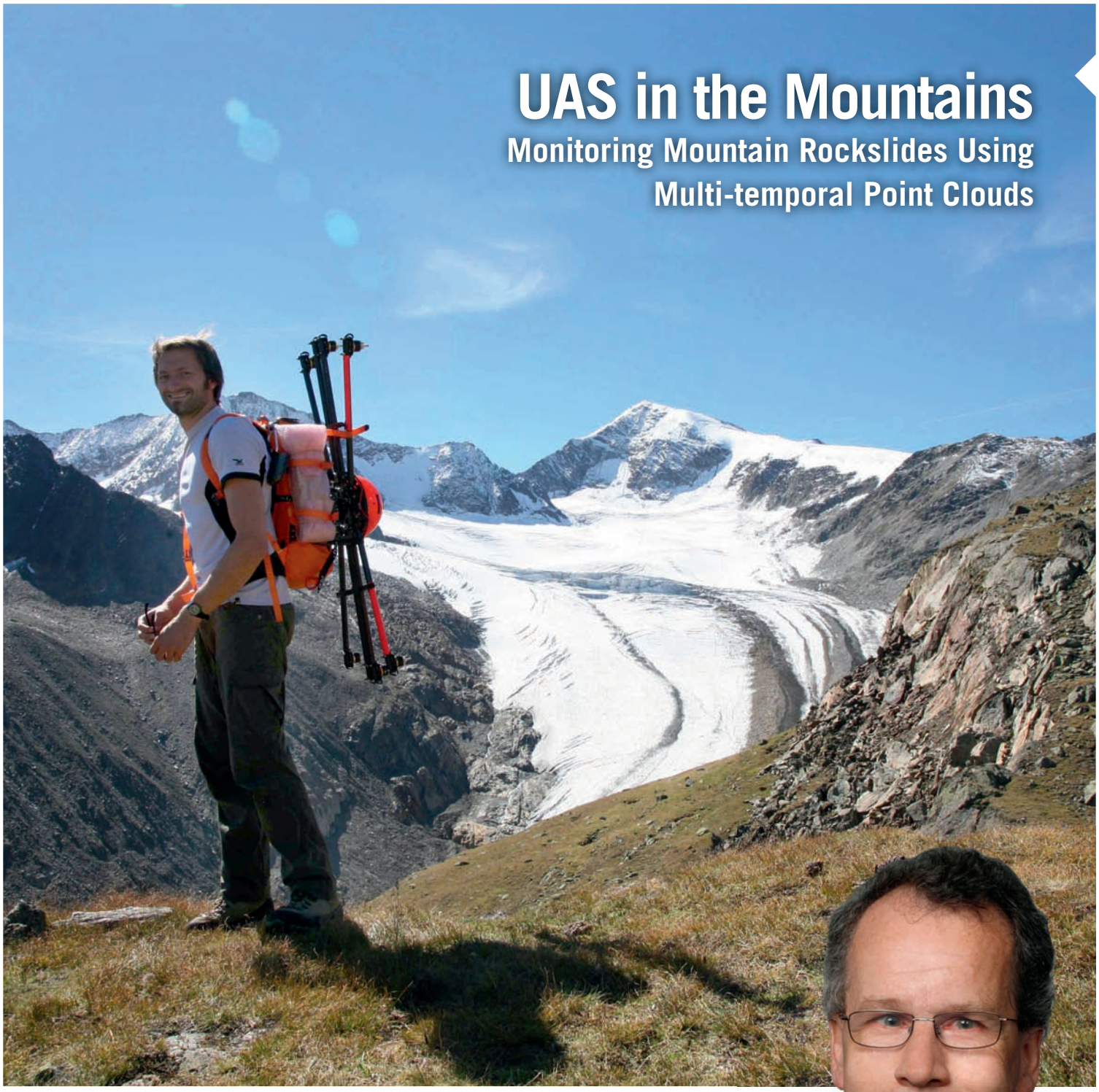
GIM INTERNATIONAL

THE GLOBAL MAGAZINE FOR GEOMATICS
WWW.GIM-INTERNATIONAL.COM

geomares PUBLISHING

ISSUE 6 • VOLUME 27 • JUNE 2013



UAS in the Mountains

Monitoring Mountain Rockslides Using Multi-temporal Point Clouds

BeiDou Maturing Rapidly

See page 37

The New Face of Cartography

Why Cartography is Relevant, Attractive and Contemporary

GIM International Interviews

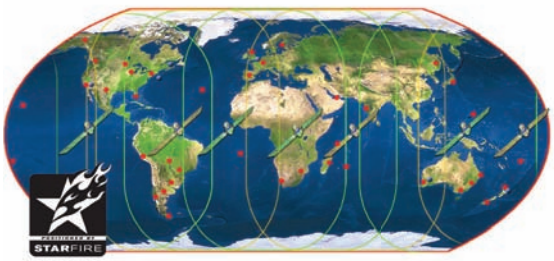
Christian Heipke

StarFire Rapid Recovery Keeps You Going

Worksite conditions are seldom perfect and GNSS signal outages can cause costly delays, but NavCom will help get you up and running again with StarFire Rapid Recovery.

NavCom's new StarFire Rapid Recovery feature helps you bridge GNSS signal interruptions by allowing you to quickly regain StarFire accuracy up to 5cm once the GNSS signal is reacquired. NavCom's StarFire Network, a Global Satellite Based Augmentation System, provides five centimeter horizontal accuracy worldwide. It offers 99.999% uptime, a seven satellite constellation, and StarFire over IP (SFoIP) delivery for redundancy to ensure system availability and position accuracy.

We understand that in order to do the job right, you need the right tools and NavCom's suite of StarFire productivity tools including StarFire Rapid Recover, StarFire Over IP delivery and RTK Extend help users reduce costs, and maintain maximum uptime.



www.navcomtech.com

NAVCOM

A John Deere Company

No 2381

GIM INTERNATIONAL

PUBLISHING DIRECTOR
Durk Haarsma
FINANCIAL DIRECTOR
Meine van der Bijl
TECHNICAL EDITOR
Mark Pronk, BSc
SENIOR EDITOR
Dr Ir. Mathias Lemmens
CONTRIBUTING EDITORS
Dr Ir. Christiaan Lemmen, Dr Ir. Bastiaan van Loenen, Dr Rohan Bennett, Dr Mike Barry
EDITORIAL MANAGER
Wim van Wegen
NEWS EDITOR
Drs. Joost Boers
COPY-EDITOR
Lynn Radford, Englishproof.nl
EDITORIAL BOARD
Ir. Paul van Asperen, Dr Bharat Lohani
SALES MANAGER
Victor van Essen
MARKETING ASSISTANT
Trea Fledderus
CIRCULATION MANAGER
Adrian Holland
DESIGN
Verheul Media Supporters BV, Alphen aan den Rijn
www.vrhl.nl

REGIONAL CORRESPONDENTS
Ulrich Boes (Bulgaria), Assoc. Prof. Dr Alper Çabuk (Turkey), Papa Oumar Dieye (Niger), Dr Olajide Kufoniyi (Nigeria), Dr Dmitry Kurtener (Russia), Dr Jonathan Li (Canada), Dr Carlos Lopez (Uruguay), Dr B. Babu Madhavan (Japan), Dr Wilber Ottichilo (Kenya), Dr Carl Reed (USA), Dr Aniruddha Roy (India), Prof. Dr Heinz Rüther (South Africa), Dr Tania Maria Sausen (Brazil)

Geomares Publishing
P.O. Box 112, 8530 AC Lemmer, The Netherlands
T: +31 (0) 514-56 18 54
F: +31 (0) 514-56 38 98
gim-international@geomares.nl
www.gim-international.com

BPA WORLDWIDE BUSINESS

Neocartography

As the boundaries between traditional and modern cartography become increasingly blurred, 'neocartography' appears to be the inevitable next stage in the development of the cartographic profession. The ancient skill of cartography, which actually forms the origins of modern geomatics, has been more heavily influenced and affected by technological innovations and developments than any other field in the spectrum. These developments have made it possible for map users to also become map producers. Moreover, maps are a very high-profile product meaning that the fruits of cartographers' labours are continually in the user spotlight, whereas specialists in other fields such as geodesy or photogrammetry and remote sensing attract less attention and are able to carry out much of their work behind the scenes. In short, the cartography profession faces considerable challenges. Nevertheless, on behalf of the industry, the International Cartographic Association (ICA) is tackling the theme of 'modern cartography' head on, as the article by Georg Gartner, president of ICA, and Manfred Buchroithner, vice president of the German Cartographic Society, entitled 'The New Face of Cartography' in this issue of *GIM International* illustrates. According to the authors, there is a discrepancy between traditional cartography based on established and proven insights, and the popularity of applications of new technologies in creating and using maps. It is therefore very important to bring together the parallel worlds in cartography. 'But why?', one might ask. Because if non-professional map-makers are creating a world in which maps no longer meet the necessary requirements, this not only leads to confusion but might also lead to accidents when decisions are based on maps that are incorrect. In turn, this would reflect badly on the 'official' field of cartography, with people maybe even holding it responsible for the problems – with a potentially disastrous impact on the industry. Therefore, the ICA's task of reaching out to the world of the 'non-professional' user and creator is one of the most important activities on the association's plate these days. The world needs to be reminded that the process of creating a map is steeped in history and backed by highly scientific knowledge based on geodetic principles – despite the fact that modern techniques make it seem so easy, literally at the push of a button. Another major task is to point out the importance of geography education within secondary schools. If everybody has a sound knowledge of the geography basics, it's easier to understand and prevent flaws in modern maps, even if they are not for professional use. Also, I believe it is important that the 'learned community' is both willing and able to comment on the general news as experts when it comes to maps and map-making. One could summarise the challenge for ICA as a 'communication' task: communicating the function of the map to user groups at all levels. Again, this is not an easy challenge for a learned society to tackle, but ICA is already facing up to it through a variety of initiatives deployed. The article on 'The New Face of Cartography' on page 22 heralds the start of a period with ample space for new cartography in *GIM International*, as we strive to contribute to and bring updates on the important message of 'neocartography'.

Photography: Arie Bruinsma

DURK HAARSMA
Publishing director
durk.haarsma@geomares.nl

Nikon Quality You Can Trust

Nikon NPL-322 series Total Station

The Nikon NPL-322 is built tough for all occasions.

The Nikon NPL-322 Total Station, an economic, versatile, and easy-to-use platform that ensures you get the job done right. Available in a 2" dual face model and a 5" single face model the NPL-322 will meet your specific accuracy needs.

Both NPL-322 total station models feature a reflectorless EDM with up to 200 meter (656 feet) range. Using the same rechargeable long life Li-ion battery as the Nivo series, combined with low power consumption design, the NPL- 322 provides over 11 hours of operating time per battery. For convenience, the Nikon NPL-322 total stations include two batteries and a dual charger, to support even the longest of working days.

Nikon's legendary optics effectively allow in more light to give you brighter, clearer images. You'll see the difference when you look through a Nikon Total Station even in the low-visibility conditions typical in the field. You'll see much more detail and much less distortion, especially over longer distances. Better optics help you aim more precisely, and they're much easier on your eyes—something you'll really appreciate on long workdays.

Nikon NPL-322: Simple • Dependable • Accurate

Features

- **2"and 5" angle accuracies**
- **Prism and reflectorless measurements**
- **Fast, accurate EDM**
- **Convenient and lont-lasting**
- **Long life Li-ion Battery**
- **Easy-to-use keypad**
- **Rugged and lightweight**

AMERICAS

Nikon Surveying Instruments
10355 Westmoor Drive, Suite #100
Westminster, CO 80021, USA

+1-720-587-4700 Phone
888-477-7516 (Toll Free in USA)

No 2360

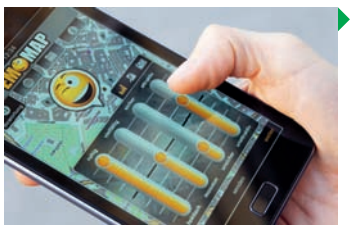
Preparations for the two hour descent back to the valley after a successful UAS flight day, surveying an active rockslide in the Austrian Alps. During three flights, the multicopter acquired 126 images for photogrammetric purpose at altitudes up to 2900 metres above sea level. Read the article 'UAS in the Mountains' to find out more.

GIM INTERNATIONAL
GIM International, the global magazine for geomatics, is published each month by Geomares Publishing. The magazine and related e-newsletter provide topical overviews and accurately presents the latest news in geomatics, all around the world. *GIM International* is orientated towards a professional and managerial readership, those leading decision making, and has a worldwide circulation.

PAID SUBSCRIPTIONS
GIM International is available monthly on a subscription basis. The annual subscription rate for *GIM International* is €140 within the European Union, and €200 for non-European countries. Subscription can commence at any time, by arrangement via our website or by contacting Abonnementenland, a Dutch subscription administration company. Subscriptions are automatically renewed upon expiry, unless Abonnementenland receives written notification of cancellation at least 60 days before expiry date. Prices and conditions may be subject to change. For multi-year subscription rates or information on current paid subscriptions, contact Abonnementenland, Postbus 20, 1910 AA Uitgeest, Netherlands
+31 (0)251-257926
(09.00-17.00 hrs, UTC +1)
paidsubscription@geomares.nl.

ADVERTISEMENTS
Information about advertising and deadlines are available in the Media Planner. For more information please contact our sales manager: victor.van.essen@geomares.nl.

EDITORIAL CONTRIBUTIONS
All material submitted to Geomares Publishing and relating to *GIM International* will be treated as unconditionally assigned for publication under copyright subject to the editor's unrestricted right to edit and offer editorial comment. Geomares Publishing assumes no responsibility for unsolicited material or for the accuracy of information thus received. Geomares Publishing assumes, in addition, no obligation to return material if not explicitly requested. Contributions must be sent for the attention of the editorial manager: wim.van.wegen@geomares.nl.



Introducing the UltraCam Osprey oblique digital aerial sensor system.

The UltraCam Osprey brings UltraCam performance and quality to your oblique aerial data acquisitions. This new UltraCam sensor system collects oblique imagery along with nadir PAN, RGB and NIR data all in a single pass and at image footprints of 13,450 (oblique) and 11,674 (PAN nadir) pixels across the flight strip. In doing so, the UltraCam Osprey provides you with a highly efficient and ideal system for a wide range of projects ranging from 3D urban mapping to classification to photogrammetric applications requiring high-geometric accuracy and superior radiometry.

The UltraCam Osprey is fully supported in the UltraMap 3.0 workflow software to perform aerotriangulation (AT) and to generate high accuracy point clouds, DSM, DTM, and DSM/DTMorthos.

Get details and see UltraCam Osprey image samples at www.UltraCamOsprey.com.

ULTRACAM OSPREY ULTRAMAP 3.0 Workflow Software System Microsoft

No 2366

INSPIRE: Is it Time for Better Semantic Interoperability?

FRANÇOIS SALGÉ
Secretary-general, CNIG (National Council for Geographic Information), France
Francois.Salge@developpement-durable.gouv.fr

On 8 April 2013, the INSPIRE committee unanimously approved the Implementing Rule regarding the themes of annex II and III. This important event is a milestone for interoperability in the EU, primarily for environmentally related spatial data, but also for other communities who will benefit from and build upon the INSPIRE experience. The Directive 2007/2/EC of the European Parliament and of the Council of 14 March 2007 established an Infrastructure for Spatial Information in the European Community (INSPIRE) and came into force on 15 May 2007. After several regulations (on metadata in 2008, network services in 2009, data and service sharing, download services and transformation services in 2010), the latest regulation deals with semantic interoperability. This means, as far as the themes of annex II and III are concerned, that every new dataset will have to comply by 2015 and every existing dataset by 2020.

Semantic interoperability refers to the ability of computer systems to transmit data with unambiguous, shared 'meaning'. Semantic interoperability is a requirement to enable machine computable logic, inferencing, knowledge discovery and data federation between information systems. Each data element will be associated with a controlled, shared vocabulary. This vocabulary comprises class names, attribute names, constraints and code lists. Datasets from several countries containing objects of any class of any INSPIRE theme with its attributes will be semantically interoperable as they will share the same meaning....or at least, that's the theory.

In practice, there will be differences in interpreting the definitions pencilled in the regulation although enlightened by the associated guidelines. For example, is every country clear on the meaning of 'ZoningElement' in the land use theme which stands for 'A spatial object which is homogeneous regarding the permitted uses of land based on zoning which separate one set of land uses from another'? Assuming that the concept is well understood by every country, each zoning element is qualified by a specific attribute called 'hilucs-LandUse' which provides the land use HILUCS class that is dominant in the zoning element. HILUCS is a code list that says for example that code '5_1_PermanentResidentialUse' means 'Residential areas dominated by detached houses surrounded by gardens and/or yards, a mix of single houses, semi-detached houses, terraced houses, town houses, row houses and blocks of flats used as permanent residence'. Is the definition applicable as such in every country? How will that definition be interpreted by the various countries?

INSPIRE just created a new ontology, a new language! Undeniably a step forward, it provides for semantic interoperability but there can be no doubt that the effective use of the regulation will generate further questions relating to the 'meaning' of the information the European SDI will serve.

DOU FOCUS AT CHINA SATELLITE NAVIGATION CONFERENCE ++ MAJOR STEP IN US OPEN DATA POLICY ++ VIETNAM PLANS SECOND REMOTE SENSING SATELLITE ++ 3D LASER MAPPING
GANISES INNOVATION IN 3D EVENT ++ LATIN AMERICAN REMOTE SENSING WEEK IN SANTIAGO ++ REAL-TIME PPP BASED ON GALILEO SIGNALS ++ LASTOOLS SERIES OF WORKSHOPS

REAL TIME IS BETTER

[ANYTIME, ANYWHERE, ANY WAY YOU NEED IT.]

Get immediate access to information that can be utilized for control, display, surveying, monitoring, or other purposes. Pacific Crest offers the most advanced radio link technology anywhere. The ADL and XDL radio lines provide the high accuracy, power and application flexibility you need. The XDL Rover is a compact and lightweight, yet very durable UHF receiver designed specifically for precise positioning applications. XDL and ADL radios and OEM modules are backward compatible with existing Pacific Crest radios and other products.

Step up to the performance you need at www.PacificCrest.com

PACIFIC CREST®

www.PacificCrest.com

No 2327

Latin American Remote Sensing Week in Santiago

The Aerial Photogrammetric Service (SAF), along with the International Society for Photogrammetry and Remote Sensing (ISPRS) and FISA, is presenting the second edition of the Latin American Remote Sensing Week (LARS 2013) which will take place from 23 to 25 October 2013 at the Centro de Extensión UC in Santiago, Chile.

http://su.pr/85HJ7j

GEO AfricaGIS and GSDI Grant

The Group on Earth Observations (GEO) has contributed USD5,000 to help defray expenses of worthy applicants from economically disadvantaged nations in Africa to attend the combined AfricaGIS 2013 and GSDI 14 conference plus training workshops before and after the conference. GEO invites, encourages and challenges additional geospatial organisations and agencies from across the globe to make similar contributions.

http://su.pr/5S9W9j

Real-time GIS Partnership between Esri and OSIsoft

OSIsoft, the California-based producer of the PI System, a leading operational data infrastructure for real-time data and events, and Esri, the global leader in geographic information systems (GIS), have announced a strategic partnership to execute their vision of real-time GIS.

http://su.pr/1gVFKg

Dutch Schoolboy Photographs Earth from 35 Kilometres Up

A 16-year-old Dutch schoolboy, Matthijs Tissen, has succeeded in taking photos of the Earth from an altitude of 114,000 feet (35 kilometres) with a camera attached to a weather balloon. All he needed for this was a helium-filled weather balloon, a camera and GPS equipment. He fixed the camera to the weather balloon and let it fly above the Earth for two and a half hours.

http://su.pr/20NemU

Before take-off.

Maptek Donates Laser Scanner to University of California Berkeley

Technology provider Maptek has donated an I-Site laser scanning instrument to the University of California Berkeley in the USA. After years of renting I-Site scanners, the university can now use the technology for graduate and undergraduate research. Educational licenses of Maptek I-Site Studio, intuitive 3D point cloud processing and modelling software have also been provided.

http://su.pr/5Ns2mU

Siberian State Academy of Geodesy Turns 80

Gottfried Konecny was honoured at Interexpo Geo-Siberia.

The Siberian State Academy of Geodesy (SGGA) has celebrated the 80th anniversary of its foundation. The official celebration took part in the Novosibirsk Opera and Ballet Theatre on 23 April 2013. The theatre welcomed world-famous specialists, outstanding members of the Academy and many of its graduates. The celebration was followed by the IX International Scientific Congress and Exhibition, Interexpo Geo-Siberia, which took place from 24 to 26 April 2013.

http://su.pr/25MJI1

ANNOUNCED ++ DUTCH SCHOOLBOY PHOTOGRAPHS EARTH FROM 35 KILOMETRES UP ++ SEPTENTRIO GNSS RECEIVERS FOR AIRBORNE GEOPHYSICAL SU ERGEO
ROUND TABLE ON GEOSPATIAL INNOVATION ++ SIBERIAN STATE ACADEMY OF GEODESY TURNS 80 ++ GALILEO AND GPS SYNCHRONISE WATCHES ++ POSTG S

LET'S HAVE A SHOT 800M AWAY!!

So, you are going to take some measurements in field. Good, you'll need a few things. First, you'll need an accurate and powerful EDM, with long long long reflectorless range. Then, you'll need a large and clear color LCD screen for high visibility under sunshine. And you'll definitely need various data transmission interface: Bluetooth, SD card, USB port. In short, you'll need KOLIDA KTS-462R8.

KOLIDA

www.kolidainstrument.com

No 2222

The Impact of the US Sequestration on Geomatics

After the postponement of the National Map Users Conference and the cancellation of this year's Joint Navigation Conference, numerous empty seats at the ASPRS 2013 Conference were yet another sign of the impact of the US sequestration. Can we expect to see more negative effects in the future? GIM International has been asking around in the geomatics sector to obtain some expert opinions. The first contribution came from ASPRS president Steve DeGloria.

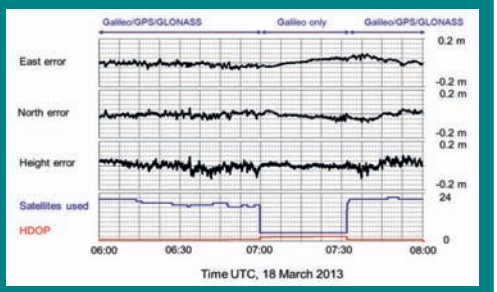
Steve DeGloria.

http://su.pr/8KkMDM

Real-time PPP Based on Galileo Signals

Since the launch of the last two Galileo satellites in autumn 2012, Fugro has been looking forward to demonstrating real-time Precise Point Positioning (PPP) based solely on Galileo signals. These two satellites have brought the constellation to a total of four satellites, the minimum required to permit calculation of a Galileo-only position. Fugro achieved this task on 18 March 2013, which was within one week of all four Galileo satellites being activated.

http://su.pr/1Szh0d



Real-time PPP with Galileo.

Most Shared

Most shared during the last month from www.gim-international.com

1. Dutch Schoolboy Photographs Earth from 35 Kilometres Up
   - **http://su.pr/20NemU**
2. Major Step in US Open Data Policy
   - **http://su.pr/9rVPga**
3. USGS Comment on Sequestration
   - **http://su.pr/1YnQma**
4. Special Edition of GIM International on UAS
   - **http://su.pr/2p9yhx**
5. First Zebedee 3D Mobile Mapping Project
   - **http://su.pr/2xETCG**

SCHOLARSHIP IN CAPE TOWN ++ FIRST ZEBEDEE 3D MOBILE MAPPING PROJECT ++ REAL-T IP

BETWEEN ESRI AND OSISOFT ++ MAPTEK DONATES LASER SCANNER TO UNIVERSITY OF CALI +

First Zebedee 3D Mobile Mapping Project

Australian researchers are using the novel mobile laser 3D mapping system called Zebedee to preserve some of the country's oldest and most culturally significant heritage sites. The handheld 3D mapping system is developed by CSIRO and can scan an environment as an operator walks through it.

http://su.pr/6GL0nS

Zebedee scanner in use at Fort Lytton.

Septentrio GNSS Receivers for Airborne Geophysical Surveys

Septentrio has announced that GeoDuster Technologies, a South Africa-based premium integrator of systems and software built to aid exploration success, has selected the TERRASTAR-D Precise Point Positioning (PPP) service and Septentrio GNSS receivers for use in airborne geophysical surveys for mining, geology, exploration and environmental applications.

http://su.pr/2AvUAN

Long-distance 3D Laser Camera System Unveiled

3D laser scanning is no longer particularly striking, but a camera system that creates high-resolution 3D images from up to a kilometre away is definitely something exciting. Physicists from Heriot-Watt University in Edinburgh, UK, have developed a laser camera that is able to take images, precise down to the millimetre, from such an impressive distance. Key to the physicists' success was solving the problem of objects which reflect laser light poorly.

http://su.pr/4bfqEp

3D images taken in daylight from 910m away (image courtesy: Optics Express).

Dassault Systèmes Acquires 3D City Modelling Pioneer

Dassault Systèmes, the 3DEXPERIENCE company and a world leader in 3D design, 3D digital mock-up and product lifecycle management (PLM) solutions, has announced its takeover of Archividéo, a leader in the automated creation and management of large 3D urban environments and landscapes.

http://su.pr/23QS8a

AIBOTIX UAVS ENTER US MARKET ++ GYROCOPTER FOR AERIA NS ++
BEIDOU FOCUS AT CHINA SATELLITE NAVIGATION CONFERENCE I US

LAStools Series of Workshops Announced

Earlier this year, technology start-up rapidlasso GmbH launched a series of seminar talks and workshops on Lidar processing using LAStools in various locations in the Asia-Pacific region. The events are hands-on tutorials on how to efficiently process large amounts of airborne Lidar using rapidlasso's LAStools software. More workshops and events lie ahead, not only in the Far East but also in Canada and parts of Europe.

http://su.pr/6WAW7y

Postgraduate Geomatics Scholarship in Cape Town

Michael Barry, presently professor of geomatics engineering at the University of Calgary in Canada, has recently created a bursary to support a PhD in geomatics at the University of Cape Town, South Africa. To help get the bursary started, he is calling on fellow alumni and past students to support this initiative.

http://su.pr/1c6vxb

Third Intergeo Round Table on Geospatial Innovation

From urban development and demographic change to the energy revolution – no relevant social challenge was ignored at the third Intergeo round table on geospatial innovation in Karlsruhe, Germany. Experts from the worlds of science and business attending the event agreed that it is only possible to tackle the complex challenges facing today's society with precise, well-prepared geoinformation and geoservices.

http://su.pr/1j1UIN

Intergeo logo.

Gyrocopter for Aerial Survey Operations

DiNelly Aerosystems presented its new eXoGyro gyrocopter as a versatile aerial platform for airborne sensing missions at the recent AERO 2013 global aviation fair held in Friedrichshafen, Germany. The eXoGyro has been developed primarily for the commercial user. With its 1.6m³ cabin, it provides the necessary space to install a variety of airborne sensor systems for mapping and other observational purposes.

http://su.pr/2Qj87c

eXoGyro gyrocopter.

SOUTH
Target your success

INTEGRATED RTK GNSS SURVEYING SYSTEM

- L1/L2, 220 channels
- GPS+GLONASS+COMPASS+GALILEO
- Static H./V. accuracy:
  ±3mm+0.5ppm/±5mm+0.5ppm
- RTK H./V. Accuracy:
  ±8mm+1ppm/±15mm+1ppm

Outstanding Waterproof

Extremely Rugged

Externel Memory Storage

Intuitive Voice Guide

S82-2013

Key Features:

→Compatible to popular brand of external radio & receiver
→Built-in transmitting radio (0.5/2w switchable), 410-430/430-450/450-470MHz optional
→Intuitive voice message guide
→Quick access to CORS
→12 LED for status/mode settings
→4GB flash memory+4GB SD card (extendable)
→IP67 water/dustproof

S86-2013

Key Features:

→Built-in transmitting radio (2/5w switchable), 410-430/430-450/450-470MHz optional
→4GB flash memory (extendable, maximum 32GB)
→Quick access to CORS
→Colorful OLED screen for status/mode settings
→Double built in battery for long hours operation
→Extremely rugged and durable
→IP67 water/dustproof

www.southinstrument.com www.southsurvey.com mail@southsurvey.com export@southsurvey.com impexp@southsurvey.com gnss@southsurvey.com

No 2380

Major Step in US Open Data Policy

US President Barack Obama has signed an Executive Order to make government-held data more accessible to the public, declaring that information is a valuable resource and strategic asset for the United States. The Memorandum establishes a framework to help institutionalise the principles of effective information management at each stage of the information's life cycle to promote interoperability and openness.

http://su.pr/9rVPga

3D Laser Mapping Organises 'Innovation in 3D' Event

In collaboration with University College London, UK, 3D Laser Mapping will organise its first-ever laser scanning product showcase. This free-to-attend event will feature the latest technical innovations and solutions from the laser scanning sector including handheld mapping systems, 3D imaging systems and the world-leading mobile mapping system, StreetMapper. The event is entitled 'Innovation in 3D' and will take place on 18 July at UCL's campus in central London.

http://su.pr/32PPSe

LADM

In the nineties I was involved in several projects, initiated by Western institutions, to re-establish Cadastres in former centrally planned economies in Central and Eastern European countries. What struck me was that Western consultants – whether from the US or Europe – were all biased towards providing homeland solutions. They tapped on their briefcases and smiled triumphantly, saying, "This here contains the ultimate solution to your problem." Unhindered by the presence of any local knowledge, they implemented the solution they knew from home. Failure guaranteed! The idea that implementing a technology in a cultural and social setting that differed from the one in which the technology had been developed might be an issue did not occur at all to those who had previously never tried to do so. Success turned out to be elusive. And slowly, the realisation grew that Western solutions and technology were not universally applicable.

MATHIAS LEMMENS
Senior editor, GIM International
m.p.j.m.lemmens@tudelft.nl

How should we proceed? We need a standard approach: a common framework, a common language. We need these for communicating the concepts of land administration (LA) to every nook and cranny of the planet. These were the thoughts of the esteemed experts Christiaan Lemmen, Peter van Oosterom and Paul van der Molen. They walked the talk, and their concerns resulted in the inception of the Land Administration Domain Model (LADM). In 2008, FIG submitted LADM to ISO. And finally, after a gestation period of some 12 years in total and nourished by many leading experts all over the world, the infant was born on 1 December 2012 and baptised ISO Standard 19152. LADM enables LA information from several sources to be combined coherently by defining a reference and providing a conceptual model integrating LA components which are universal all over the world. These components are: (1) people and organisations; (2) rights, responsibilities, and restrictions (including mortgage); (3) spatial units; (4) sources to capture the spatial units (surveying); and (5) representation of spatial units (geometry and topology).

In April 2013, we at *GIM International* started a series on LADM. "The standard [...] can easily be changed depending on local demands [...], the approach is as flexible as possible," the developers stated in their contribution. That sounds as if the emperor wears no clothes. That sounds as if implementing LADM is like sailing in tricky waters. When a standard is easily adaptable to indigenous needs, it behaves like mercury – it may even evaporate above the sea of good intentions. It would be a mistake to think that adopting LADM is an off-the-shelf solution. Basically it provides a framework for communication and aligning thoughts of all involved, which are, as lessons show, by definition diverging. It is still hard work to realise or improve LA, and part of the hard work lies in the acquisition of the data describing the outlines of spatial units. It would be incorrect to tap on the LADM briefcase and smile triumphantly, saying, "This here contains the ultimate solution to your problem."

OPEN DATA POLICY ++ VIETNAM PLANS SECOND REMOTE SENSING SATELLITE ++ 3D LASER MAPPING ORGANISES INNOVATION IN 3D EVENT ++ LATIN AME ING WEEK
N SANTIAGO ++ REAL-TIME PPP BASED ON GALILEO SIGNALS ++ LASTOOLS SERIES OF WORKSHOPS ANNOUNCED ++ DUTCH SCHOOLBOY PHOTOGRAPHS METRES U

GIM INTERNATIONAL INTERVIEWS CHRISTIAN HEIPKE

Tomorrow's Global Geospatial Needs

The International Society for Photogrammetry and Remote Sensing (ISPRS) is one of the leading organisations within the geomatics sector and has a long-standing partnership with *GIM International*. We spoke to Christian Heipke, secretary general of the ISPRS, during the 2013 Geospatial World Forum in Rotterdam, The Netherlands. Here, he shares his views on topics such as the growing role of unmanned aerial systems (UAS) and oblique imagery – just two examples of major developments in data acquisition at the moment – as well as the future challenges for the industry.

Congratulations on receiving the Photogrammetric (Fairchild) Award, the highest scientific recognition from the American Society for Photogrammetry and Remote Sensing (ASPRS), in March 2013. How did that feel?

The award came as a big surprise. Of course, I felt very honoured to have been selected. But when I saw the list of previous winners, I felt that my name didn't really belong among them. Firstly because the award seems to honour lifetime achievements, and I still feel too young for such recognition. And secondly, I don't think my contributions are significant enough for this award. But then, I did feel proud as well …

Two recent major developments in photogrammetry are oblique imagery and unmanned aerial systems (UAS). Which key opportunities does oblique photogrammetry offer in terms of 3D city modelling?

First of all, oblique images – which have actually been around for many decades – provide formidable facade texture for automatically rendering 3D city models. Obviously, if doors, windows, balconies and suchlike need to be entered into the models as spatial objects (in contrast to pure texture), these can be extracted from oblique images. In addition, monitoring activities taking place in urban settings are largely facilitated using facade views. Other applications comprise determining the facade material – such information can be useful for sound simulation – and monitoring a building's heat flux using thermal oblique images. In short, oblique images are a valuable tool for visualisation, and they can be used to derive a lot of information which is not accessible from aerial images.

Which geo-related applications are likely to benefit most from using UAS?

As a platform, the type of UAS we are talking about in photogrammetry closes the gap between terrestrial and aerial imaging. A UAS is much easier to employ than aircraft, and at least for small projects it is much more economical. Possible applications include archaeology, precision farming and mapping small areas in general. If monitoring is part of the job and the area needs to be revised frequently, for instance in construction site documentation or when monitoring traffic jams or sporting events, this is of course an added bonus. One can also envision a UAS being equipped with a thermal camera to detect heat leakages in industrial plants. In disaster management, of course, rescue crews can benefit from using UAS to quickly obtain an overview of the situation, and security applications also profit from UAS.

What will be the role of UAS for modelling the built environment in 3D?

Since the built environment is of course an area where much change happens, monitoring is a major task. UAS can be used for checking if a database of the neighbourhood is complete and up to date by comparing its content to UAS images, or for acquiring newly constructed buildings, annexes, etc. As mentioned before, oblique images taken from a UAS can also be used to render the 3D city model for visualisation purposes.

Are there any major obstacles blocking the path to UAS becoming an established photogrammetric technology?

In terms of technology, power is one of the most limiting factors today. Batteries are very heavy, thus UAS can only stay in the air for a relatively short amount of time. For rotary wing UAS such as quadcopters and octocopters as well as for some fixed wing systems, wind and weather can be another limiting factor – flying in rough meteorological conditions is not advisable. On the non-technical side, flight permits are sometimes hard to obtain for safety reasons, and data privacy may become an issue, as was the case with Google Streetview in a number of countries. But with proper planning, these issues should not be a real obstacle for photogrammetric projects.

Research into image matching has been taking place for more than three decades now, and many of the multitude of methods developed have been implemented in commercial Digital Photogrammetric Workstations (DPWs). Nevertheless, it is still an active research area. Could you explain this?

Indeed, image matching has a long history, and from a superficial

Christian Heipke

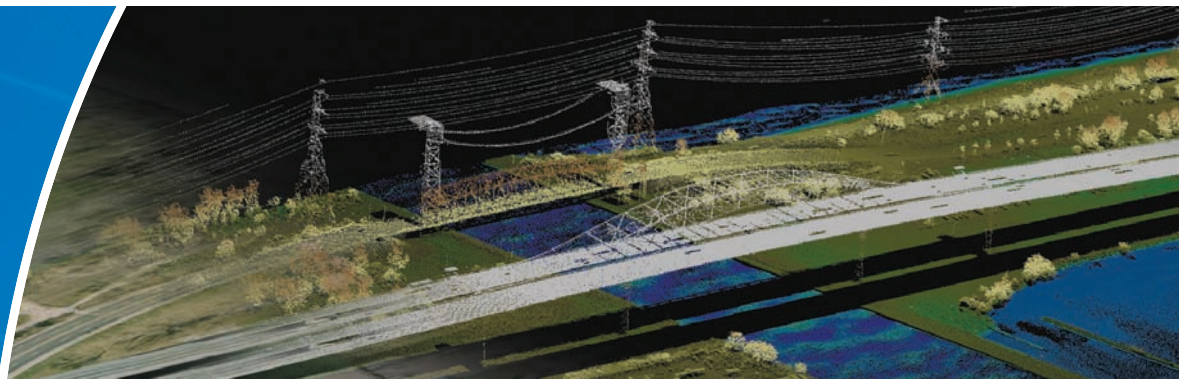
Christian Heipke is a professor of photogrammetry and remote sensing at Leibniz Universität Hannover, Germany, where he leads a group of 25 researchers. His professional interests comprise all aspects of automation in photogrammetry and its connections to computer vision and GIS. His has authored or co-authored over 300 scientific papers, more than 70 of which have appeared in peer-reviewed international journals. He received the 1992 ISPRS Otto von Gruber Award, the 2012 ISPRS Fred Doyle Award and the 2013 Photogrammetric (Fairchild) Award from ASPRS. He currently serves as ISPRS secretary general and chairs the German Geodetic Commission (DGK).

✉ isprs-sg@ipi.uni-hannover.de

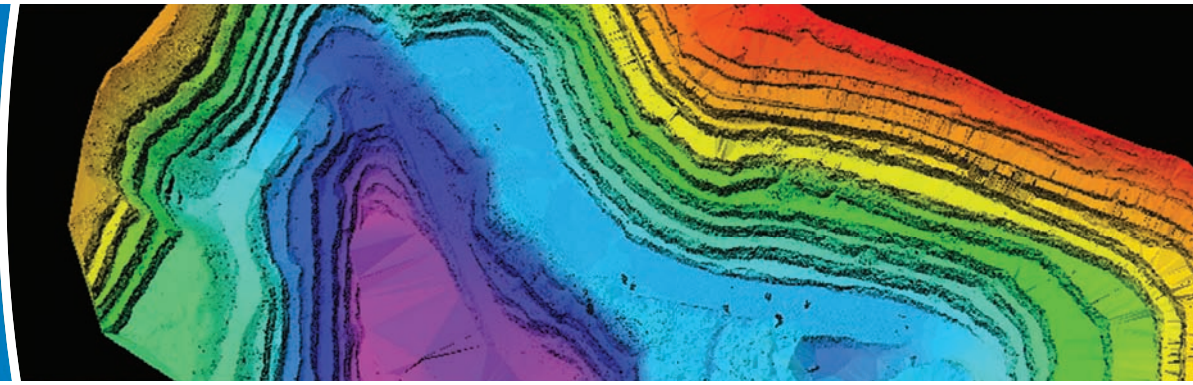
Optech

Setting the Standard for **Lidar** and **Camera** Integration

AIRBORNE



TERRESTRIAL



MOBILE

Advanced Engineering ▪ Sensor Integration ▪ Unparalleled Support

The world is changing fast, and Optech sensors continue to meet the growing demand for accurate and timely information. For over 35 years Optech has led the world in advanced laser ranging and imaging systems, building on its core expertise in lidar technology. Whether it's airborne, mobile or terrestrial surveying, Optech lidars and seamlessly integrated cameras provide a highly efficient and cost-effective solution.

Optech offers the only full line of high-performance aerial digital cameras, both standalone and lidar-integrated. For film replacement, corridor mapping, oblique imagery or thermal analysis, Optech's scalable and flexible camera systems reduce costs and deliver superior image quality.

For project managers, Optech delivers precise, accurate and geo-referenced spatial data. For surveyors worldwide, Optech delivers rugged lidar and camera hardware with reliable support and service—anywhere, any time—backed by the industry's leading global 24/7 support.

2013 Optech ILSC

June 25-27
Toronto, Canada
www.optech.com/ ilsc2013

www.optech.com

No 2376

point of view, one might argue that the research should have been finished long ago. But we should not forget that matching serves very different purposes. The first goal was to produce a digital terrain model from aerial images in open areas. First attempts date back to at least the 1960s, and useful solutions appeared together with the first DPWs. Attention then shifted to automating image orientation, thus to automatically deriving tie points in aerial triangulations. Commercial solutions first became available some 15 to 20 years ago and have been refined ever since. In the meantime, we are able to use a very large set of images from the web, which were never intended to be used for photogrammetric purposes, for automatically reconstructing a model of the depicted scene.
Nowadays, researchers aim at reproducing 3D city models with many height discontinuities in extremely high resolution, and also at recognising obstacles in autonomous driving applications. The latter obviously needs real-time solutions. Matching results also start to be a very valuable piece of information for automatic image understanding, which is a major driving force for today's research into dense matching. For instance, when we want to extract buildings from images, we are well advised to take into account that buildings are higher than the surroundings. If this height information is available, it makes it much easier to discern buildings from other objects with similar grey values such as roads. Stereo operators have known that for a long time.
In a nutshell, when we talk of image matching we talk of a very broad range of methods with rather different applications. While some have been solved decades ago, research still struggles with others. I actually believe this situation will continue for a while.

The spatial resolution of today's satellite imagery is 41cm, although this figure is effectively 50cm due to the US government's restrictions on civilian imaging. The trend is towards increasingly higher resolution. Will such imagery eventually become a competitor for aerial photogrammetry?
The answer is a clear yes. At a ground resolution of 50cm, we already see severe competition. Of course, celestial mechanics can't be beaten – the satellites must follow their orbits. Hence, today, images from space cannot be acquired with the same flexibility as those from the air. But this situation may change once we have access to satellite constellations, and these have started to appear in recent years. RapidEye with five satellites in medium resolution and the French Pléiades system with two high-resolution satellites are only two examples.
On the other hand, there is a clear demand for even higher ground resolution for many applications. Many of the aerial images acquired today have a pixel size on the ground of 10cm or less. Thus, it seems that there will still be a market for both satellite and aerial imagery in the foreseeable future.

UAS can operate autonomously as a result of digital flightplans, while today's software enables automatic generation of digital elevation models and orthoimagery. How do conventional DPWs need to be adapted in order to become UAS software?
Most DPW software is optimised with respect to aerial image blocks with parallel viewing direction and regular overlap in and across the flight direction. However, UAS produce many more and often smaller images with rather varying exterior orientation and irregular overlap, and the viewing direction may be oblique or nadir. In order to handle such images, DPW software must become more flexible and more robust – this also goes for input formats, but primarily for automatic generation of approximate values to run matching and bundle adjustment processes, and for a proper consideration of distortion during image exploitation. Furthermore, manual inspection of oblique images is a necessity. Finally, due to the many images, a free and smooth roaming across different stereo models without operator intervention is a must.

Which major developments do you foresee, in geodata acquisition technology in general and in photogrammetry specifically, in the next five years?
I guess what we will see is an even closer integration between methodologies from aerial and close-range photogrammetry –

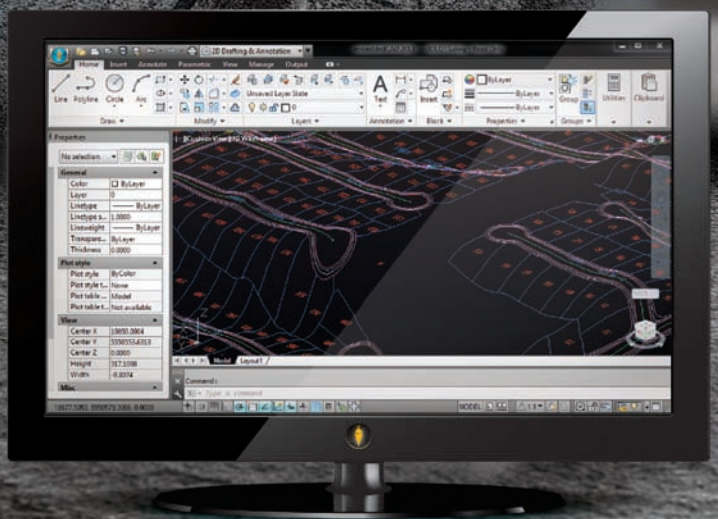
MicroSurvey CAD 2013

MicroSurvey inCAD 2013

MicroSurvey POINTPrep 2013

They're Here.

MicroSurvey embeddedCAD 2013



2013 Desktop Line-up Now Available

MicroSurvey offers the most complete desktop survey & design programs – offered on a CAD platform of your choice in order to fit your established workflow:

- **MicroSurvey CAD 2013** – Built with IntelliCAD® 7.2.
- **MicroSurvey embeddedCAD 2013** – Powered with Autodesk Technology™; uses the 2013 engine and supports DWG 2013 as the native file format.
- **MicroSurvey inCAD 2013** – Plugin for AutoCAD®.
- **MicroSurvey PointPrep 2013** – Built specifically for construction professionals to assist with site prep.

Download a free 30-day trial at:

FREE DEMO

www.MicroSurvey2013.com

MicroSurvey®

No 2217

UAVs and oblique images are just two examples of this trend. We will also see a further integration of different sensors (optical and thermal cameras, laser scanners, etc.) to form geosensor networks and platforms for mobile mapping and robotics applications. On a more general note, crowdsourcing and community mapping are very interesting alternatives to traditional data acquisition.
On the processing side, we will see more and more automation for vector data acquisition, updates and monitoring. Sensor orientation, surface matching and orthophoto generation are automated already, and classification and image interpretation will follow in the future. The need is partly due to the sheer amount of data being acquired every day; think of the many satellites in orbit, and how many millions of images are being uploaded to the web every day. Automation is the only way to process this increasing volume of images.
Real-time processing is another trend which will become more important. I already mentioned obstacle avoidance, which by the way is also important in UAS campaigns, but many monitoring tasks demand fast results as well. Geoinformation for personal use such as pedestrian navigation and personalised location-based services are another driving force in our field. All these trends are of course governed by the development of the internet, and standardisation and ubiquitous computing will become increasingly important.

How do you see the role of ISPRS in the coming decade?
ISPRS is unique in its three dimensions: (1) ISPRS is a scientific society embracing the areas of photogrammetry, remote sensing and geospatial sciences. The society is the premier global player in the science of acquisition and automatic analysis of any kind of images and of geospatial information; (2) ISPRS is a society with activities ranging from pure science to exciting innovative applications, thus uniting academia, government, industry and private business. ISPRS is the ultimate meeting place for business, with major exhibitions demonstrating the commercial strength and future potential of our discipline; and (3) ISPRS is a truly global society serving the needs of people of all ages and organisations from all nations around the globe. ISPRS is thus also the global society for education, outreach, technology transfer and capacity building.
While all three dimensions are of vital importance to ISPRS, an undisputed lead in scientific matters forms its basis, since it is today's science which defines tomorrow's products and services as well as the answers to global geospatial needs. As a consequence, we need to make sure that ISPRS remains the number 1 scientific organisation for 'information from images'.

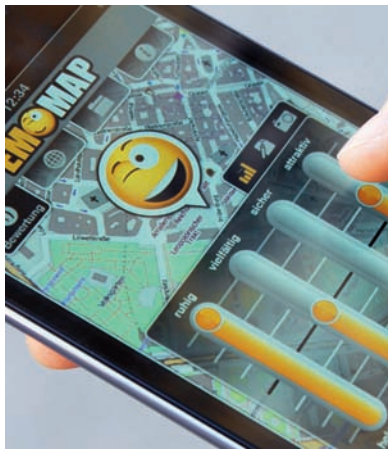
Orhan Altan, ISPRS president for the period 2008-2012, said in an interview with GIM International in 2012 that ISPRS should prioritise environmental monitoring and sustainable development. What is your standpoint on this?
I very much believe that Orhan Altan is right when he says environmental monitoring and sustainable development are major topics of today's world, and therefore ISPRS should contribute to them as much as possible. At the same time, photogrammetry, remote sensing and the spatial information sciences provide the core of the geospatial data infrastructure, which of course serves many different applications. In that sense I believe that ISPRS should make sure that the information from images benefits other areas as well: from our traditional field of topographic mapping to agriculture, forestry, resources and regional planning, and all the way to industrial metrology, cultural heritage, sports, the media industry and medical applications. Images and the information they provide play an important role in each of these very different applications.

Spread the word about an extremely interesting field with a bright future in terms of job prospects

Attracting sufficient students is a major issue for geomatics programmes at European universities. How is the situation in Hanover, and do you have any suggestions for how to increase the number of geomatics students throughout Europe?
Attracting enough students has been a challenge for many years. Also in Hanover, we would like to see more students than we presently have. We are active in a number of ways in order to try to change the situation. A current initiative is our 'Day of Geodesy and Geoinformatics' to be held on 15 June 2013. We are joining forces with private industry and public administration to present the different facets of our profession, as the employers too are starting to realise that there is a real shortage of well-educated young professionals in our field.
We are addressing both students-to-be and people already within our industry who can act as multiplying factors by spreading the word about an extremely interesting field with a bright future in terms of job prospects. ◂

WHY CARTOGRAPHY IS RELEVANT, ATTRACTIVE AND CONTEMPORARY

The New Face of Cartography



Perhaps now more than ever, cartography is affected and advanced by technological innovations and developments. New possibilities have emerged for acquiring, processing, modelling and distributing spatial data. In the context of new technologies, an increasing number of cartographic applications are either already available or in development. Cartographers are being called upon to redefine the role of their scientific discipline and to integrate the theoretical foundations with these technological developments. The International Cartographic Association (ICA) has a crucial role to play in this transition.

Traditional paper-based cartography is increasingly evolving into a modern discipline that makes use of the latest technologies, be it in data acquisition, data distribution or data visualisation. Maps are becoming more popular and are being distributed more widely. This is demonstrated by the enormous number of online map-based applications and mobile apps. Maps serve as interfaces to abundant information systems and as frameworks for presenting spatial information, either through their application on mobile input or output devices or through the internet.

CARTOGRAPHIC DATA CAPTURING

Nowadays, on a global level, a considerable amount of fundamental data used for deriving cartographic information is initially acquired by means of remote sensing, whether from airborne or space-borne platforms. This implies that unmanned aerial vehicles (UAVs) are also of increasing importance for detailed depictions. In addition to UAV data, whether it be simple digital imagery in the visible range or hyper-spectral data, ultra-high resolution (UHR) space imagery is one of the major information sources globally. The third dimension, which is of the utmost importance in cartography, can now be derived in near real time by either automated photogrammetric plotting of digital photographs in a multi-stereoscopic mode, by 3D image range cameras or by laser-scanning (Lidar), both airborne and terrestrial. The synergetic use of these various acquisition technologies and techniques can lead to new developments and applications in cartography; one example of this is rapid mapping, the ultimate method for the near-real-time provision

Manfred F. Buchroithner has been full professor for cartography at the Dresden University of Technology since 1992. He was vice chairman of EARSel and is currently serving as vice president of the German Cartographic Society.

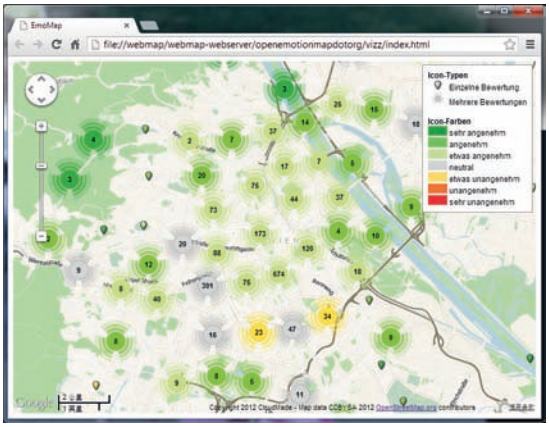
✉ manfred.buchroithner@mailbox.tu-dresden.de

Georg Gartner is a full professor for cartography and dean for academic affairs for geodesy and geoinformation at the Vienna University of Technology. He serves currently as president of the International Cartographic Association.

✉ georg.gartner@tuwien.ac.at

▲ *Figure 1, 'Emotional Mapping' app for collecting affective responses in space.*

▼ *Figure 2, Aggregated view of affective responses of the 'Emotional Mapping' app.*



▲ *Figure 3, AR-based interface and route directions for pedestrian navigation (Courtesy: Salzburg Research, Map data: OpenStreetMap and Contributors, CC-BY-SA).*

of best-quality cartographic information after disasters.

The intention to generate the geoinformation to be visualised reflects a very emotional human desire (cf. Buchroithner 2011): data that we personally gather in the terrain, e.g. by means of GPS coordinates, is more trustworthy. Thus, it is no wonder that the currently increasing trend of producing volunteered geographic information (VGI) has transitioned to crowdsourced mapping, i.e. the act of outsourcing tasks traditionally performed by specific individuals to a group of people or a community ('crowd') through an open call. Crowdsourced mapping continues to gain in importance. Even bodies of the United Nations and the European Spatial Data Research Network (EuroSDR) are inviting researchers, national mapping and cadastre agencies, and GIS professionals to discuss the role of crowdsourcing for authoritative mapping. The term itself expresses the specific aspect of users' willingness to make information available (Goodchild 2007). However, it also describes surreptitious crowd-mapping – by broadcasting companies or mobile communication providers, for instance, who track their clients' behaviour.

The term 'neocartography' is increasingly used to express the collaborative nature and integrative possibilities of crowdsourced data in online cartography. Users often generate not only GPS-recorded trajectories but also attributes and substantial technical content; there are many projects in which users make such information available via easily usable predefined web 2.0 interfaces such as Google Maps, Google Earth or OpenStreetMap.

CARTOGRAPHIC DATA PROCESSING

From a cartographer's point of view, innovative infrastructures for information transfer are extremely relevant. Ubiquitously available cartographic communication processes demand specific infrastructure requirements (Gartner 2009).

In the context of geodata management and distribution, numerous current technological developments will have an impact on cartography, either directly or indirectly. Examples include new basic conditions in data modelling such as, for example, service-oriented architecture (SOA), cloud computing or the possibility for data transfer in near real time (real-time data streaming). Recent trends like cloud computing may assist the server-client models which are increasingly penetrating the market of web cartography.

Pushed by the continual introduction of new generations of mobile input and output devices (mobile phones, smartphones, etc), the expanding telecommunication industry and the increasingly rapid data transfer rates within mobile communication, there is an upward trend in the availability of dynamic information and entertainment services on mobile devices. When coordinates of the user's device can be used as variables for modelling and presenting information, such systems can be called location-based services, and these in particular are attracting considerable interest from mobile app developers.

VISUALISATION AND MAP DESIGN

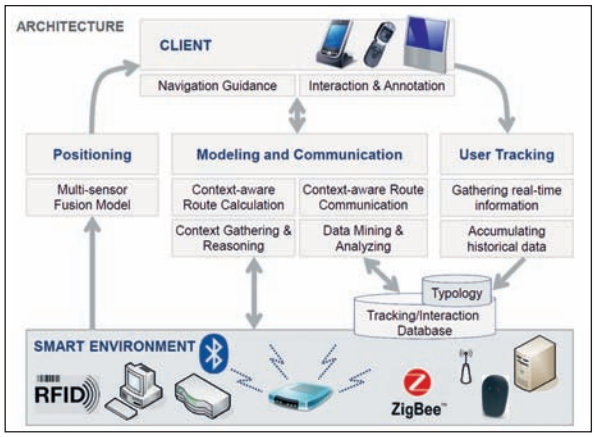
Currently, many discussions concern the user's role as 'map producer'. Many users are ▶

interested in producing their own map presentations and visualising individual spatial data, and a large number of users are willing to spend a considerable amount of time on this 'personalisation' process (Gartner 2009). Despite the heterogeneous quality of the resulting collections and visualisations of data, and the fact that many presentations do not by any means correspond to cartographic standards, there is an undeniable trend towards user-generated data collection and cartographic presentation. There is no doubt, therefore, that traditional cartography is being asked to develop and adopt easily usable and efficient tools to assure continued map quality.

Designing maps in the era of web mapping 2.0 is a great challenge, not only due to the limitations and restrictions of displays as output media for maps in general, but also and in particular due to online conditions of usage. Cartographers have recently begun to propose new design guidelines for modern web maps that address the interactive user and enable efficient communication of spatial information adhering to aesthetic aspects of how it is displayed. Since internet users are not necessarily familiar with existing cartographic principles, user-defined cartographic presentation forms often result in unreadable and inappropriately designed maps. In this context, there is a great need for cartographic design guidelines and the user-defined possibilities of web maps to be combined.

Here, two current trends deserve to be mentioned: firstly, the display of cartographic information using mobile devices (mobile cartography), applying either preloaded or internet-derived data. Catchwords like 'real-time cartography' and 'ubiquitous cartography' are also used in this context. This includes the vision that everyday items will be able to communicate wirelessly thanks to miniaturised sensors and processes. Terms like 'pervasive computing' or 'ubiquitous computing' describe the holistic integration of information technology in living spaces, processes and situations of usage. A common feature of this development is the comparatively small format of the respective displays. The problem with diminished display sizes in relation to classical paper maps needs to be stressed as one of the major challenges to be overcome in the future. Here, new media like electronic paper in the form of flexible, ultra-thin displays might help to overcome the present disadvantages.
Secondly, auto-stereoscopic cartographic displays – i.e. analogue or digital displays, whether static or mobile, that allow a spontaneous three-dimensional view of a map without additional viewing aids like polarised glasses – are currently penetrating the cartographic market (Buchroithner 2012). Even real-time rendering of 2D scenes to stereoscopic 3D scenes is currently in the process of becoming operational and commercial (cf. Buchroithner & Knust 2012).
As already mentioned, personalised and/or customised maps, with individualised map content and/or an individual map design and which may possibly also display private geotagged photographs, are becoming increasingly commonplace. Even the aforementioned UHR satellite images have recently been combined with panoramic summit photographs of the most prominent peaks of the world [1].

Wireless communication and microelectronics are key technologies which are likely to result in the integration of information technologies into 'smart spaces' or 'smart objects'. It is possible to implement geosensor networks (GSN) consisting of numerous tiny yet cheap electronic devices that can monitor their surroundings, perform simple calculations and communicate with each other. Such geosensor networks will open up interesting opportunities for automated data acquisition in various application fields in the future. In this context, it must also be mentioned that modern cartography's move towards cloud computing enables intelligent web maps, leading to 'maps and apps' for everybody!



▲ *Figure 4, Ubiquitous cartography for pedestrian navigation.*

MODERN CARTOGRAPHY AND ICA'S ROLE

As a globally well-represented and internationally visible organisation, the International Cartographic Association (ICA) plays a special role as a promoter of the development of cartography and GI science, especially in this current dynamic situation. Research and development within ICA are aimed at creating theory and methods for handling cartography and GI, addressing all the challenges arising from the application of new technologies for cartographic tasks. Thus, new tools can be created for cartographic and GI practice. Such topics are addressed by the ICA's main work forums, its Commissions. These organisations are formally established by vote at the quadrennial ICA General Assembly, although to address specific short-term issues interim Working Groups can also be established in between editions of the General Assembly by the ICA Executive Committee (EC). A key ICA instruments is the Research Agenda. This is written in order to show ICA's actual and potential contribution to scientific research within global society, and to serve as a moderator for discussions in that forum. ICA has a clear agenda for research covering all fields and topics ▶

within cartography and GI science to implement its own strategic mission: "To ensure that geospatial information is employed to maximum effect for the benefit of science and society" (ICA Strategic Plan, 2003).

The most important date in 2013 for anyone interested in modern cartography is 25 to 30 August, when the International Cartographic Conference [2] will take place in Dresden, Germany. More than 400 papers will be presented, demonstrating the relevance, attractiveness and modernity of contemporary cartography and GI science.

CONCLUSIONS

Technological innovations are creating parallel worlds in cartography: traditional cartography on the one hand, with its long history, profound knowledge and approved methods, and a growing number of non-professionals creating and using cartographic forms of expression with available technologies on the other. In order to benefit from the advantages, strategies are required to connect these parallel worlds. One approach is through new and modified education programmes like the Austro-German international master's course in cartography (Peters, et. al. 2011) as well as the strengthened contribution of cartographic knowledge into the world of new applications. An explanation of the current situation can be found in Freitag's (2008) call for the basics of cartography to be further developed. The author argues that all theoretical models of the cartographic communication process fail to consider the social context of communication. To include all these aspects, he suggests a model that connects dialogue-oriented processes with collaborative ones. He also suggests that the function of the map should be explicitly clarified for certain user groups so that the basic communication model will become relevant for concrete user activities. ICA is striving to rise to this challenge through instruments such as Commissions, publications, its Research Agenda and the International Cartographic Conference 2013 in Dresden, Germany.

MORE INFORMATION

1. www.huffingtonpost.ca/2013/03/19/google-maps-seven-summit-mountain-climbing_n_2909014.html
2. www.icc2013.org

REFERENCES

http://su.pr/3YUSQP

X91 GNSS - The industry's performance and reliability standard

- ***TRACKING EVERY SIGNAL AND EVERY SATELLITE***
  Advanced 220-channel GNSS technology for state-of-the-art RTK accuracy and reliability
- ***FLEXIBLE AND SCALABLE***
  Internal UHF and Cellular data modems; bundled with Carlson SurvCE or CHC Landstar field software
- ***EFFICIENT***
  Small, lightweight and rugged design for the most demanding field work
- ***SUPPORT***
  Worldwide network of local service centers and dealers

www.chcnav.com

No 2363

MONITORING MOUNTAIN ROCKSLIDES USING MULTI-TEMPORAL POINT CLOUDS

UAS in the Mountains

Alpine areas challenge the ingeniousness of humans in designing and performing airborne surveys. There is little space for navigation and poor reception of GNSS signals, while steep slopes cause large differences of scale in the imagery obtained. Winds may be strong and unpredictable and temperatures are often below zero, plus rapid fluctuations in altitude can complicate matters further. The authors show that UAS technology based on a multicopter enables a rockslide to be monitored at an altitude of 2,900m.

Mountains are highly dynamic areas where landslides, rockfalls, debris flows and avalanches can be frequent occurrences. If such natural hazards threaten human lives or infrastructure, risk assessments and the implementation of safety measures – such as developing early warning systems – are essential. The underlying studies require up-to-date, detailed and accurate data on topography in the form of a digital surface model (DSM) and orthoimagery. These can be captured by UAS less expensively compared to conventional airborne surveys. Furthermore, unlike traditional land surveying, UAS enables data capture without the need to enter dangerous or restricted areas on foot.

TERRAIN AND UAS

The area to be monitored is part of a famous trekking trail in the Alps near Vent/Sölden in Austria, threatened by active rockslides and formation of crevices (Figure 1). The site covers an area measuring 900m by 400m, and the altitudes vary from 2,450m to 2,850m.

The two systems available at GRID-IT GmbH were a QUEST-UAV fixed-wing UAS and a TWINS. NRN multicopter. Both were easily transportable, which was important since accessing the remote location entailed hiking for three hours. Both were capable of operating in Alpine conditions. Fixed-wing UASs can stay in the air longer than multi-rotor ones and capture larger sites, but they also need launch and landing space which is rare in mountainous regions, which is why the multicopter was chosen. A second reason for this decision was the fact that it would deliver full coverage in just three flights. Nadir images of terrain with steep slopes, as present in mountains, show large scale differences which impede photogrammetric processing.

Hansjörg Ragg is a photogrammetry and remote sensing specialist at GRID-IT GmbH, Austria, and is responsible for UAS campaigns at the Institute of Geography at the University of Innsbruck. With a background in machinery and engineering, he holds an MSc in geography and focuses on Alpine hazard monitoring based on UAS data.

✉ ragg@grid-it.at

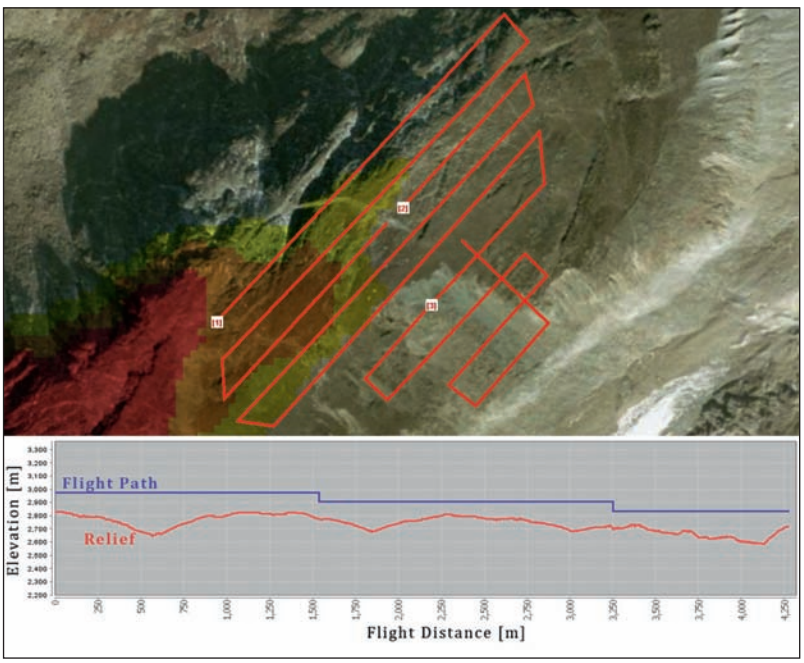
Christine Fey is specialised in remote sensing for landslide investigations at alpS GmbH – the Centre for Climate Change Adaptation Technologies, Austria. In her PhD thesis, she conceptualises workflows for the interpretation of landslide events based on multi-temporal 3D datasets.

✉ fey@alps-gmbh.com

▲ *Figure 1, Fresh crevices along trekking trail.*

▼ *Figure 2, Preparing the multicopter for landing, which has to be controlled manually.*

Therefore oblique images were taken instead by tilting the camera so that the image plane was approximately parallel to the slope. The tilting was performed automatically during flight by uploading the pitch and roll angles in the autopilot as part of the flight plan. The flying height was limited to 150m due to legal restrictions. Its foldable rotor arms and removable rotors eased transport. With an aerial survey payload of 1.2kg, the UAS can stay in the air for 20 minutes under normal conditions. However, this number is almost halved to 12 minutes at Alpine heights due to thin air, gusty winds and low temperatures which exhaust batteries more quickly.



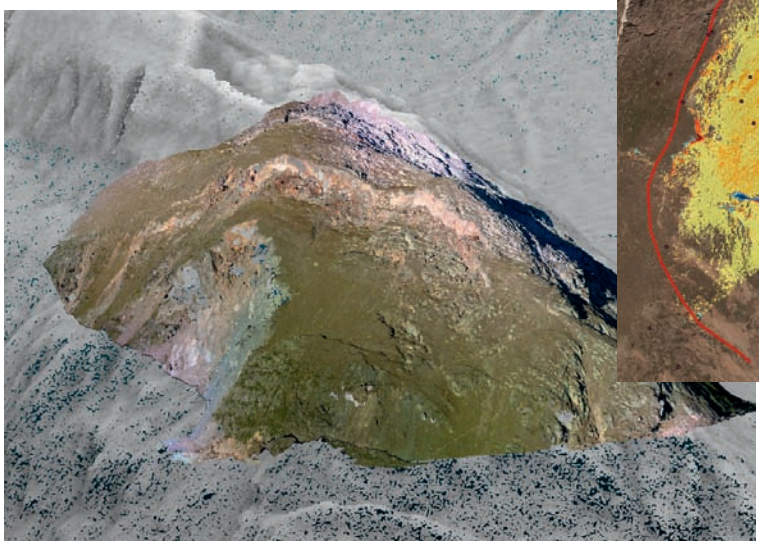
▶ *Figure 3, Flight lines 36 metres apart.*

FLIGHT PLAN

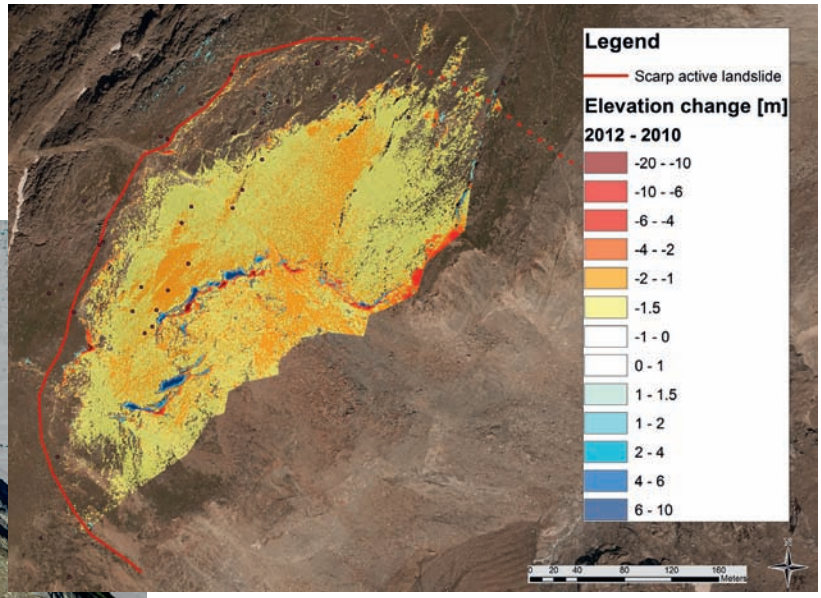
Before the flight, seven ground control points (GCPs) were marked and measured by differential GNSS to ensure accurate georeferencing. The flight plan was designed using GRID. flightmanager, a flight planning and analysis system specially developed for hilly terrain. The flight was carried out fully autonomously; only launch and landing were controlled manually (Figure 2). To warrant optimal resolution over the entire area, the flight lines were tiered in three levels, each with a different camera tilt (Figure 3). The images were collected with 75% along and across-track overlap, resulting in 126 images.

PROCESSING AND ANALYSIS

After flight, the position of the projection centre and the three attitude angles were extracted from the logger using GRID. flightmanager and assigned to each image. These external



▼ *Figure 4, UAS DSM (6cm GSD) draped over a hill-shaded Lidar DSM (1 metre GSD); the corresponding orthoimage colour is assigned to each point of the UAS DSM.*



▲ *Figure 5, Elevation changes.*

orientation parameters together with GCP coordinates were entered into Apero/Micmac software for bundle block adjustment and dense matching purposes. The focal length of the camera had to be adapted during block adjustment because the low site temperature had voided the calibrated value, which had been determined indoors. The aero-triangulation resulted in a root mean square error of 0.72 pixels (4.3cm) and a GCP accuracy of 1.4cm. From the overlapping imagery, 78 million points with 6cm spacing were automatically extracted using image-matching software and were georeferenced in a local coordinate system to compare the resulting point cloud against an airborne Lidar DSM captured in 2010 (Figures 4 and 5). Within two years, sliding towards the southeast had caused a subsidence of between one and two metres. The multi-temporal data allowed the determination of length, velocity and direction of surface displacement. Based on a geological structural analysis, the trekking trail was redirected towards more stable ground.

CONCLUDING REMARKS

UAS technology is valuable for monitoring natural hazards in Alpine environments. Flight planning and collision checks are key factors in ensuring a safe and successful flight mission. Carefully defined flight plans yield the high-resolution imagery needed for rockslide monitoring based on DSMs and orthoimagery.

SERIES ON EXPERIENCES WITH UAS

The present article is the sixth in a series of articles focusing on experiences gained on Unmanned Aerial Systems (UAS) for a broad spectrum of potential applications. UAS technology is a low-cost alternative to classical manned aerial photogrammetry and is obviously growing mature. The series started in January 2013. This summer *GIM International* will publish an extra edition totally dedicated to UAS. For more information contact Wim van Wegen: wim.van.wegen@geomares.nl.

ACKNOWLEDGEMENTS

Thanks are due to the Province of Tirol for providing the reference data and the Alpenverein for its cooperation. ◀

FURTHER READING

- Pierrot-Deseilligny, M., Clery, I. (2011) An Open Source Bundle Adjustment Software for Automatic Calibration and Orientation of Set of Images, IAPRS&SIS, Vol. 38(5/W16).
- Pierrot-Deseilligny, M. Paparoditis, N. (2006) A multi-resolution and optimization-based image matching approach: An application to surface reconstruction from SPOT5-HRS stereo imagery, ISPRS Archives of Vol. 36 (Part 1/W41).
- Remondino, F., Barazzetti, L., Nex, F., Scaioni, M., Sarazzi, D. (2011) UAV photogrammetry for mapping and 3d modelling — Current status and future perspectives. ISPRS Archives, Vol. XXXVIII-1/C22 UAV-g.

AN ASSESSMENT OF THE LADM FROM THE CADASTRE 2014 PERSPECTIVE

Long Live Modelling!

Series on LADM

This article is the third of a series on Land Administration Domain Models (LADM) and its implementations. The upcoming issues of GIM International will cover worldwide developments related to LADM. For more information on this series, or if you would like to contribute, please contact the editorial manager: wim.van.wegen@geomares.nl

The Land Administration Domain Model (LADM) makes a significant contribution to understanding the importance of data modelling in the domain of land, land administration and land management. The 'Cadastre 2014' vision of the International Federation of Surveyors (FIG) stated back in 1998: "Cadastral mapping will be dead! Long live modelling!". While one might think that this message was clear enough, few professional colleagues took it seriously. The editorial team of the LADM were the first to undertake action to get to the bottom of this important issue. Now that the LADM has become an official ISO standard, that statement is strongly underpinned.

Jürg Kaufmann was born in 1942 and graduated from the Swiss Federal Institute of Technol-ogy. In 1988, he founded his own company, Kaufmann Consulting, working in the field of cadastre and geomatics at national and international level. Among many other involvements, he has sat on the management board for the Swiss cadastral surveying system reform. Jürg Kaufmann was a member FIG Commission 7 and chaired the working group on 'Cadastre 2014'.

✉ jkcons@swissonline.ch

'Cadastre 2014' is the result of a FIG Commission 7 working group examining trends and de-velopments in the field of cadastre. The working group was active from 1994 to 1998 and pre-sented its results at the FIG Congress in Brighton in July 1998. It projected the trends and de-veloped visions of how cadastral systems might look in 20 years' time. The 'Cadastre 2014' vision has received worldwide attention and has been translated into 27 languages.

The idea of 'Statement 3 on Cadastre 2014' (Figure 1) is to model objects instead of thinking in graphical categories. Maps have no function as information repositories; their only purpose will be the visualisation of information. The consequence as mentioned in Statement 3 – that by 2014 draftsmen and cartographers will have disappeared from the cadastral field – was obviously slightly too inflated, but LADM efforts show that the general trend was correct. Cadastre 2014 has been a prominent departure point for the LADM. Indeed, in the introduction of the International Standard, it is highlighted that the LADM will be based on the conceptual framework of 'Cadastre 2014'.

MODELLING AND STANDARDS

Models are not eternal; they need improvements and amendments over time, on the one hand due to the inability to see the reality clear enough from the beginning, and on the other hand due to changes of real or legal conditions. The modelling process needs to investigate a problem to its very root, to have the courage to declare a certain view as fixed, and to make the model binding at least for a certain period of time. People are often not too keen on having to think hard, and it seems they may even be scared of compulsory standards.

INTERNATIONAL STANDARD

In the meantime, the LADM has become an ISO International Standard. It should be remembered that the first normalisation conference of CEN/TC 287 took place in or around 1990. CEN insisted at that time on having a standard by

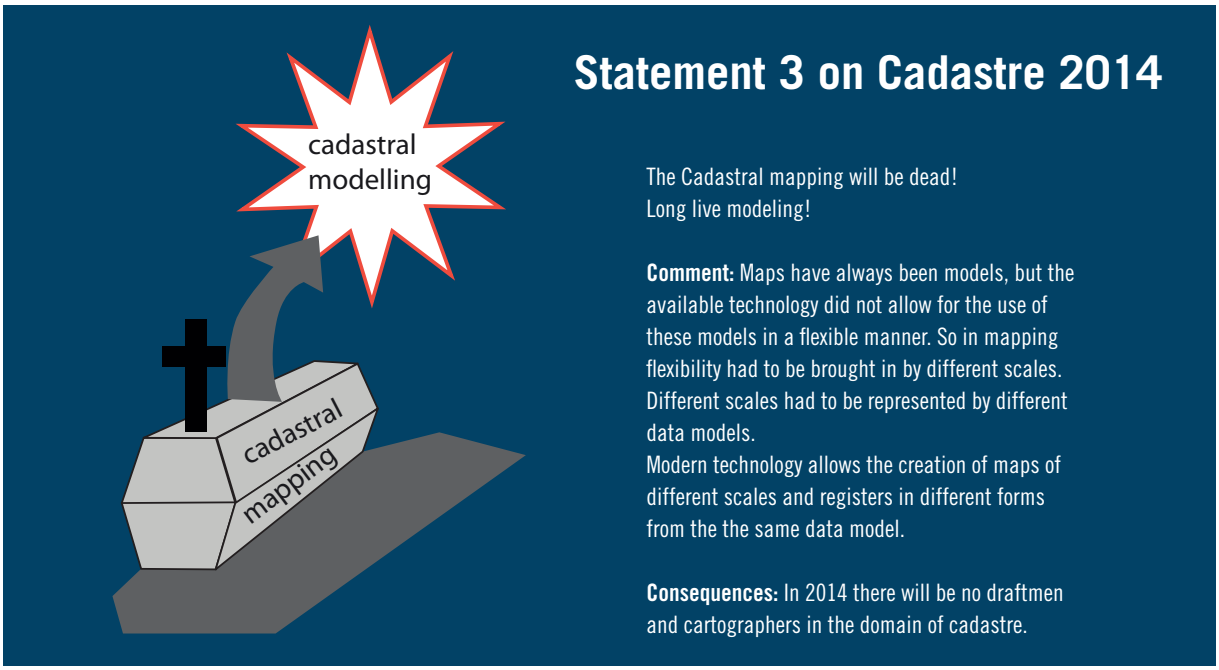


Figure 1, Statement 3 on Cadastre 2014.

1995 at the latest. The discussions were dominated by national data exchange formats and the major European countries tried to impose their own format. The Northern countries and Switzerland then brought conceptual modelling into the discussion. Later on, CEN left the leadership in this field to ISO. Unfortunately the Swiss authorities have not been very keen to contribute to the international standardisation even though data modelling started in Switzerland prior to 1990. More than 20 years later, a standardised model is now in place. Many would have wished for this much earlier, but again it has to be mentioned that people do not tend to like compulsory standards.

PEOPLE-TO-LAND RELATIONSHIP

The so-called 'property-based' approach does exist in different cadastral systems. To deal with this phenomenon, special units can be introduced as with what are known as the 'Basic Administrative Units' or 'Basic Property Units' (abbreviated to 'baunits') in the LADM. A baunit is in fact a group of spatial units with the same right(s) and right-holder(s). This makes the model heavier and these special units have to be administered. The alternative would be to accept that the only clean solution is the triple Object-Right-Subject pattern, which respects the concept of database normalisation with minimal redundancy. This is the only approach that also respects that cadastral systems are to be "simple and efficient". A better solution would be to adapt the cadastral system accordingly. The database can be queried in order to obtain the information about a particular owner's property, and the baunit can be 'calculated' when needed. This solution does not produce additional administrative effort. This approach is one of the cases where the cadastral professionals make their own system more complicated than needed, punishing themselves and the clients by imposing procedures which are more expensive and time-consuming than necessary. This is one reason behind the problematic image our profession has.

USABILITY WITHIN SDI

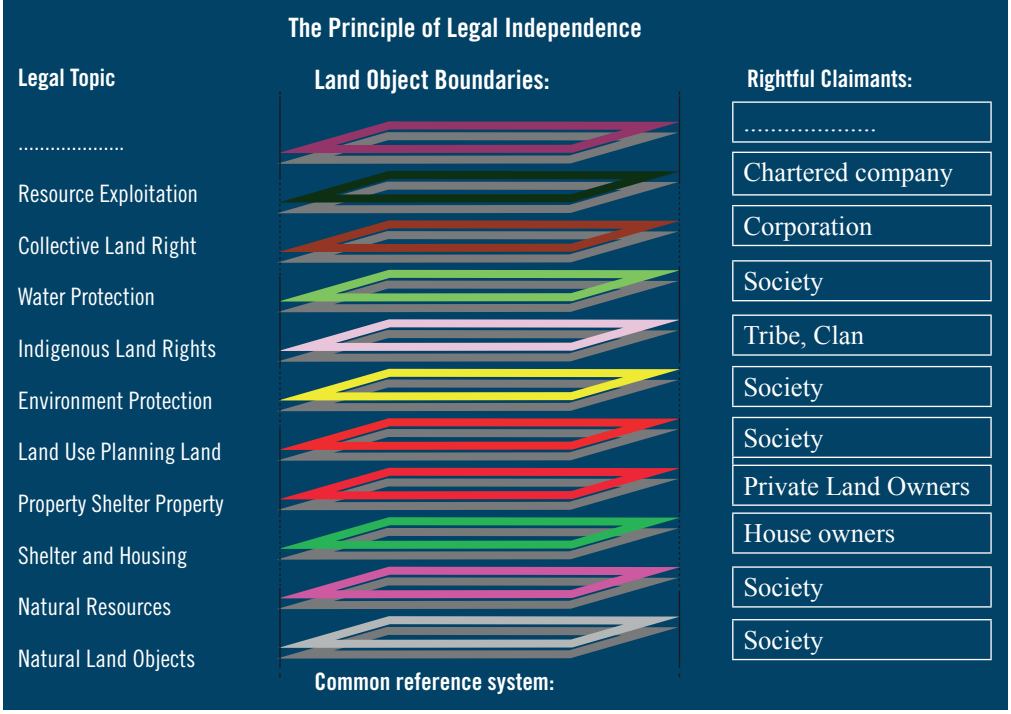
According to proven experience, cadastral information about land ownership is a prerequisite for any National Spatial Data Infrastructure (NSDI): no NSDI can be successful without such basic cadastral information. This is also illustrated in the INSPIRE Directive. The principle of legal independence in Cadastre 2014 (Figure 2) is the key for the cooperation of different authorities and stakeholders in an NSDI. In the Swiss Federal Act on Geoinformation, data modelling is a key issue. It is safe to say that there will be no NSDI without defined data models and the LADM is the only standardised one. But the LADM must be kept simple, otherwise it could fail due to complexity.

LOCAL SITUATIONS

Adaptability is only possible when there are clear definitions – and a data model is a clear and efficient definition. So the LADM will help to adapt the model to local situations efficiently. However, not every situation is worth adapting to, and preference should always be given to the simplest possible approach. The LADM can be applied successfully in many situations, but it should not be the aim of an application to

Cadastre 2014 - The Principle of Legal Independence

Cadastre 2014 received a lot of attention for the concept that future cadastre will show the complete legal situation of land, including public rights and restrictions – using the concept of legal land objects. The principle of legal independence is a key item in the realisation of Cadastre 2014. This means that legal land objects, being subject to the same law and underlying a unique adjudication procedure, have to be arranged in one individual data layer; and for every adjudicative process defined by a certain law. Besides a special data layer for the legal land objects underlying this process has to be created. This is illustrated in Figure 2.



▲ *Figure 2, Cadastre 2014 - The Principle of Legal Independence.*

complicate the model by inefficient procedures. It can sometimes be better to re-engineer existing systems.

RRRS: RIGHTS, RESTRICTIONS AND RESPONSIBILITIES

Restrictions are based on laws. Scanning the Swiss legal framework in view of the Swiss Cadastre for Public Legal Restrictions on Landownership Rights (PLR-cadastre) showed that more than 180 federal laws are creating restrictions, with cantonal and municipal laws and regulations generating a similar number. All topics subject to the PLR cadastre and the NSDI are to be modelled with the help of the data definition language INTERLIS, the Swiss standard. The impact areas of all these restrictions are modelled as an additional information layer with the basic Object-Right-Subject concept. In this model, the Objects normally have a geometric form, the Rights can have different types (ownership, possession, use, occupation, etc.) as defined by formal laws or informal rules and be temporal, and the Subjects can be any type of rightful claimants (natural persons, legal persons, tribes, societies, etc.).

ACCEPTANCE

Despite the importance of data modelling, the level of professional acceptance is still far from overwhelming. Since governments will accept what the professionals are saying, additional efforts and contributions are needed from the industry, and FIG should do more as mentioned in Cadastre 2014: "FIG should promote and sponsor a competence centre for modern cadastral systems; develop a common view of and recommendations for future national licensing policies and further use its contacts with governments and non-governmental organisations to launch an initiative for new, reliable, cost-effective cadastral services, provided by competent professionals."

FUTURE DEVELOPMENTS

We will soon be able to handle 3D objects efficiently and the time aspect will be taken into consideration in the process models, because processes have an important time component. Our world is three dimensional and takes place in a 4D context. Concerning the 'Semantic Web Technology', data models such as the LADM are helpful for supporting a common terminology, which is essential for common understanding. Standardisation work must go on. Of course, as the only international domain model standard, the LADM has to be maintained and revised on a regular basis.

ACCURACY

The growing impact of Cadastre 2014 can be seen in the LADM. There is still an obstacle remaining, making it difficult to fully understand the background of Cadastre 2014 and to draw the right conclusions. Furthermore, the introduction of the so-called 'RequiredRelationship' makes the LADM more complicated and less efficient. This is related to the fact that, within the LADM, it should be possible to include explicit relations between different themes, e.g. rights and restrictions. The reason behind this explicit linking is that overlays are not accurate enough in many cases, which causes unreliable results. This needs some explanation. Surveyors are often confronted by old and inaccurate maps, although the way many of them react to them is surprising. Despite being keen on always having the newest, most modern equipment and technology, they

attempt to 'make the best' of such old and inaccurate material – yet the best way to deal with old and inaccurate material is to replace it with new data. Nevertheless, complex procedures are developed instead and, in this case in the LADM, simple and straightforward models are destroyed. As a result, the surveyor's work is becoming more complex and expensive: identifying inaccurately represented facts, rectifying distorted map contents and managing unnecessary links in databases is inefficient, time-consuming and costly – plus it destroys the image of our profession. Why does this behaviour continue, why are old and inappropriate products being referred to when there is access to satellites, CORS systems, remote sensing, photogrammetry, highly efficient terrestrial measuring technology, etc? Why?

In the Swiss cadastral reform, a lot of time was lost in discussing the use of existing map material. Ultimately, the resulting legal framework included a considerable amount of articles regulating the handling of old, existing map material. Only a few cantons applied the prescribed method, and obtained unsuitable results. After a short time, these results were replaced by new data acquired using modern survey methods.

CONCLUDING REMARKS

With their flexible structure, Cadastre 2014 and the LADM allow target-oriented and efficient working. One does not have to deal with traditional cadastral map content; instead, one can concentrate on current needs. This is done practically by using orthophotos to support identification, determination and up-to-date documentation and registration of boundaries. And one can continue to acquire data as needed for the appropriate management of land, land rights, restrictions and the like without being forced to take care of the inaccurate content of the old cadastral maps that do not correspond to the needs of modern societies. It is necessary to overcome this insistence on traditional map content and instead create models that document reality and support sustainable development. This is the background of Cadastre 2014. The LADM is expected to have a positive impact on contemporary thinking about data management in modern land administration systems. ◂

Leica Nova MS50
Make the right decision

Leica Nova MS50 – World`s First MultiStation

You only get a moment to make the right decision. So ultimate performance and absolute reliability are critical. Our new Leica Nova MS50 MultiStation combines total station, imaging and scanning technologies together to create a unique solution that covers the complete workflow process from capturing and visualising to deciding, acting on and delivering.
Leica Nova: a whole new dimension in measuring technology

www.leica-geosystems.com/nova

Leica Geosystems AG
Heerbrugg, Switzerland
www.leica-geosystems.com/nova

- when it has to be **right**

Leica Geosystems

No 2378

DEVELOPMENT AND STATUS OF BEIDOU NAVIGATION SATELLITE SYSTEM

BeiDou Maturing Rapidly

The BeiDou Navigation Satellite System (BDS) officially started providing its service to the Asia-Pacific region on 27 December 2012. Its regional service capability is equal to that of GPS. As the third global navigation satellite system, BDS has attracted considerable attention around the world, and the orbiting satellites and ground stations continue to work well. Technical evaluations and practical tests involving various user devices have proved that the BDS is functioning as designed, and in line with requirements. China regards BDS as an important driving force, representing new opportunities for the GNSS and LBS industries, and is keen to promote the use of BDS by Asia-Pacific countries. Application projects in many different fields are currently underway in various regions of China.

Navigation satellite systems are a key part of the geospatial infrastructure. Reflecting the importance it attaches to the construction of such infrastructure, China began to explore ways to build a navigation satellite system with its own intellectual property rights in the 1970s. A Chinese scientist put forward the concept that two geostationary satellites were capable of positioning for a region in 1983. In 1989, tests proved that the concept was workable. In 1994, the Chinese government approved the BeiDou Satellite Navigation System programme, and the first satellite was launched in October 2000. December 2003 saw the first generation of the BeiDou navigation satellite test system, with three satellites in orbit, put into use for domestic users. China had become the third country in the world capable of developing a navigation satellite system, after the United States and Russia. The test system was applied in surveying, communication, transportation and maritime activities, as well as for forest fire prevention, disaster relief and public security, and delivered satisfactory results. In April 2007, the first satellite of the BeiDou Navigation Satellite System (second generation) was launched. From 2009 to 2011, nine satellites were put into orbit successfully. The system began to provide service to China and its surrounding area for test operation on 27 December 2011, and six more satellites were launched in 2012. Finally, on 27 December 2012, the BeiDou Navigation Satellite System was officially in full operation, providing service to the Asia-Pacific region.

CONSTRUCTION PRINCIPLES

BDS's construction is based on a 'three-step' development strategy. The first step was to establish the BeiDou Navigation Satellite Test System by 2003. The second step was to establish the BeiDou Navigation Satellite System which can cover

Dr Miao Qianjun studied geodesy for his bachelor degree. After obtaining a doctoral degree in aerophotogrammetry and remote sensing at Wuhan University, he finished a post-doctoral programme on city planning at Tsinghua University in Beijing, China. He has worked as a leading scientist at a research institute for surveying, mapping and GIS. He was deputy director general of a provincial administration of surveying, mapping and geoinformation, and he has been in his current position as vice president and secretary general of the GNSS & LBS Association of China since 2011. He has extensive experience of the navigation satellite system and the related industries.

✉ miaoqianjun@vip.163.com

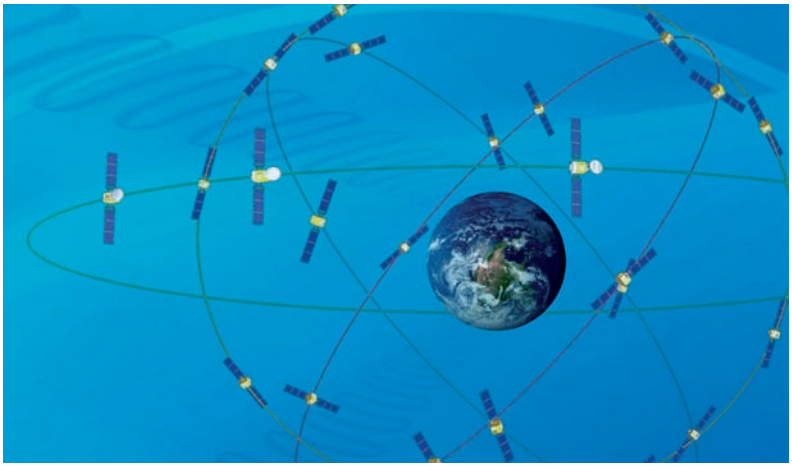


Figure 1, BeiDou satellite constellation.

Figure 2, Applications of the BeiDou system.

the Asia-Pacific region by 2012. Now that the system is in full operation with 16 satellites in orbit, only the third step remains: to completely finish the BeiDou Navigation Satellite System with global coverage by around 2020.

The fundamental task when constructing and developing BDS was to ensure wide application and boost the growth of related industries. The system must be a good system offering high quality, safety, practical usage and major benefits. The principles observed are outlined below.

The construction, development and application of the system should be open to the whole world. It should provide high-quality service free of charge to users across the globe. China is ready to co-operate with other countries in developing satellite navigation projects, enhancing exchanges between the existing satellite navigation systems and promoting the development of satellite navigation technology and the related industries.

China hopes that compatibility and interoperability will be realised between BDS and other countries' satellite navigation systems within the framework of the International Committee on Global Navigation Satellite Systems (ICG) and the International Telecommunication Union (ITU). China is committed to actively promoting the construction and development of BDS, continuously improving service quality and realising the seamless integration between the different stages.

Performance

The main performance statistics of the BeiDou system in China and surrounding areas are as follows:

1) Positioning accuracy: 10 metres horizontally, 10 meters vertically
2) Velocity accuracy: 0.2 metres per second
3) Timing accuracy: one-way 50ns
4) Two-way high precision timing and short message communication service can be provided.

BEIDOU SYSTEM CONFIGURATION

China established the BeiDou system alone and operates it independently. BDS can provide positioning, navigation and timing services with high accuracy and high reliability, just like GPS. An extra, unique advantage is the short message service, which enables people to not only identify their geographic locations but also to let others know where they are.

The BeiDou Navigation Satellite System is based on the China Geodetic Coordinate System 2000 (CGCS 2000) and is composed of three parts: the space section, the ground section and the user section. The space section contains five Geostationary Earth Orbit (GEO) satellites, 27 Medium Earth Orbit (MEO) satellites and three Inclined Geosynchronous Orbit (IGSO) satellites. The GEO satellites are operating in orbit at an altitude of 35,786 kilometres and positioned at 58.75°E, 80°E, 110.5°E, 140°E and 160°E respectively. The MEO satellites are operating in orbit at an altitude of 21,528 kilometres and an inclination of 55° to the equatorial plane. The IGSO satellites are operating in orbit at an altitude of 35,786 kilometres and an inclination of 55° to the equatorial plane. The ground section consists of a certain number of stations, including the main control stations, the injection stations and the monitoring stations. And the user section includes various application devices of the BeiDou system, most of them compatible with other navigation satellite systems.

The time reference for the BeiDou system uses the BeiDou Navigation Satellite System Time (BDT). BDT adopts the second from the International System of Units (SI) rather than the leap second as the basic unit for continuous accumulation. The start epoch of BDT was UTC 00:00:00 on 1 January 2006 (Coordinated Universal Time). BDT's offset with respect to UTC is

▲ *Figure 3, Transportation monitoring.*

◀ *Figure 4, Harbour management.*

controlled within 100 nanoseconds. The leap seconds are broadcast in navigation (NAV) messages.

MAIN APPLICATIONS

The BeiDou system is currently being used in the transportation industry. Across nine provinces, over 100,000 vehicles for logistics and passengers will be equipped with BDS navigation devices for safety purposes. In Guangzhou city, more than 10,000 cars from public organisations have had BeiDou receivers installed to enhance vehicle management in anti-corruption measures. BDS navigation devices are also used on more than 30,000 fishing vessels in the seas around China. Furthermore the BeiDou system will be used for meteorological observations to improve China's capabilities in terms of disaster prevention and mitigation.

The navigation satellite industry offers great potential. Statistics show that China's navigation satellite industry reached a total turnover of approximately USD19 billion in 2012. Experts have estimated that the global navigation satellite industry's product value will reach about USD500 billion by 2020, with China's contribution accounting for around 16%.

INTERNATIONAL CO-OPERATION

The BeiDou/GNSS Application Demonstration & Experience Campaign was held in Pakistan in September 2012, during which the industrial representatives of China and Pakistan were involved in broad information exchange and communication. The two countries will co-operate on promoting applications of BDS in Pakistan, which will entail BDS-based joint research on applied technology, monitoring infrastructure construction and training. The Asia-Pacific Space Cooperation Organization as well as Thailand, Korea, Australia, Malaysia and Indonesia have expressed an interest in the use of BDS.

China's BDS will increasingly join GPS, GLONASS and Galileo in bringing benefits to the whole world

In November 2012, China hosted the Seventh Meeting of the International Committee on GNSS (ICG 7) in Beijing, which saw the ICG issue its first-ever joint declaration on GNSS in the form of the Beijing Declaration. This declaration recognised that GNSS has developed into a multi-systems' system, in which different navigation satellite systems are beginning to work together for applications. The declaration underlines that, for the well-being of humankind, various navigation satellite systems should strengthen their co-operation.

China attaches much importance to exchange and co-operation with navigation satellite systems from the USA, Russia, EU and related international organisations. China is keen to promote the compatibility and interoperability of different systems to provide a better service to users around the world.

FUTURE

BDS aims to be the top-level navigation system in the world. The BeiDou system covering the Asia-Pacific region is already working well, providing a precise positioning and time service that can be used by automotive vehicles, ships, aircraft, citizens and public bodies alike. As related technologies continue to develop, the coming two years are expected to bring a boom in applications for BDS in China and see the industry growing rapidly. The successful operation of the existing BeiDou system and its industrialisation will enable the ultimate goal to be achieved: a complete BeiDou Navigation Satellite System with more than 30 satellites covering the globe by 2020. China's BDS will increasingly join GPS, GLONASS, Galileo and other GNSS systems in bringing benefits to the whole world. ◀

NAVCOM TECHNOLOGY

Precise Positioning Solutions from a John Deere Company

NavCom Technology, a John Deere Company based in Torrance, California, USA, is a leading provider of advanced GNSS products for OEMs, VARs and system integrators requiring high-performance RTK systems, global five centimetre-level GNSS satellite corrections, geodetic-quality GNSS receivers and engineering consulting in the areas of precise positioning and robotics.

Founded in 1992 during the early development of GPS, NavCom contributed greatly to the evolution of GPS by designing innovative solutions and technologies. These efforts led to a noteworthy number of NavCom patents and patent applications in the areas of GPS, signal acquisition, wireless communications, antenna design and frequency modulation techniques.

NavCom was acquired in 1999 by John Deere, one of its largest clients at the time, after successfully completing many contract engineering projects for the company. NavCom now operates as a wholly owned subsidiary of Deere & Company, the worldwide leader in agriculture, and is dedicated to John Deere's 176-year-old traditions of integrity, quality, commitment and innovation.

▲ *NavCom's Sapphire OEM board and SF-3050 RTK/GNSS receiver.*

One of its first innovations as a John Deere Company was the introduction of the StarFire Network (known then as the Wide Area Correction Transform) – one of the first global satellite-based augmentation systems capable of delivering high-accuracy positioning anywhere in the world, without a local base station.

PARTNER AND PATHFINDER

NavCom's close relationship with its parent company has contributed to substantial growth and innovation within the precision-agriculture marketplace, producing a number of advanced products and services that have revolutionised farming practices and work-site productivity. NavCom's

Every month *GIM International* invites a company to introduce itself in these pages. The resulting article, entitled Company's View, is subject to the usual copy editing procedures, but the publisher takes no responsibility for the content and the views expressed are not necessarily those of the magazine.

vision is to replicate this successful formula in other market sectors such as construction, land survey, offshore exploration and others. Today, NavCom partners with VARs, OEMs and system integrators who have the same goals and aspirations in delivering customer solutions that provide a sustainable competitive advantage to support growth.

As one of the industry's leaders, NavCom's key personnel include a winner of the Johannes Kepler Award and the inventor of the Hatch-Filter Technique. The company employs a management team with over 150 years of collective GPS/GNSS experience, as well as more than 70 engineers and scientists capable of taking a project from conception, through design, to a complete system solution.

HIGH-PRECISION SOLUTIONS

NavCom provides an extensive range of geodetic-quality GNSS and RTK receivers as well as the StarFire five-centimetre GSBAS correction service to precise positioning and navigation markets. NavCom's ability to tightly couple the design of its GNSS receivers and StarFire service provides innovative solutions to the marketplace that enhance the quality and competitiveness of its customers' solutions.

Building upon these innovative solutions, NavCom introduced solutions that further enhanced and addressed key customer pain points with such innovations as RTK Extend and StarFire Rapid Recovery. Outages from radio communications or physical signal blockages, such as shading, can leave a customer without positioning data, thus slowing down projects and increasing costs. In response to such key productivity concerns, NavCom developed these game-changing solutions that allow users to maintain accuracy despite loss of radio signals or even to reacquire positioning almost instantaneously.

NavCom's LAND-PAK survey solution.

NavCom is represented worldwide by a growing network of OEMs and Value Added Resellers (VARs) who serve a diverse and growing set of applications that span land survey, machine control, offshore and military/government markets.

FUTURE OF GNSS

High-precision GNSS products are providing mission-critical solutions in agriculture, construction, land survey, offshore exploration and many other markets. The adoption of these solutions has resulted in substantial productivity benefits that will continue to drive the demand for GNSS technology. The GNSS industry is not standing still either. With new signals on both the GPS and GLONASS constellations, the planned deployment of new global constellations like Galileo and BeiDou and the deployment of a variety of regional augmentation constellations, the GNSS end user will have an ever-increasing portfolio of options to choose from. These developments will continue to drive the growth of the GNSS market as continued GNSS receiver technology improvements substantially improve the capability and performance of GNSS receiver products while at the same time reducing size, power consumption and cost. All of these changes will result in greater capability for the end user that will further improve the quality and productivity of their current solutions while opening up the potential for new applications.

NavCom will continue to meet these demands for its customers, providing sustainable solutions that meet both integrator and end-user needs.

The Engine Behind FIG Becomes an Honorary Member

It is probably true that more or less everyone within the FIG community – and many more far beyond it – know FIG director Markku Villikka. Unfortunately, his engagement with FIG will soon come to an end as he is due to retire from FIG at the end of July 2013 because of long-term illness. Markku will be very sorely missed as part of FIG and its member organisations, by land surveyors worldwide and especially by the FIG Office. He has always worked very hard and intensively yet with discretion and respect at all times.

Markku Villikka, FIG director (second from left), is leaving the Federation.

When Markku started as director of the FIG Office in early 1999, a new era for FIG began. He has built up the permanent office to what it is today. He has worked intensely on developing and refining the global forum that FIG provides to its member associations, stakeholders and partners. Apart from the four-yearly Congress, of which the next will be held in June 2014 in Kuala Lumpur, Malaysia, he has also improved the annual Working Weeks. FIG Regional Conferences have also become a success, attracting and strengthening regional cooperation and professional development.

Markku Villikka's 25 years in FIG have included the chairmanship of FIG Commission 8 – Spatial Planning and Development. Markku has also served as the president of the Finnish Association of Geodetic and Land Surveyors MIL and as secretary general of the Council of European Geodetic Surveyors (CLGE).

In view of this, the backbone and engine behind FIG has been appointed to the rank of Honorary Member. FIG's 36th General Assembly held in Abuja, Nigeria, May 2013, unanimously endorsed the application by the two Finnish member associations to honour FIG director Markku Villikka's 25 years of outstanding contribution to both the profession and the Federation itself. The decision was followed by a standing ovation. Since the FIG director was not able to be present at the Working Week in Abuja, president CheeHai Teo awarded Markku with his honorary membership certificate and pin during his visit to Finland on 13 May 2013.

At the meeting, the director stated: "I highly appreciate this recognition from the FIG members, colleagues and friends who have been essential part of my life for 25 years. It has been a privilege to be part of the process in building FIG into the organisation that it is today. This would have not been possible without the devotion of so many volunteer professionals that have put their heart and soul into FIG, including the many Councils and the office staff."

Markku Villikka emphasised his encouragement for young people to join FIG and gain insight into the international challenges that surveyors have to address, today and in the future. He concluded by saying: "Personally, I gained a lot by being lucky enough to start my work in FIG in my early 30s. Therefore I strongly encourage young surveyors to take an active role in FIG as early as possible. I wish all members and the Federation every success for the years to come."

CheeHai Teo, president of FIG
Louise Friis-Hansen, FIG office manager

MORE INFORMATION
www.fig.net

FOIF Since 1958

It's professional

For more information please visit our website:
www.foif.com
or email to: internationalsales@foif.com.cn

Suzhou FOIF Co.,Ltd.

TÜV CE ISO-9001 DNV CERTIFICATED FIRM Certificate No.QSC-5112

no 2275

GSDI Small Grants Program: Accomplishments of the Past

The Global Spatial Data Infrastructure (GSDI) Association Small Grants Program has supported numerous international geospatial efforts in the past decade. The support the programme has provided to the GSDI member organisations has resulted in meeting programme goals to foster partnerships, develop in-country technical capacity, improve data compatibility and access, and increase political support for spatial data infrastructures (SDIs).

The GSDI Association, the U.S. Federal Geographic Data Committee, and the GISCorps of URISA are partners in this programme. Three types of award can be utilised: (1) cash award up to USD2,500; (2) SDI/GIS consulting services up to the value of USD2,500; or (3) a combination of cash award and SDI/GIS consulting services. The consulting services are offered through the GISCorps [1].

The past year has seen completion of all but two of the 17 projects awarded in 2012 as well as two projects from the 2011 award year. The results of the projects represent the success of the programme in increasing the knowledge and deployment of SDIs throughout the international community. Highlights of the GSDI Small Grants Program include:

- Hosting numerous workshops to provide training on concepts, exchange ideas and build relationships for future SDI work in Colombia, Indonesia, Macedonia, Rwanda, South Africa, Uzbekistan and Zimbabwe
- Geospatial metadata training, outreach and generation in Ecuador, Ethiopia and Nigeria
- Activation of a geospatial portal in Ethiopia [2]
- Expansion of Rwanda's GeoPortal [3]
- Initialisation of a geospatial portal for Zimbabwe
- Hosting of a tri-country (El Salvador, Honduras and Nicaragua) meeting that resulted in the creation of a steering committee to guide actions needed to complete Gulf of Fonseca Hydrographic Survey and Nautical Charting
- Translation of the 'SDI Cookbook' into Albanian
- Establish an encoding standard for Multilingual (four languages) Place Name Database in China
- Improvement of a policy and strategy for the realisation of SDI for Tajikistan

Use of GIS and SDI in promoting Coffee Quality in Maraba Sector South Province of Rwanda.

Additional information and links to final project reports are available at [4]. The GSDI's Societal Impacts Committee [5] oversees the programme which is chaired by Dr Carmelle J. Terborgh.

Gita Urban-Mathieux is FGDC Grants Coordinator for the Federal Geographic Data Committee within the US Geological Survey and a member of the Societal Impacts Committee of the Global Spatial Data Infrastructure Association. She is also the contact for the GSDI Small Grants Program [burbanma@fgdc.gov].

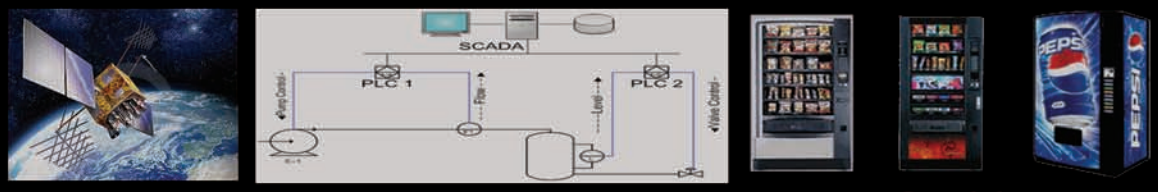
MORE INFORMATION

1. www.giscorps.org
2. hoarec.org/index.php/geoportal-home
3. www.cgis.nur.ac.rw/geonetwork/srv/en/main.home
4. www.gsdi.org/sic1
5. www.gsdi.org/standingcomm?project_id=305

www.gsdi.org

WWW.TRACE.ME

Never lose control with this innovative little piece of GPS/GPRS hardware.



TraceME can protect, follow and control most of your valuables.

Hardware dimensions of the smallest version: 44 x 22 x 7mm
Extremely small and lightweight including housing, antennas and battery.

TraceME applications: Personal tracking with SOS. Object protection and tracking. Logistics. M2M. Security and Surveillance. Remote control and Diagnostics. ODB-II version available. Vehicle immobilisation. Rentals tracking. Alternative and cheaper solution for SCADA. Alzheimer-, eldery-, patients- and people tracking. Remote control of Vending- and other machines in the field. Animal tracking. Backup Power Generators. OEM version is possible.

The mission of the Association is the advancement of geodesy.

IAG implements its mission by:

- advancing geodetic theory through research and teaching,
- collecting, analysing and modelling observational data,
- stimulating technological development, and
- providing a consistent representation of the figure, rotation and gravity field of the Earth and planets, and their temporal variations.

IAG EXECUTIVE COMMITTEE 2011 - 2015

President:
Chris Rizos, c.rizos@unsw.edu.au

Vice-President:
Harald Schuh, harald.schuh@tuwien.ac.at

Secretary General:
Hermann Drewes, iag@dgfi.badw.de

Immediate Past President:
Michael Sideris, sideris@ucalgary.ca

President of Commission 1 Reference Frames:
Tonie van Dam, tonie.vandam@uni.lu

President of Commission 2 Gravity Field:
Urs Marti, urs.marti@swisstopo.ch

President of Commission 3 Rotation & Geodynamics:
Richard Gross, richard.gross@jpl.nasa.gov

President of Commission 4 Positioning & Applications:
Dorota Brzezinska, dbrzezinska@osu.edu

Chair of Global Geodetic Observing Systems (GGOS):
Hansjörg Kutterer,
hansjoerg.kutterer@bkg.bund.de

President of Communication & Outreach Branch (COB):
József Ádam, jadam@sci.fgt.bme.hu

Representatives of the Services:
Riccardo Barzaghi, riccardo.barzaghi@polimi.it
Tom Herring, tah@mit.edu
Ruth Neilan, ruth.e.neilan@jpl.nasa.gov

Members at large:
Claudio Brunini, claudiobrunini@yahoo.com
Richard Wonnacott, rwonnacott@gmail.com

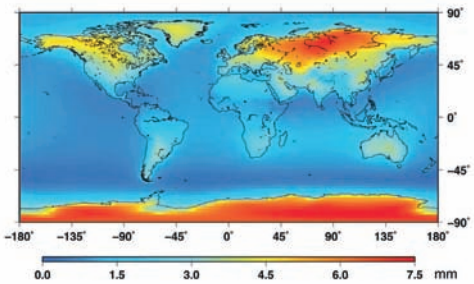
President of the ICC on Theory:
Nico Sneeuw, sneeuw@gis.uni-stuttgart.de

Assistant Secretary:
Helmut Hornik, hornik@dgfi.badw.de

Since the predecessor of the IAG, the 'Mitteleuropäische Gradmessung', was established back in 1862, IAG is celebrating its 150th anniversary in 2012. Celebrations will climax in September 2013 at the IAG Scientific Assembly in Potsdam, Germany. This location is particularly significant since the first ever meeting, in April 1862, was organised by General Baeyer, as representative of the Kingdom of Prussia, in Berlin. The participants were several geodesists from the Kingdom of Saxony and the Austrian-Hungarian Empire.

IAG Commission 3, 'Earth Rotation and Geodynamics'

The IAG is organised into Commissions, Services, the Global Geodetic Observing System (GGOS) and the Inter-Commission Committee on Theory (ICCT). Details can be found in the Geodesists' Handbook [1]. The four Commissions, their goals and their activities are being highlighted in a series of articles in *GIM International*.



A model of the root-mean-square variability of the vertical displacement of the solid Earth's surface caused by atmospheric pressure loading. The largest variability is on land areas at middle to high latitudes; the smallest variability is on areas covered by the oceans (Image courtesy: Tonie van Dam, University of Luxembourg).

The 'Terms of Reference' for Commission 3 acknowledge that the solid Earth moves and deforms in response to forces acting on it, whether they derive from outside or inside our planet. This includes the entire range of phenomena associated with Earth rotation and Earth orientation such as polar motion, length of day, precession and nutation, the observation and understanding of which are critical to the transformation between terrestrial and celestial reference frames. It also includes tidal processes such as solid Earth and ocean loading tides, and crust and mantle deformation associated with tectonic motions and glacial isostatic adjustment.
Commission 3 interacts with the IAG's GGOS and the other Commissions and Services of the IAG as well as with other organisations such as the International Astronomical Union (IAU) in order to accomplish its objectives.

Commission 3 has the objectives of promoting co-operation and collaboration on the theory, modelling and observation of Earth rotation and geodynamics, of serving the geophysical community by facilitating interactions with organisations that provide the data needed to study Earth rotation and geodynamics, and of ensuring the development of research in Earth rotation and geodynamics by organising meetings, symposia and sessions at conferences and general assemblies, by creating working groups on specific topics, and by encouraging the exchange of ideas and data and the comparison of methods and results with the goal of improving accuracy, content, methods, theories and understanding of Earth rotation and geodynamics.
Commission 3 is grouped into a number of sub-commissions as below (with the chairpersons listed in brackets):

- SC3.1 Earth Tides and Geodynamics (Spiros Pagiatakis, Canada)
- SC3.2 Crustal Deformation (Markku Poutanen, Finland): SC3.2a Global Crustal Deformation (Jeff Freymueller, USA), SC3.2b Regional Crustal Deformation (Manabu Hashimoto, Japan)
- SC3.3 Earth Rotation and Geophysical Fluids (Maik Thomas, Germany)
- SC3.4 Cryospheric Deformation (Matt King, United Kingdom)
- SC3.5 Tectonics and Earthquake Geodesy (Haluk Ozener, Turkey)

The Commission 3 Steering Committee comprises president Richard Gross (USA), vice president Aleksander Brzezinski (Poland), the chairs of the five sub-commissions and two sub-sub-commissions, the chair of Joint Study Group 3.1: Séverine Rosat (France), representatives of the Services: Brian Luzum (USA) and Srinivas Bettadpur (USA), and a member-at-large: Ben Chao (China – Taipei).
The main tasks of Commission 3 in the future will include:

- Assisting the sub-commissions with accomplishing their objectives, including improving models of the rotational and deformational response of the solid Earth to forces acting on it, such as tidal forces, earthquakes and other tectonic phenomena, and changes in the load acting on the Earth's surface caused by changes in the distribution of mass in the atmosphere, oceans and continental ice and water
- Establishing a Joint Working Group with Commission 19 of the IAU with the objective of improving the theory of the Earth's rotation
- Organising commission-wide and more topical symposia such as the recent Earth Tides Symposium that was held in Warsaw, Poland, in April 2013
- Developing a dedicated website for all Commission 3 activities.

Commission 3 will co-ordinate a number of sessions at the upcoming IAG Scientific Assembly to be held in Potsdam, Germany, 1-6 September 2013, to celebrate the 150th anniversary of the IAG [2].

MORE INFORMATION
www.iag-aig.org
http://euler.jpl.nasa.gov/IAG-C3
1. http://bit.ly/XYhh8e
2. www.iag2013.org/IAG_2013/Welcome.html

RUIDE

Upgraded EDM on the new RTS-820R^5/860R^{5}series. Measure more possibilities!

500m

incredibly long reflectorless range

0.3s

stunningly fast measuring speed

www.ruideinstrument.com

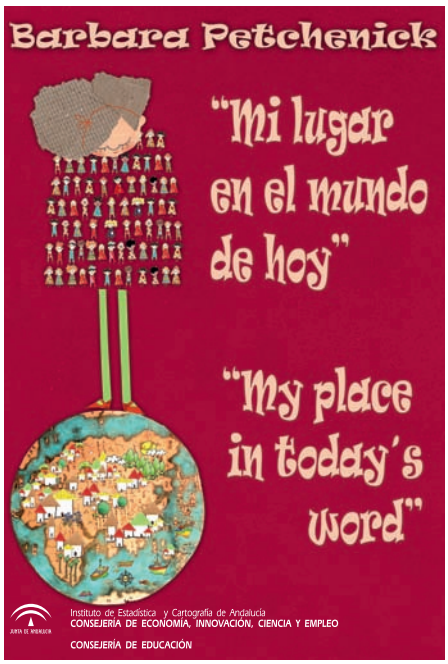
No 2379

Cartography for the Young

The last ICA column in this magazine discussed the exhibitions associated with each International Cartographic Conference (ICC), including the ICC 2013 to be held in Dresden this August. Among the exhibitions are entries for the biennial 'Childrens Map' contest, organised by the ICA Commission on Cartography and Children, and named the 'Barbara Petchenik Competition' after the late ICA vice-president and eminent American cartographer.

This year, ICA celebrates the 20th anniversary of the first Barbara Petchenik Competition which was organised in Cologne, Germany, to coincide with the ICC 1993. The decades since then have revealed an extraordinary depth of artistic talent, scientific awareness and geographical knowledge in young people from all over the world who have contributed their maps of our planet to the competition. Two book volumes of *Children Map the World* have been published by ESRI Press (one in 2005 and the second in 2009), reproducing the highlights and award winners from the past 20 years. Although the entries are expected to be maps of the whole world, the theme varies from one competition to the next: recently, children have interpreted 'Many Nations-One World' and 'Living in a Globalized World', while this year's theme is 'My Place in Today's World'. Entries have already been received from countries around the globe which organise national contests themselves before sending representative samples to the international coordinators, Peter van der Krogt and Ferjan Ormeling (The Netherlands).

There are specific rules for the competition and, under the direction of Commission chair Jesus Reyes (Budapest, Hungary), continuity and rigour in the difficult administration and judging of the prestigious awards has been maintained. Professor Reyes, assisted by vice-chair Diah Kresnawati (Indonesia), also maintains the high profile of the Commission in other areas. Outreach to other international organisations has been notable in recent months, with participation in the European Association of Geographers (EUROGEO) 2012 Symposium in Dublin, Ireland, and interaction with IGU Commission on Geographical Education, at the symposium held in Freiburg last August just before IGU's 32nd congress.



Promotional poster for the 2013 Barbara Petchenik Childrens Map Competition, Spain.

The Commission is active in promoting its other work, with its dedicated website containing useful materials for the Childrens Map competition, including advice on running national competitions, a parental permission form for entrants, resource material written by Henry Castner (USA) and a collection of 32 different blank graticules that can be used by teachers and children for map drawing. Outreach using social media is also a characteristic of the group, with a Facebook profile [1] established in 2012, facilitating contact between members and engaging with a wider spectrum of people. Its success is underlined by the detailed statistical analysis which Facebook site owners can access: for example, the most 'likes' come from Hungary and Brazil, but in 3rd and 4th places are Tunisia and Egypt, two countries that are not yet national members of ICA.

The Commission is leading the organisation of 'Sharing Knowledge', a joint ICA Symposium to be held at Dresden University of Technology on 23 August 2013, prior to the main ICC 2013. Details are available at [2].

MORE INFORMATION
www.icaci.org
1. www.facebook.com/icaccc
2. http://lazarus.elte.hu/jointsymposium2013/

Outreach and Capacity Building

A primary vision of ISPRS is that the Society should be "…the primary provider of educational resources and capacity building to increase public understanding and use of spatial information and the associated technology, and to ensure an ongoing supply of trained scientists in photogrammetry, remote sensing and spatial information sciences." Implementation of this vision requires the scientific community to work with the public to ensure the role of geospatial data is understood and data are used to the best advantage for all of society. Five outreach initiatives of ISPRS include: 1) Regional Representatives; 2) Technical Commission VI devoted to education and capacity building; 3) Student Consortium Summer Schools; 4) ISPRS Foundation travel grants to assist regional participation in ISPRS events; and 5) Cooperation with the Open Geospatial Consortium (OGC) to provide training at regional geospatial conferences.

Participants at previous ISPRS Student Consortium (WG VI/5) Summer Schools held in the USA, Taiwan, Thailand and Vietnam.

Regional Representatives are appointed to assist the ISPRS Council with activities promoting the mission and visions of ISPRS in areas that are not adequately represented. This term, the Regional Representatives are Hussein Farah, director general of the Regional Centre for Mapping of Resources for Development in Nairobi, Kenya; Mario Hernandez, formerly of UNESCO; and Nguyen Dinh Duong, in the Vietnamese Academy of Science and Technology, Hanoi, Vietnam. These individuals represent the views and concerns of their particular region, encourage organisations and countries in their region to become members of ISPRS and attempt to host at least one ISPRS meeting within their region during the inter-Congress period.

Technical Commission VI, 'Educational, Technology Transfer and Capacity Development', has a critical role in ISPRS to support, promote and stimulate education and training, technology transfer and activities in underrepresented regions. The Working Groups of Commission VI are focused on these goals, as well as support and connection with the ISPRS Student Consortium and co-ordination of regional capacity development activities. The president of Commission VI, Jianya Gong, and secretary, Peng Yue, of the State Key Laboratory of Information Engineering in Surveying Mapping and Remote Sensing (LIESMARS) at Wuhan University, China, along with vice president Tsehaie Woldai from ITC, Enschede, The Netherlands, are leading six working groups towards enhanced geospatial education, training and regional activities that elevate the power of geospatial data to a global audience [1].

The ISPRS Student Consortium (SC) is a vibrant organisation formed in 2004 to link advanced university students and young professionals from around the world who are interested in geospatial sciences. The SC provides a platform for information exchange, student-focused events and activities connecting talented, early-career individuals within ISPRS. Working closely with WG VI/5, the SC has organised an annual Summer School in locations such as Turkey, Poland, Slovenia, China, Vietnam, USA, Taiwan and Thailand. Plans are currently underway for the 9th Summer School to be hosted in Ethiopia.

MORE INFORMATION
1. www2.isprs.org/commissions/comm6.html
www.isprs.org

HI-TARGET

Qstar Qstar High-precision GIS Handheld Collector

- Receive GPS+GLONASS+COMPASS
- 806MHZ high-speed CPU
- 256RAM, 8G flash memory
- 5 Megapixel auto-focus camera with LED
- 1.5 meter anti-drop IP67
- Integrated high precision G-sensor
- 8800mAh Li-ion battery, over 12 hours continuous work.

Hi-Target Surveying Instrument Co., Ltd

www.hi-target.com.cn
www.gnss-gps.com

ADD:10th Floor,Chuangxin Building,Tian'an Technology Zone, No.555, North of Panyu Road,Panyu District,511400, Guangzhou City,China Tel: 0086-20-22883930 Fax: 0086-20-22883900 E-mail: info@zhdgps.com

No 2353

Click to GIM-INTERNATIONAL.COM for more events

Future events

JUNE

Prague Geo Summit 2013
Prague, Czech Republic
from **01-02 June**
E: jana@appsevents.com
W: www.praguegeosummit.org

UAVveek 2013
Siegen, Germany
on **03 June**
For more information:
E: info@hauspatmos.de
W: www.microdrones.com/UAVveek

HxGN LIVE
Las Vegas, NV, USA
from **03-06 June**
For more information:
E: contactus@hexagonconference.com
W: http://conference.hexagon.com

33rd EARSeL Symposium 2012
Matera, Italy
from **03-06 June**
For more information:
E: secretariat@earsel.org
W: www.earsel.org/symposia/2013-symposium-Matera/index.php

13th SGEM GeoConference and Expo
Albena, Bulgaria
from **16-22 June**
For more information:
E: sgem@sgem.org
W: www.sgem.org

MundoGEO#Connect LatinAmerica 2013
São Paulo, Brasil
from **18-20 June**
For more information:
E: imprensa@mundogeo.com

FIG Technical Seminar – Reference Frame in Practice
Manila, Philippine
from **21-22 June**
For more information:
E: mikael.lilje@lm.se
W: www.fig.net

RIEGL LIDAR 2013
Vienna, Austria
from **25-27 June**
For more information:
E: userconference2013@rieglusa.com
W: www.riegllidar.com

3rd Imaging and Lidar Solutions Conference (ILSC) 2013
Toronto, Ontario, Canada
from **25-27 June**
For more information:
E: conference@optech.com
W: www.optech.ca

ICHC 2013
Helsinki, Finland
from **30 June-05 July**
For more information:
W: http://ichc2013.fi

JULY

Esri International User Conference
San Diego, USA
from **08-12 July**
For more information:
W: www.esri.com

IGARRS 2013
Melbourne, Australia
from **21-26 July**
For more information:
E: info@igarss2013.org
W: www.igarss2013.org

SA Surveying + Geomatics Indaba 2013
Ekurhuleni, Gauteng, South Africa
from **23-24 July**
For more information:
E: president@sagi.co.za
W: www.sagi.co.za/indaba2013.php

AUGUST

AUVSI13
Washington, DC, USA
from **12-15 August**
For more information:
E: mgreeson@auvsi.org
W: www.auvsishow.org/auvsi13

International Cartographic Conference 2013
Dresden, Germany
from **25-30 August**
For more information:
E: manfred.buchroithner@tu-dresden.de
W: www.icc2013.org

SEPTEMBER

UAV-g 2013
Rostock, Germany
from **04-06 September**
For more information:
E: info@uav-g.org
W: www.uav-g.org

54th Photogrammetry Week
Stuttgart, Germany
from **09-13 September**
For more information:
E: dieter.fritsch@ifp.uni-stuttgart.de
W: www.ifp.uni-stuttgart.de/phowo/index.en.html

OCTOBER

13th Int'l Scientific and Technical Conf: From Imagery to map: Digital photogrammetric technologies
Fontainebleau, France
from **23-26 September**
For more information:
E: awada@racurs.ru
W: www.racurs.ru

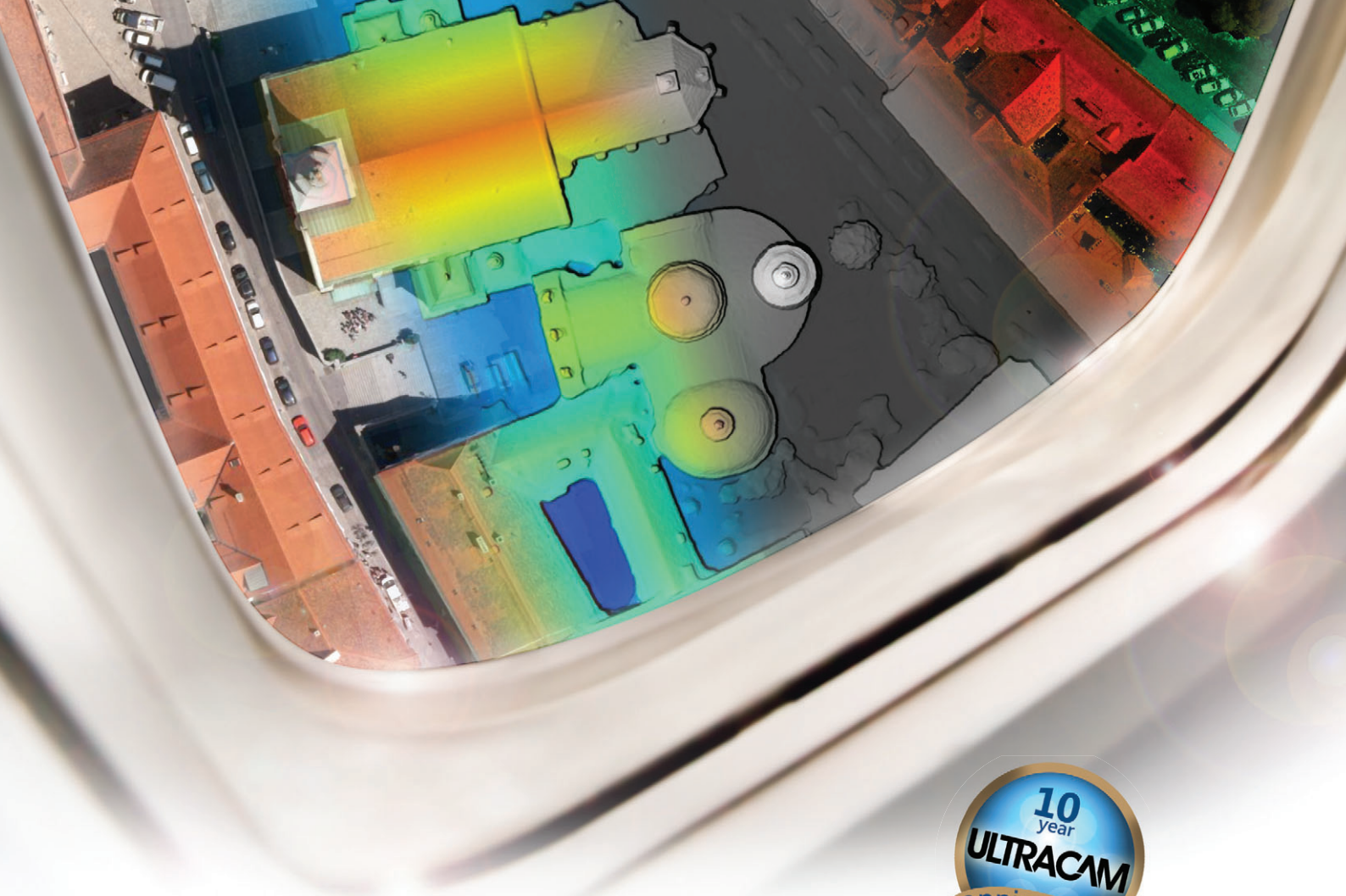
6th International Conference "Earth from Space — the Most Effective Solutions"
Moscow, Russia
from **01-03 October**
For more information:
E: nadezhda@scanex.ru
W: www.conference.scanex.ru/index.php/en.html

Intergeo 2013
Essen, Germany
from **08-10 October**
For more information:
E: dwenzel@hinte-messe.de
W: www.intergeo.de

Calendar Notices
Please send notices at least 3 months before the event date to:
Trea Fledderus, marketing assistant, email: trea.fledderus@geomares.nl

For extended information on the shows mentioned on this page, see our website: www.gim-international.com.

ADVERTISERS INDEX



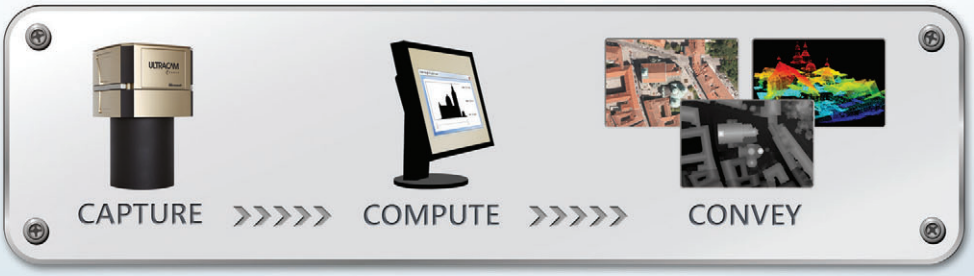
Taking mapping to new heights.

10 year ULTRACAM anniversary

Fly high with the Eagle f210. The UltraCam Eagle now features an exchangeable 210mm lens system that allows you to fly high-altitude missions and still capture the same high-resolution, geometrically accurate PAN imagery you've come to expect from UltraCam technology. No need to be concerned about the increased atmosphere: the superb signal-to-noise ratio of the UltraCam Eagle f210 allows for an exceptionally high image dynamic that allows for correction of color shifts caused by atmosphere, haze, hotspots, and other artifacts using the UltraMap workflow software. Meanwhile, the small field of view of this new lens minimizes lean for tall buildings while still allowing full utilization of the Eagle 20,010 pixel swath width for ortho image production. Occlusions are minimal even for narrow streets or alleys!

Create Orthos, Digital Surface Models & Point Clouds with UltraMap 3.0. The superb geometry and best-in-class radiometry of the UltraCam Eagle f210 naturally also benefit the downstream data processing in UltraMap. AT results are outstanding and through Dense Matcher and OrthoPipeline modules new to v3.0, UltraCam data from any height can be leveraged to rapidly and automatically create high-density point clouds, digital surface models, and DSM/DTM-based orthomosaics.

Visit www.UltraCamEagle.com for details.



ULTRACAM ULTRAMAP 3.0 Workflow Software System Microsoft

No 2367