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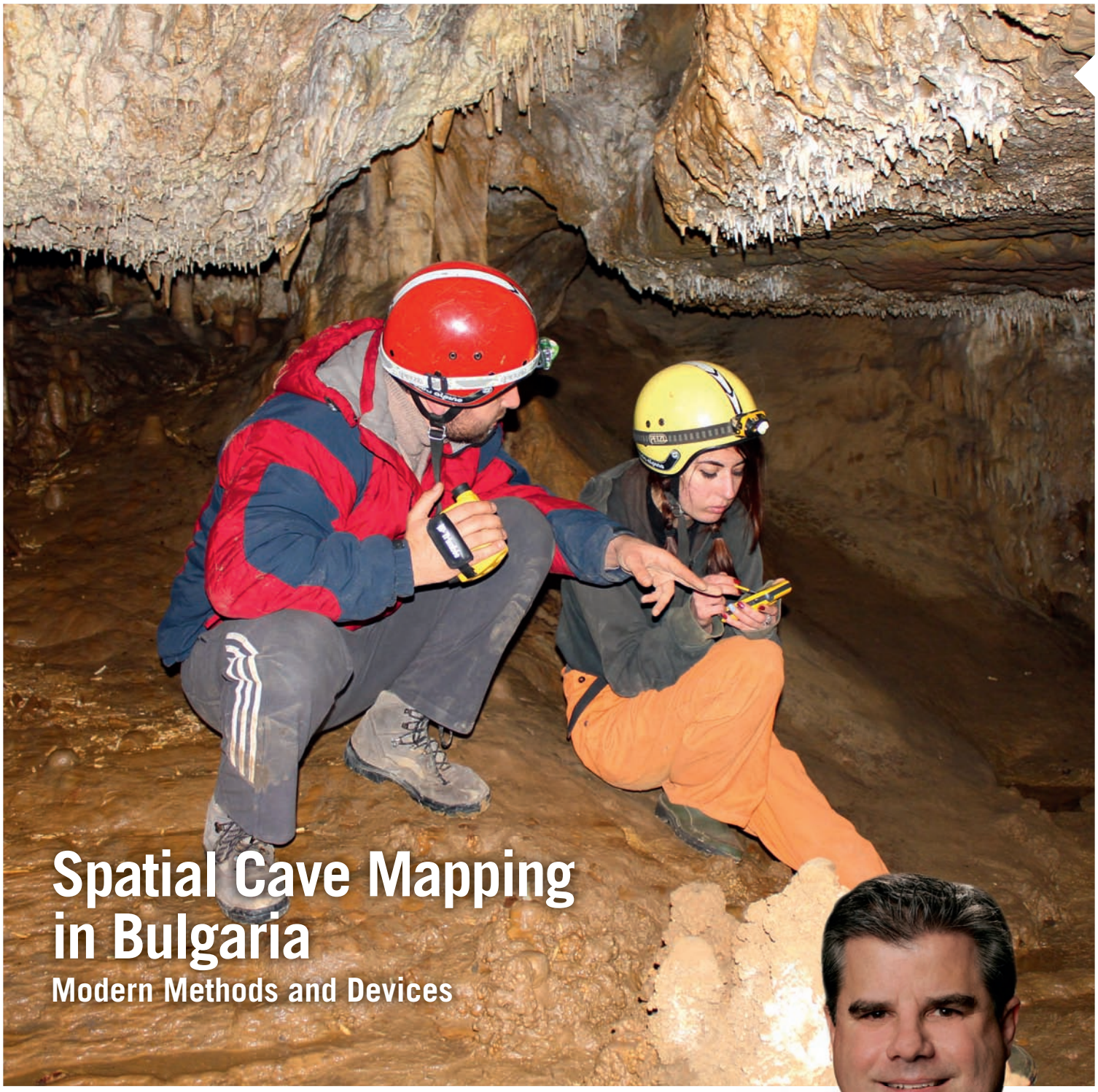

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Modern Methods and Devices

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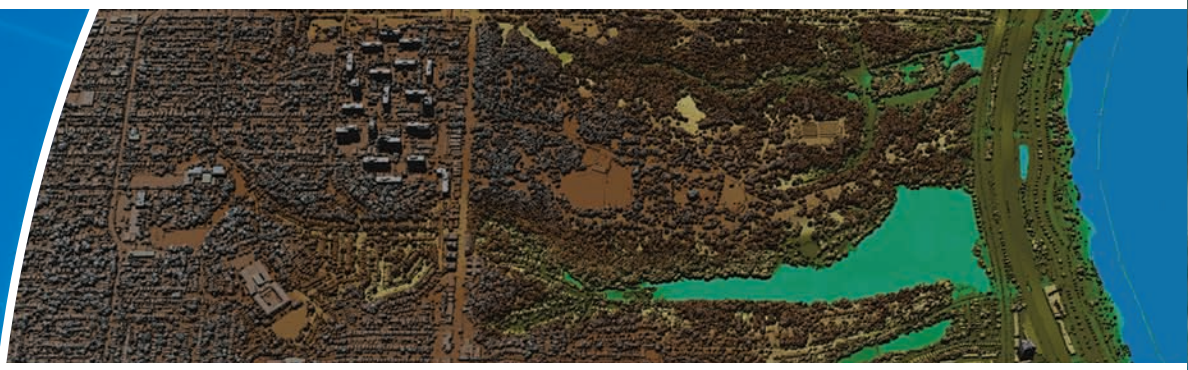
Kevin Pomfret

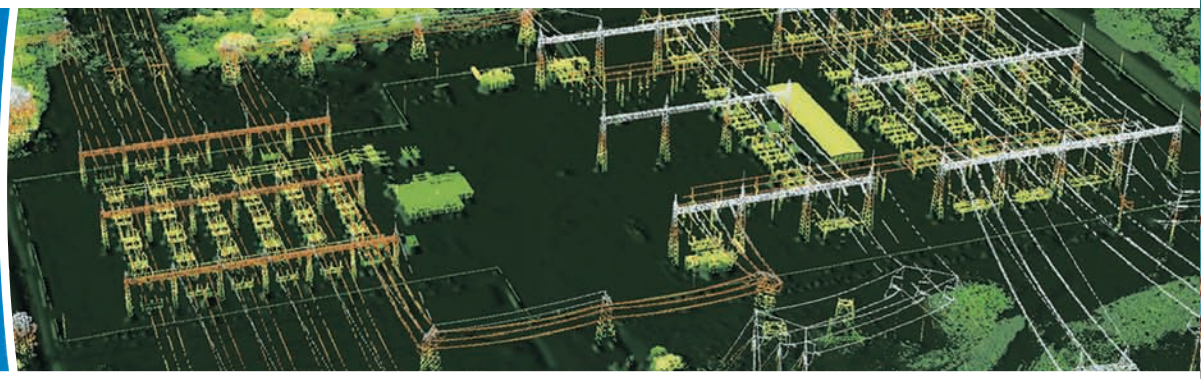
Optech

One **Platform**... Multiple **Solutions**

WIDE-AREA MAPPING



CORRIDOR MAPPING



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BPA WORLDWIDE BUSINESS

Governments

Governments should rethink their future role in a society where geospatial information is one of their citizens' daily needs. 50 years ago, the collection and use of geospatial information was a prerogative of governments, but in the last ten years in particular geospatial information has become available to everyone. Geoinformation is no longer the exclusive domain of governments, nor will it ever be again, which is why governments are obliged to review their tasks.

According to Vincent Hoong, chief executive of the Singapore Land Authority, there will be lots of new opportunities for governments in terms of providing and managing geospatial information. During his address at the 2nd High Level Forum of the United Nations Initiative on Global Geospatial Information Management (UN-GGIM) in Doha, Qatar, at the beginning of February, Hoong stated that there are around 2.4 billion internet users and 6.2 billion mobile subscribers worldwide – all of whom are potential contributors of location-based information. In order to tap into this amazing source, governments should evolve from being data collectors and information providers to become data and information facilitators. A government could play four distinctive roles. The first role is as a facilitator of infrastructure for geodata platforms, which can serve as a medium for information exchange between the government, businesses and citizens. The second role is that of stimulator: a country's government should stimulate and encourage businesses and citizens to develop geosolutions. As Hoong pointed out, just a few of the many thousands of apps in the various app stores have been developed by governments – not to mention the mobile devices themselves, which have all developed been within the private sector. One way for governments to stimulate new geosolutions would be through conferences or symposia where different parties could come together to discuss, develop and engage. The third role is one which will be particularly appealing to many policymakers within governments, namely the role of authenticator or certifier of geospatial data. Ultimately, all data needs a label to prove that it is trustworthy, and governments – national mapping agencies and cadastres – are the most obvious parties to provide such reassurance. After all, they have been doing this for years in other areas. The fourth and final role Hoong identified is one of capacity builder. Governments could intensify this role in co-operation with academies and private industry to ensure the availability of a large contingent of capable professionals.

Photography: Arie Bruinsma

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Any governments considering fulfilling one or more of these roles are clearly facing up to their responsibility. The process starts with evaluating the state of geospatial information in their country, holding discussions and identifying needs. It will end in a well-defined role for that government in the rapidly developing world of geoinformation, thus ensuring the best for its citizens who are increasingly relying on geoinformation in their daily and business lives. Vincent Hoong sees it as challenge, but certainly something that is doable. The UN-GGIM will serve as the forum for the exchange of best practices, allowing governments to learn from one another. In future issues of *GIM International*, you will be able to read more on the discussions and outcomes of the 2nd High Level Forum of UN-GGIM in Doha, Qatar.

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When mapping caves, the harsh underground environment can pose extra challenges which require an unconventional approach to the application of modern technologies. The article starting on page 33 offers insight into how a wireless combination of laser rangefinder and all-in-one handheld device was used to safely store and preview the collected data to ensure optimal mapping accuracy during a project in Bulgaria.

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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.

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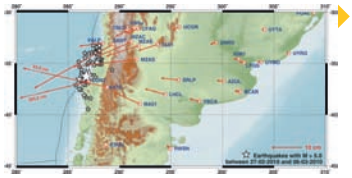

A Toast to Good Co-operation and Best Practices

'It takes two to tango' is a common idiomatic expression when referring to a situation in which a couple should pair to attain a certain goal. Well, in Buenos Aires, Argentina, last November, it was not two but four entities joining forces at the 44th Directing Council Meeting of the Pan-American Institute of Geography and History (PAIGH) to expedite the building of spatial data infrastructure (SDI) for the Americas. Indeed, the main regional entities playing a key role in SDI development in the Americas launched the Joint Plan 2013-2015 to harmonise efforts and work plans, foster specialisation and avoid duplication, as well as to prepare relevant institutions in the region for constant technological changes and innovations.

The purpose is not to bring about a new form of governance of regional SDI but rather to consolidate a widely distributed system of responsibilities while respecting the necessary independence of the parties. Thus, the effort seeks to consolidate: the role of PAIGH as facilitator of regional processes and capacity-builder; the function of the Geocentric Reference System for the Americas (SIRGAS) as supplier of geodetic reference frames for the region; the Permanent Committee on Geospatial Data Infrastructure for the Americas (CP-IDEA) as steward of regional and institutional policies and direct liaison with the United Nations' regional cartographic conferences and GGIM; and the Geospatial Network for Latin America and the Caribbean (GeoSUR) as developer of services and applications built on institutional and regional spatial databases. This is also an exercise that considers the global connections of each agency. All of this is to be achieved through the implementation of a joint plan of action, which has been created by comparing the features of each organisation, their functions, work plans and their institutional projections.

SANTIAGO BORRERO
Secretary General of the Pan-American Institute of Geography and History (PAIGH), sborrero@ipgh.org

Underlying this undertaking is the consensus among the leaders of the four participating agencies that the SDI of the Americas will not become a tangible and sustainable reality as a result of individual activities, but rather as the outcome of their united and co-ordinated actions. By its very nature, the building of spatial data infrastructure is a long-term, dynamic process that combines concepts, methods, cultural and institutional issues, as well as scientific and technological resources, capital and specialists in order to be able to put spatial information effectively at the service of development. This complex process is unquestionably not an easy one and it is perhaps hardest to advance on the regional level. These joint actions will lead to the consolidation of SDI as an increasingly efficient mechanism for decision-making, regional integration and growing the infrastructure required for sustainable development in the Americas.

The joint document will be published in multiple languages and its preliminary version is available at http://www.ipgh.org/Iniciativas/JointActionPlan.pdf

I would like to raise a toast to good co-operation and best practices – cheers!

ESA ORGANISES GNSS SUMMER SCHOOL IN DAVOS ++ FUNDING FOR EUROPEAN EARTH OBSERVATION UNTIL 2020 ++ TRIMBLE ACQUISITION OF PENMAP SOFTWARE ++ TWO DAYS FULL OF
RESPONSE IN QUEENSLAND ++ IGARSS 2013: BUILDING A SUSTAINABLE EARTH THROUGH REMOTE SENSING ++ NIKON-TRIMBLE LAUNCHES NEW SERIES OF TOTAL STATIONS ++ UN-GGIM:

ESA Organises GNSS Summer School in Davos

From 15 to 25 July 2013, the ESA International Summer School on GNSS will be held in Davos, Switzerland. The objective of the summer school is to provide attendees with a comprehensive overview of satellite navigation, beginning with the GNSS system, its signals, the processing of the observations in a receiver and finally determining the position-navigation-time (PNT) solution.

http://su.pr/2vH5ka

UN-GGIM: Call for Case Studies

The United Nations Initiative on Global Geospatial Information Management (UN-GGIM) is requesting geospatial users, members of industry, national mapping and cadastral authorities and academic institutes to submit case studies which demonstrate the value of geoinformation. During the 2nd High Level Forum of the UN-GGIM, which was held in Qatar from 4 to 6 February, co-chair Vanessa Lawrence made it clear that while UN-GGIM has already received a number of case studies, it still needs many more.

http://su.pr/1NOUHp

The UN-GGIM logo.

Funding for European Earth Observation until 2020

The European Council has secured Global Monitoring for Environment and Security (GMES) programme funding through 2020. The multi-annual financial framework – MFF – is a seven-year plan for the EU's budget. On 8 February, European heads of state and government agreed to include GMES in the 2014-2020 MFF for GMES Services, In-Situ Component (a network of sensors on the ground, at sea and in the air) and the Space Component, thus securing funding for the programme's long-term operational phase.

http://su.pr/2fES75

Two Days Full of 3D Measuring

On 13 and 14 February 2013, the annual 'Oldenburger 3D-Tage' event took place in the northern German city of Oldenburg, attracting some 200 experts from the whole of Germany and neighbouring countries. Participants could enjoy a total of 56 presentations as well as an exhibition where relevant companies showcased the latest developments, research results and applications of the optical 3D measuring technique.

http://su.pr/1qhTtw

Impression of the Oldenburger 3D-Tage.

AAM Aids Flood Response in Queensland

When tropical storm Oswald hit the Australian town of Bundaberg in Queensland in late January 2013 resulting in extensive flooding, a number of crucial relationships came into play. AAM immediately responded to the request to deploy an aircraft to capture aerial imagery for digital mapping purposes, demonstrating the importance to protection and relief efforts of strong partnerships between response teams, government agencies and consultants.

http://su.pr/2zrcNv

Capturing the flooding in Queensland.

3D MEASURING IN OLDENBURG ++ CHC TO SUPPLY GNSS RECEIVERS FOR CHINESE MAPPING PROJECT ++ INDIA'S GAGAN ADDS A NEW DIMENSION TO NAV ... OS FLOOD
CALL FOR CASE STUDIES ++ UAV OPERATOR'S CERTIFICATE ISSUED TO LAND SURVEYS ++ RENISHAW COMPLETES ACQUISITION OF MDL ++ UAS CONDUCTS ... ABOVE SEA

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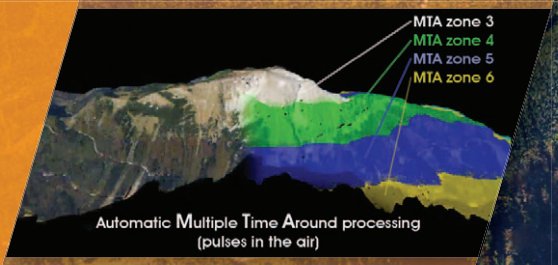

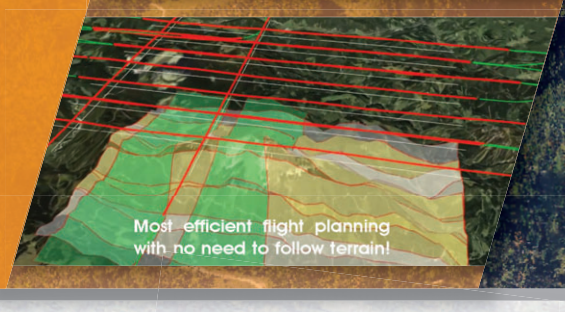

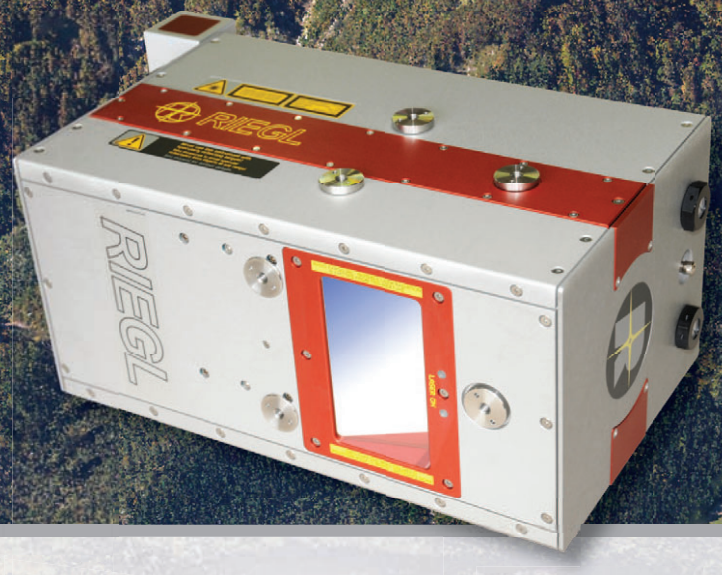

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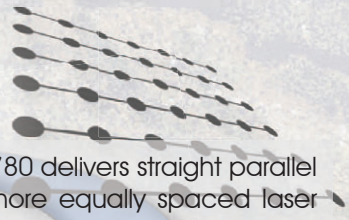

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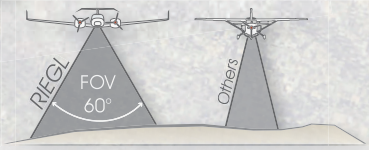

The *RIEGL* LMS-Q780, operated at up to 10,000 feet above ground with its full FOV of 60 degrees, provides both a wide effective swath width and a narrow point spacing simultaneously.

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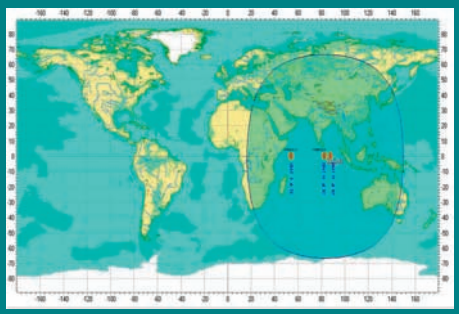
India's GAGAN Adds a New Dimension to Navigation

In 2014, GPS Aided Geo Augmented Navigation (GAGAN) means that airspace on the Indian subcontinent will have a safety shield, helping airline pilots navigate with reliability, availability and integrity. With GAGAN, India becomes only the fourth region in the world to have its own satellite-based augmentation system (SBAS), after USA, Europe and Japan.

http://su.pr/1iwDHw



Typical coverage of GAGAN satellites (source: ISRO and AAI).

CHC to Supply GNSS Receivers for Chinese Mapping Project

CHC Navigation has been awarded a contract to supply 90 units of X91 GNSS receivers to the Chinese National Survey and Mapping Bureau (SBSM) for the completion of the Chinese Sea Islands and Reef Surveying and Mapping project. SBSM is the Chinese governmental organisation in charge of supervising and managing projects on a national scale such as boundary and cadastral surveying. Recognised as one of the five key surveying projects of the SBSM under the 11th Five-Year Chinese Plan, the project is aimed at precisely redefining the coordinates of each island and reef.

http://su.pr/4Xk9jv

Trimble Acquisition of Penmap Software

Trimble has acquired a suite of software solutions from Bradford-based Penmap.com Ltd., United Kingdom. Penmap.com's solutions include both office and field data-capture software specifically designed for the cadastral and surveying markets. The software suite enables Trimble to further address local application requirements and customer needs by providing complete, customised surveying software solutions for the cadastral market. Financial terms were not disclosed.

http://su.pr/3Nchki

Using 3D Laser Scanners in Archaeology and Heritage Sectors

3D Laser Mapping is organising the latest in a series of free, application-specific workshops designed to promote a new range of hand-held 3D laser scanners. The latest workshop is aimed at potential users of the Mantis Vision imager from within the archaeological and heritage sectors and will take place on 14 March 2013 at the Creswell Crags Limestone Gorge and Cave Systems near Sheffield, UK.

http://su.pr/5FFlcS

The 3D Mantis in action.

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Prague Geo Summit Focuses on Education

The Prague Google Geo Summit is scheduled for Saturday 1 June and Sunday 2 June at the International School of Prague, Czech Republic. This event is a professional development experience designed to help educators get the most from Google's geo-related products and technologies. The summit will focus on the use of Google Earth and Google Maps in education, and attendees will be a mixture of directors, administrators, geography teachers and teachers of other subjects.

http://su.pr/2nkPNc

UAS Conducts Survey at 4,300m above Sea Level

Edáfica, a Chilean environmental consulting company which owns an sUAS Stardust II, was hired by Collahuasi mining company to conduct a survey of biophysics and ecotypes. The aim of the survey was to explain the conservation status of the species Frankenia triandra growing in Salar de Coposa under governmental protection. The system is also working in many 3D mapping projects for the mining industry. The key factor here is the ability to fly at very high altitudes and obtain high-quality results at the same time.

Stardust II UAV.

http://su.pr/2cewST

Renishaw Completes Acquisition of MDL

Renishaw has taken full ownership of Measurement Devices Ltd (MDL). The worldwide engineering technologies company has purchased the remaining 34% shareholding for a cash payment of GBP4.5 million. The acquisition of the shares concludes an agreement reached in 2010, at which time Renishaw purchased an initial 29% stake in MDL, a UK-based business specialised in designing and manufacturing high-speed laser measurement and surveying systems for use in extreme environments.

http://su.pr/1wyjD8

Most Shared

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

1. New Drone for Mapping Tested in Swiss Alps
   - http://su.pr/6q61u5
2. 'ITC Cutbacks Would Have Negative Impact'
   - http://su.pr/77jGds
3. Original Aerial Photos Show Aftermath of 1953 Flood Disaster
   - http://su.pr/2pnF5e
4. Photogrammetric Software Suite for UAS
   - http://su.pr/205UW4
5. Airborne Unmanned Sensor System for UAVs
   - http://su.pr/8lWfzQ

UAV Operator's Certificate Issued to Land Surveys

Land Surveys, Australia, is now a fully certified Australian Unmanned Aircraft Vehicle (UAV) operator. UAV Operator's Certificate 1-URV83-01 was issued by the Australian Civil Aviation Safety Authority (CASA). This award of the UAV OC marks a significant milestone in the commercialisation of Land Surveys' UAV surveying activities and recognises that the systems and processes the company has established are in accordance with legislation and guidelines set down by CASA.

http://su.pr/1Xevyj

Land Surveys' UAVs are operated by qualified surveyors or photogrammetrists.

LEVEL ++ PRAGUE GEO SUMMIT FOCUSES ON EDUCATION ++ ESA ORGANISES GNSS SUMMER SCHOOL IN DAVOS ++ FUNDING FOR EUROPEAN EARTH OBSE ++ TRIMB
ACQUISITION OF PENMAP SOFTWARE ++ TWO DAYS FULL OF 3D MEASURING IN OLDENBURG ++ CHC TO SUPPLY GNSS RECEIVERS FOR CHINESE MAPPING S GAGAN

Nikon-Trimble Launches New Series of Total Stations

Nikon-Trimble has introduced the Nikon NPL-322 series of mechanical total stations that includes instruments with 2" and 5" angular accuracy. The 2" accuracy model offers dual displays for highly productive angle measurement. Both NPL-322 total station models feature a reflectorless EDM with a range of 200 metres.

http://su.pr/1Howj8

Nikon NPL-322 series.

IGARSS 2013: Building a Sustainable Earth through Remote Sensing

World-renowned scientists and engineers are set to meet at the Melbourne Convention and Exhibition Centre, Australia, from 21 to 26 July for this year's IEEE International Geoscience and Remote Sensing Symposium. IGARSS 2013 is the platform for discussing the latest developments in satellite imaging technologies, recent research breakthroughs, challenges and the future direction of geosciences and remote sensing.

http://su.pr/1feNVR

Monetisation

We live in a monetised world in which all components of life – be they goods, skills, sport, leisure, health or art – are expressed in the form of currency. In such a world, it is very natural that questions arise such as 'What is the economic impact of geoservices?' And this question has been scrutinised by Oxera Consulting Ltd, registered in Oxford, UK, and Brussels, Belgium, in a study commissioned by Google. The resulting report was published in January 2013. The study aims to quantify the impact of geoservices on the world economy and consumer welfare, expressed in terms of billions of US dollars. Geoservices stem from firms who serve their clients with satellite imagery, online maps, digital maps stored in car navigation systems and other local devices, satellite positioning signals, and navigation devices. Examples of such firms are Google, Garmin and Cartifact. The latter is based in the USA and specialised in innovative cartographic technology.

MATHIAS LEMMENS
Senior editor, GIM International
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The researchers recognise that estimating global impacts is not a precise science and that the numbers should be treated as indicators rather than accurate values. The result is that the estimated global revenues from geoservices cover the broad bandwidth of USD150 billion to USD270 billion per year while accounting for roughly 0.2% of the gross domestic product the entire planet generates. Car navigation may help to save 125,000 years of travel time per annum globally, saving an amount of time worth USD18 billion and fuel worth USD5 billion. Geoservices also enable precision farming and improved irrigation with an annual impact of between USD8 billion and USD22 billion on a global scale. These figures show how important geoservices are for the global economy.

Geoservices also contribute to components of life which are difficult, or even improper, to quantify in terms of money; one such component is aid emergency response. In England alone, geoservices may help to save over 150 lives annually. An appealing argument is provided for those who are tasked with the tough job of convincing potential students to populate the class rooms of geomatics programmes as a career choice: five years after graduation, students educated in the use of geoservices can expect to be earning on average 3% more than those who did not receive such an education.

While reading the report, I suddenly began to wonder why people living in this era attach so much merit to money. Why are people so fixated on currency? Has currency not become confused with other values – ones deeply rooted in the human soul, such as wisdom, fulfilment and altruism (i.e. serving others and society without immediate pursuit of profit)? Greed brings debt, enslavement and suffering; maybe not to you, but certainly to others. To paraphrase John F. Kennedy: "Don't ask how you can profit from your fellow citizens. Ask instead what you can do for mankind."

ADDS A NEW DIMENSION TO NAVIGATION ++ AAM AIDS FLOOD RESPONSE IN QUEENSLAND ++ IGARSS 2013: BUILDING A SUSTAINABLE EARTH THROUGH R NIKON-TRIMBLE LAUNCHES NEW SERIES OF TOTAL STATIONS ++ UN-GGIM: CALL FOR CASE STUDIES ++ UAV OPERATOR'S CERTIFICATE ISSUED TO LAND SURVEY PLETES

GIM INTERNATIONAL INTERVIEWS KEVIN POMFRET

Impact of Privacy Laws on Geomatics

In the past, the only people who knew where we were at any given time were the people who saw us there and the people we told. This is changing due to geoinformation and it makes some people very uncomfortable. It is only to be expected that this development will result in some fundamental amendments to privacy laws, says Kevin Pomfret, executive director of the Centre for Spatial Law and Policy. He shares his thoughts on changes to privacy regulations and their potential impact on the geospatial community with *GIM International*.

Can you tell us more about the main focus of the Centre for Spatial Law and Policy?
The primary focus of the Centre is educating government and industry on the legal and policy issues that impact the collection, use and distribution of geoinformation. Such education is intended to result in consistent, transparent and well-reasoned legal and policy frameworks. Some of these issues are rather obvious, such as directives relating to spatial data infrastructures. Others are less obvious, such as laws and policies with respect to privacy or data protection that define location information as personally identifiable. Unfortunately, the legal and policy communities are lagging far behind the technology community, particularly with respect to geospatial technology and applications that use location and other types of geoinformation. Moreover, these issues are not taught in law schools and, until now, there has been no central source for keeping up with relevant legal and policy developments.

Which geographical territory does the Centre cover, and what is its technical mandate?
The Centre is based in the USA, but it is focused on developments around the world. Moreover, these issues cut across various legal disciplines and technology platforms. As a result, they are as relevant to a commercial satellite imaging company as they are to mobile app developers that utilise location information, or to a GIS department within a government agency. Each is struggling – or will soon be struggling – with these issues. The Centre is trying to help industry and government get ahead of the issues before they begin to hinder the potential of this technology.

Do you have counterparts in other parts of the world?
Not directly. There are several universities around the world with professors and researchers that focus on various aspects of these issues, and the Centre works with them whenever possible. However, as far as I know, there is no organisation with the same objectives as the Centre for Spatial Law and Policy.

Are US privacy regulations, at either state or federal level, obstructing significant further developments in the geospatial industry?
Currently there are no privacy regulations, or federal/state laws and policies, which are obstructing further developments. However, there is a great deal of uncertainty surrounding geoinformation and privacy, and that is having an impact on the industry. For example, in the state of New York, a local government agency stopped using commercially available satellite imagery to identify households which had not obtained a licence to build a backyard pool due to privacy concerns expressed by the media and public. Similarly, there are conflicting decisions from different jurisdictions in the United States on what approval law enforcement must obtain before collecting geo-location information on potential crime suspects.

What could these developments mean for the future?
I do think that, within the next 12 months, we are likely to see legislation or court cases in the US that will begin to have an impact. For example, there are a number of bills before Congress that would regulate the collection, use and/or distribution of geo-location information relating to consumers. Similarly, there are bills in Congress and at the state level that would regulate the government's ability to use tracking devices to monitor the movements of crime suspects, even in public spaces. In addition, there is bill awaiting signature from the Governor of Virginia that would greatly restrict the government's ability to use drones for a period of two years to allow further research to be conducted on the privacy implications. While the individual effect of each of these on the geospatial industry might be minimal, together they could begin to have a significant impact on the availability of geospatial data and how it can be used.

Kevin Pomfret

Kevin Pomfret is the executive director of the Centre for Spatial Law and Policy and the founder of GeoLaw, P.C. Prior to attending law school, Pomfret served as a satellite imagery analyst with the US government. In that capacity, he developed an imagery collection strategy to monitor critical arms control agreements and worked on requirements for future collection systems. Upon entering private practice, he began to focus on the unique legal issues associated with spatial data, including intellectual property rights, licensing, liability, privacy and national security. In addition to his work with the Centre, Kevin Pomfret counsels businesses on data licenses and distribution agreements, privacy policies and spatial data audits and consults on developing legal and policy frameworks for national spatial data infrastructures.

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How does privacy regulation differ between the USA and the EU?

At this point, there is a significant difference between how the EU and the US protect privacy. The EU has a comprehensive data protection regime in place whereas the United States, with a few specific exceptions, has avoided codifying privacy protection. That is beginning to change, as there have been increased calls to protect consumer privacy in the US, particularly with regard to the collection and use of online information. However, there is still a significant gap between the two. In fact, some European officials have recently complained that the US government is trying to influence efforts within Europe to update its data protection regime in order to protect US-based companies.

Is the idea of 'privacy violation' open to interpretation? It seems that people may not want to be filmed while in their backyard or on the sports field, but they are happy to post the fact that they are there on Foursquare.

With respect to location privacy, I think there is a good deal that we still need to understand. In the past, generally the only people who knew where we were at any given time were the people who saw us there and the people we told. This is now changing, which could result in some fundamental amendments to privacy laws. Moreover, it makes some people – but not all – very uncomfortable. However, there are a few things that we need to keep in mind with respect to location privacy. Firstly, concerns over disclosing your location appear to be less universal than concerns associated with disclosing your financial situation or medical records. Willingness to disclose location seems to be more dependent upon factors such as gender, age, religion and cultural background. As a result, it will be much more difficult to develop broad-based consensus on what to protect. Moreover, it will prove much more difficult to define privacy from a location standpoint. Is it within a few metres, a street or a town? Also, how do you factor in the temporal component? Secondly, 'privacy concerns' are often a standard reaction whenever a new technology makes people feel uncomfortable, for whatever reason. A few years ago, for example, taxi drivers in a certain US city complained that mandatory installation of GPS devices in their vehicles was an 'invasion of their privacy'. A few years after the devices were installed, a study conducted using the information from the GPS devices revealed that many taxi drivers in that city overcharged their customers by claiming to have driven farther than they actually drove, leaving us to draw our own conclusions about their initial objections.

Which geospatial techniques – GPS/GNSS for geo-locating individuals, photogrammetry by UAS, etc – should receive the most urgent attention from legislators and policymakers regarding privacy?

I don't believe that geospatial techniques themselves require the attention of legislators and policymakers – all technology can be used for both 'good' and 'bad'. I think that analysis needs to begin

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with what privacy interests are you trying to protect and how best to protect them. For example, privacy concerns associated with repressive governments using technology to monitor the movements of opposition leaders are different from concerns about consumers receiving unwanted texts from a restaurant because they just happened to be nearby. Each involves some of the same technologies, but that does not mean that they should be analysed or addressed in the same manner.

The EU has a comprehensive data protection regime in place whereas the United States has avoided codifying privacy protection

What message would you like to give to the readers of GIM International?

As a member of the geospatial community for over 25 years, beginning as a satellite imagery analyst, I have been very pleased to see the growth in the adoption of geospatial technology and the many uses involving geoinformation. Moreover, I believe that we are still at an early stage of the maturity cycle and that there are a number of other commercial, governmental and societal benefits ahead. However, the growing success of the technology also brings greater scrutiny from legislators, regulators and the media. I worry that as laws and policies develop, they will limit the many potential benefits of geoinformation. Moreover, as the geospatial ecosystem has become increasingly interconnected, the greatest legal and policy impediments may arise due to a law, regulation or policy on an issue such as privacy that is not directly 'geospatially driven' yet has unintended consequences for our industry. ◂

TESTING SUITABILITY FOR BOUNDARY IDENTIFICATION IN URBAN AREAS

UAS for Cadastral Applications

When ownership of one or more parts of a parcel changes, seller(s) and buyer(s) are legally obliged to identify the new boundaries. Stakeholders are often unable to attend the on-site identification session. Could high-resolution images captured by UAS bring relief? Would it be possible to use a high-quality orthomosaic as substitute? The crux is that precision and spatial resolution must be high enough. Having conducted tests in an urbanised area in The Netherlands, the authors conclude that the precision of 3cm is similar to conventional land surveying and that UAS imagery enables seller(s) and buyer(s) to perform boundary identification.

Identification of the location of new legal boundaries is presently done on site in the presence of a cadastral officer. Even when an appointment has been made, and sometimes when the cadastral officer is already on site, seller and/or buyer frequently cancel the arrangement – an undesirable and costly phenomenon. To improve the efficiency of boundary identification, the simultaneous presence of stakeholders on site should be substituted by other means. High-resolution aerial imagery discloses the topographical situation and thus offers a potential alternative, provided that the precision is 6cm or better, since that is the precision of conventional land surveying.

CONCEPT

High-resolution images enable the creation of orthomosaics of uniform scale and hence the boundaries outlined are free of distortion. However, orthomosaics created from conventional aerial images are unsuitable because their current precision and resolution are too low. Improving this to the required level

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Martijn Rijsdijk (1975) received an MSc degree in geodesy from Delft University of Technology and is presently manager of process and product innovation at Kadaster, focusing on improving workflows and products. During his career at Kadaster, he has been involved in diverse projects including integration of National Mapping Agency and Kadaster, and the founding of Geonovum.

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Wim Witteveen (1955) has been with Kadaster since 1976 and operated in a variety of functions including surveyor, information analyst and project leader. Currently he is consultant for information management GEO.

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Figure 1, Falcon 8 (left) and Microdone MD-4 1000.

Figure 2, Test at the Pyramid of Austerlitz (left) conducted by experts from KLPD, Kadaster and NLR.

would be very costly. Images captured by Unmanned Aerial Systems (UAS) seem to have appropriate characteristics: flying at a relatively low altitude (40m) results in better resolutions while the precision is 6 to 10cm, as Swiss tests show. A slight improvement to these figures would be enough to make UAS imagery suitable for boundary identification. These images would eliminate the necessity for all stakeholders – seller(s), buyer(s) and cadastral officer – to be present on site simultaneously. Instead, the seller(s) and buyer(s) would be able to identify the new boundaries on the image, possibly at the moment of transaction in the notary office. The cadastral officer would then be able to sketch the boundary on a soft or hard copy of the aerial image.

TEST SET-UP

During the winter and spring of 2012, Kadaster started tests on the suitability of aerial images captured by UAS for the identification of property boundaries. The tests were conducted in co-operation with KLPD (Dutch national police force), National Aerospace Laboratory of the Netherlands (NLR) and, in a later stage, the firm OrbitGIS. Three experiments were conducted at two locations: Austerlitz and the city of Nunspeet. The first experiment carried out in Austerlitz concerned a learning phase aimed at getting acquainted with the technology. The second experiment concerned a practical case. The third experiment – also a practical case – was necessary due to some failures during the second experiment.

EQUIPMENT

A Falcon 8 from Ascending Technologies (AscTec) was used in the first and second experiments, and a Microdone MD-4 1000 Beta was used in the third experiment (Figure 1). The Falcon 8 is an octocopter (eight rotors), remains stable up to wind speeds of 10m/sec (5 Beaufort; fresh breeze), can carry a payload of 500g and can stay in air for 20 minutes. Navigation and positioning is done using GNSS, an inertial measurement unit (IMU), a barometric height sensor and a compass. The camera on board was a Panasonic LX-3, which is a good-quality compact camera with a focal length of 5.1mm and has an image size of 3,648 x 2,736 pixels and a pixel size of 2µm. The Microdone MD-4 1000 Beta is a quadrocopter (four rotors), can carry a payload of 1,200g and can stay in the air for up to 45 minutes. Navigation and positioning is done using GNSS. The camera

SERIES ON EXPERIENCES WITH UAS

This article is the third in a series of articles focusing on experiments carried out to test the aptness of Unmanned Aerial Systems (UAS) for a broad spectrum of potential applications. An Unmanned Aerial Vehicle (UAV) is the carrier of sensors and systems used for geodata acquisition. The platform together with the on-board sensors constitute an UAS. The applications may include land administration, map updating, landslide and dike monitoring, and biodiversity and heritage conservation. UAS technology is a low-cost alternative to classical manned aerial photogrammetry and is obviously growing mature. Feel free to contact us if you would like to contribute:

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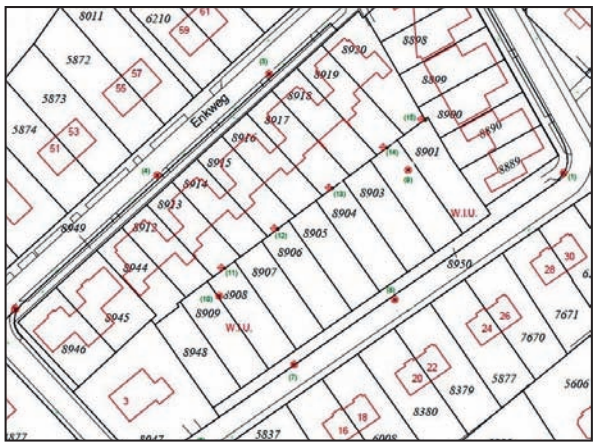
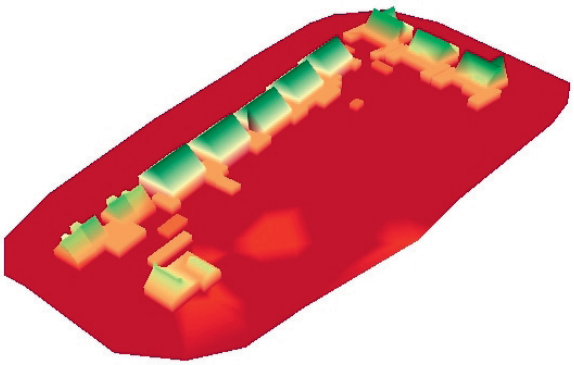
▲ *Figure 3, Improvements: targets for camera calibration are laid out in terrain and professional ground markers are used (inset).*

▲ *Figure 4, UAS in action above new homes in Nunspeet, April 2012.*

▼ *Figure 5, Cadastral map of Nunspeet showing the test area including the placement of ground markers (red circles) and location of sewer pits (red squares).*





▲ *Figure 6, Digital Elevation Model of the Nunspeet test site.*

on board was an Olympus E-P3 OGT with a focal length of 17mm, an image size of 4,032 x 3,024 pixels and a pixel size of 4.4µm. During the flights, the built-in stabilisation of the cameras was switched off since stabilisation shifts the lens, which infringes the calibration parameters. Since a UAS can only stay in the air for a limited time span, an aerial survey is usually divided into several sub-flights, depending on the area that has to be covered.

AUSTERLITZ

The Pyramid of Austerlitz, a victory monument built by Napoleon's army in 1804, is an unpopulated, sandy area covered by a few buildings and surrounded by forest (Figure 2).
The test area was chosen in order to gain experience while minimising the potential risk of injuring casual bystanders and passing public.
First ground control points (GCP) were signalised and their positions measured with GNSS. The signals consisted of out-of-use compact discs as their silver sheen was thought to warrant good visibility in the images. Their visibility was indeed very good, although sometimes too good as some signals appeared as flares on the images due to high reflection. After a few test flights, the actual flights were started at around 13:00h. The temperature was around freezing, which caused battery failure. The UAS could stay in the air for less than 10 minutes instead of the nominal 20 minutes. At 15:00h, rainfall prompted cancellation of the last flight. This experiment improved insight into preparation of the flight plan, distribution of GCPs, setting of camera parameters and selection of proper software for block adjustment and orthomosaic creation. The camera was not calibrated. After block adjustment, the average precision was worse than 10cm.

NUNSPEET

The second experiment, conducted in Nunspeet on 29 March 2012, concerned a real cadastral situation in which the parcel boundaries of 20 new houses had been identified and measured. Kadaster and its partners planned and executed four sub-flights to cover the target area, for which municipal permission was required since the flights would be conducted over houses and civilians. Instead of compact discs, professional ground markers were placed at distributed locations, and targets placed on paper sheets enabled self-calibration of the camera (Figure 3). The parameters were calculated during block adjustment. The last flight (Figure 4) could not be completed entirely since a sudden blast threw the UAS off balance and the experiment had to be terminated, resulting in incomplete coverage of the area. Camera calibration plus better visibility and distribution of GCPs resulted in an average precision of 3cm after block adjustment. Due to incomplete coverage, no useful orthomosaic could be generated.

THIRD EXPERIMENT

A third experiment was therefore set up and conducted on 19 June 2012, also in Nunspeet. In this experiment, the earlier experiences gained on specifying flight parameters and number and distribution of GCPs could be fully explored. Eight GCPs were well distributed along the border of the site and two GCPs were placed in the centre part (Figure 5). When conditions are optimal, the number of GCPs might be further reduced to 5 or 6. Just one

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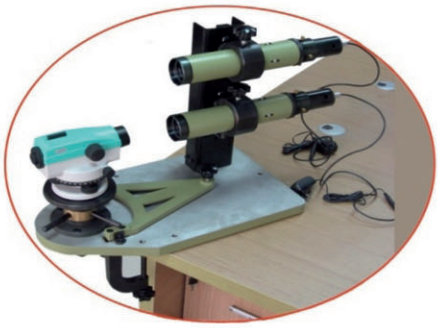

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flight, conducted within 25 minutes, sufficed to capture the site with 80% overlap both across and along track from an altitude of 58m, yielding 360 images. Compared to multiple flights, which capture a site in bits and pieces, complete coverage carried out in one flight results in higher geometrical fidelity. Nevertheless, to increase redundancy, a second flight was performed yielding 380 images. Tie points were automatically detected using image matching software. The block adjustment revealed a precision of 3cm. Next, a Digital Elevation Model (DEM) was created using OrbitGIS software (Figure 6), and a quasi 'true' orthomosaic was generated with the same software. Projection of property boundaries onto the orthomosaic showed that orthomosaics can be created with a precision of 2 to 3cm (Figure 7).

FINAL REMARKS

These tests show that low-altitude aerial imagery is suitable for boundary identification. However, the conditions for which the method is feasible need further investigation; for example, UAS might become the preferred method for inaccessible areas. GCPs were signalised and measured prior to flight, but in an operational setting this task might be performed more optimally after image capture. Of course, a prerequisite is that all stakeholders – buyer(s), seller(s) and cadastral officers – should adopt the method and get used to it. Furthermore, the legal consequences have to be scrutinised.

Figure 7, Orthophoto of Nunspeet (upper left) and detail overlaid with cadastral boundaries (red lines).

FURTHER READING

- Eissenbeiss, H., 2009, 'UAV Photogrammetry', ETH Zurich.
- Flury, G. (2011), 'Evaluering der Gleisleitungsvermessung mittels UAV', ETH Zurich
- Manyoki, M., Theiler P., Steudler, D. and Eissenbeiss H., 2011, Unmanned Aerial Vehicle in cadastral applications, ETH Zurich, Switzerland
- Sippo M., 2013, Experiences in UAS Photogrammetry, *GIM International* 27(1).

BY **CLAUDIO BRUNINI**, SIRGAS PRESIDENT,

ADVANCING GEODESY IN LATIN AMERICA AND THE CARIBBEAN

Geodetic Reference Frame for the Americas

SIRGAS (an acronym of the Spanish term for 'Geocentric Reference System for the Americas') is an international organisation under the umbrella of the International Association of Geodesy (IAG) and the Pan-American Institute of Geography and History (PAIGH). Its main objective is the definition, realisation and maintenance of a state-of-the-art geodetic reference frame in Latin America and the Caribbean. This reference frame must support both highly demanding scientific studies and the development of a Spatial Data Infrastructure for the Americas. More than 50 institutions from 19 countries, including the national mapping agencies of Latin America, are committed to SIRGAS in a voluntary partnership.

Due to the complexity of the scientific and technological concepts – digital signal processing, celestial mechanics, relativity theory and a great many others – that make Global Navigation Satellite Systems (GNSS) possible, it is easy to forget the fact that positioning theory is based on one of the oldest and simplest mathematical formulas: Pythagoras' Theorem. Receiver coordinates are computed by solving a triangle whose vertices are the Earth's geocentre, the GNSS receiver, and the GNSS satellite (Figure 1). The unknown receiver coordinates are embedded in the length of the side that links the receiver to the geocentre; the lengths of the other two sides are either known – the distance between the satellite and the geocentre – or measured by the GNSS receiver – the distance between the satellite and the receiver. In order to apply Pythagoras' theorem, the receiver coordinates must be computed in the same reference frame as the satellite coordinates.

The precise GNSS orbits delivered by the International GNSS Service (IGS) refer to the International Terrestrial Reference Frame (ITRF). Hence, GNSS users interested in the accuracy of their results must compute their coordinates in the ITRF. The use of a different reference frame does not ensure compatibility between the three sides of the abovementioned triangle, and might significantly reduce the accuracy of the computed coordinates.

Claudio Brunini has been professor at the Universidad Nacional de La Plata (Argentina) for the past 30 years. He was elected as SIRGAS president in 2007 and re-elected in 2011. The Humboldt Foundation awarded him a George Forster Research Fellowship. From 2000 to 2008, he was a member of the *Journal of Geodesy*'s Editorial Board. He is co-author of over 50 publications in peer-reviewed journals.

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Laura Sánchez is responsible for the IGS Regional Network Associate Analysis Centre for SIRGAS (hosted by DGFI since 1996), has been SIRGAS vice-president since 2007 and is an associate editor of the IAG Symposia series.

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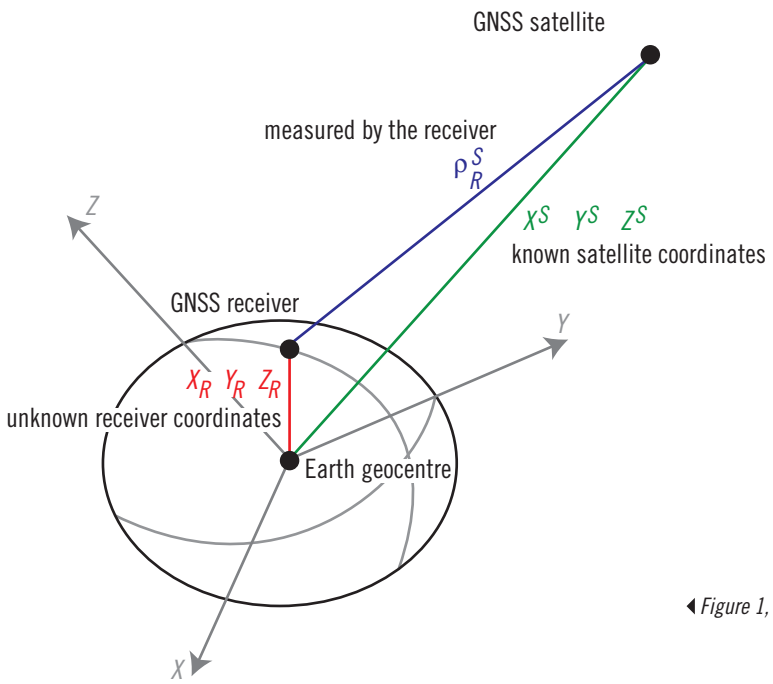

Figure 1, Principle of GNSS positioning.

SIRGAS is the densification of the ITRF in Latin America and the Caribbean. Its use was recommended to all the American and Caribbean countries at the United Nations Cartographic Conference for the Americas which held in New York, USA, from 22 to 26 January 2001. At present, SIRGAS has been officially adopted by 14 countries in the region.

THE MAJOR CHALLENGE

Within the main SIRGAS objective of defining, realising and maintaining the reference frame in Latin America and the Caribbean, the biggest challenge lies within the 'maintenance' aspect. Modern geodesy demands reference coordinates established with an accuracy of a few millimetres while, at the same time, these reference coordinates must be materialised on the ground by means of geodetic marks. These markers are continuously moving due to a variety of geodynamic processes, ranging from the rather smooth continental drift to the sudden jumps produced by earthquakes or seasonal changes caused by hydrological or atmospheric variability. These natural processes change the marker coordinates in different ways: continental drift or crustal deformation occurs with an almost constant velocity, from millimetres to centimetres, per year (Figure 2); variations of hydrologic and atmospheric masses loading the ground produce coordinate changes up to several centimetres with a seasonal periodicity (Figure 3); while intense earthquakes can suddenly change the coordinates from centimetres to metres (Figure 4).

These changes must be continuously monitored and the reference coordinates must be permanently updated in order to keep their accuracy within modern geodesy's acceptable range of just a few millimetres. The major challenge currently faced by SIRGAS is the definition of a strategy to cope with coordinate changes that are not constant over time (e.g. seasonal changes due to load processes or jumps caused by earthquakes).

THE SIRGAS ENGINE

SIRGAS is realised and maintained through a complex engine that encompasses: i) a continent-wide Continuously Observing Network (CON) of GNSS stations (SIRGAS-CON); ii) data centres; iii) processing centres; and iv) combination centres. GNSS data are produced, archived and processed according to international standards and specifications, particularly those issued by the IGS and the International Earth Rotation and Reference Systems Service (IERS).

SIRGAS-CON is presently composed of 280 GNSS stations distributed throughout Latin America, the Caribbean and surrounding regions (Figure 5). These stations are installed and maintained by national organisations, in some cases in an international collaboration framework, under the co-ordination of SIRGAS. Seventy of these stations are also part of the IGS network and provide the link to the ITRF. In the last decade, the network has grown at an average rate of 25 stations per year while station performance has continuously improved too: today, 127 stations are GPS+GLONASS-capable and 52 stations are real-time-capable.

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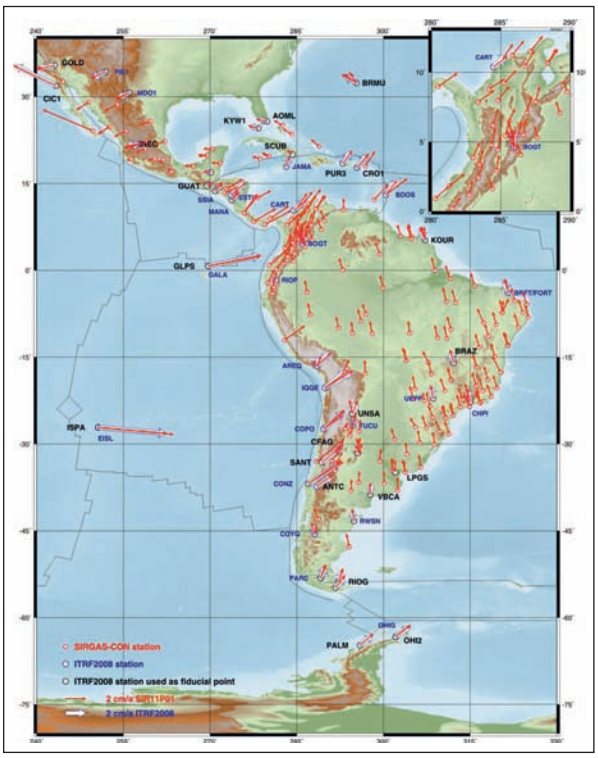
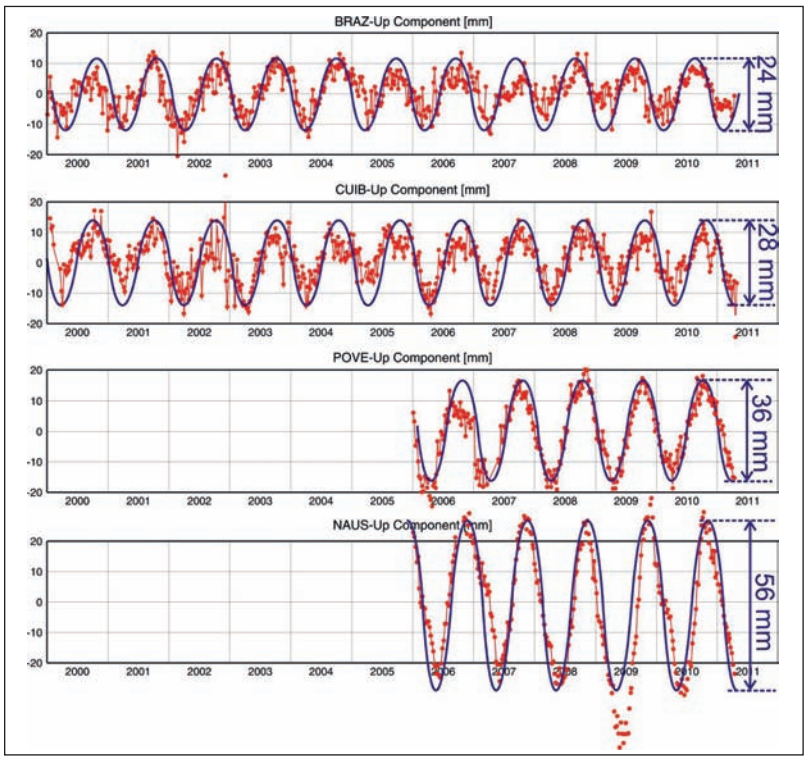
One global and nine regional data centres archive the data produced by the network, which are processed, on a weekly basis, by 10 processing centres. To accomplish this task, SIRGAS-CON is clustered in one core network and several densification sub-networks. Each sub-network is independently computed by three processing centres operated by different Latin American institutions (CIMA-Argentina, IGN-Argentina, IBGE-Brazil, IGM-Chile, IGAC-Colombia, IGM-Ecuador, INEGI-Mexico, SGM-Uruguay, LUZ-Venezuela) and by the Deutsches Geodätisches Forschungsinstitut (DGFI). The weekly solutions computed for every sub-network are integrated in a continental solution by two combination centres: IBGE (Brazil) and DGFI (Germany). SIRGAS promotes the installation of (at least) one processing centre in each country, ensuring the development and sustainability of in-country capabilities to manage modern reference frames at the national level. Moreover, SIRGAS encourages and supports the installation of experimental processing centres, which are candidates to become SIRGAS processing centres. During a specified probation period, they align their processing strategies with those required by SIRGAS and demonstrate their capacity for timely and regular delivery of weekly solutions. Afterwards, they may be appointed as official processing centres. In January 2013, the first SIRGAS Experimental Processing Centre in Central America started activities at the Universidad Nacional of Costa Rica.

SIRGAS AND THE COMMUNITY

Two kinds of solutions are delivered to the community by SIRGAS, both of which realise the ITRF: i) weekly station positions referred to the corresponding weekly solution of the IGS network, and ii) multi-year solutions referred to the ITRF, including station position at a reference epoch and linear coordinate changes, i.e. velocities.
A new multi-year solution is computed by the DGFI annually. The latest one, named SIR11P01 (Figure 2), comprises all weekly solutions from January 2000 to April 2011. It includes 229 stations and realises the ITRF2008 at the reference epoch 2005.0. The precision of the coordinates at the reference epoch was estimated to be ± 0.5mm for the horizontal components and ± 0.9mm for the vertical, while the precision of the constant station velocities was estimated to be ± 0.4mm/a.
Public and private-sector users alike can freely access the SIRGAS-CON solutions through the SIRGAS website, where they can find guidelines for the proper application of such products.



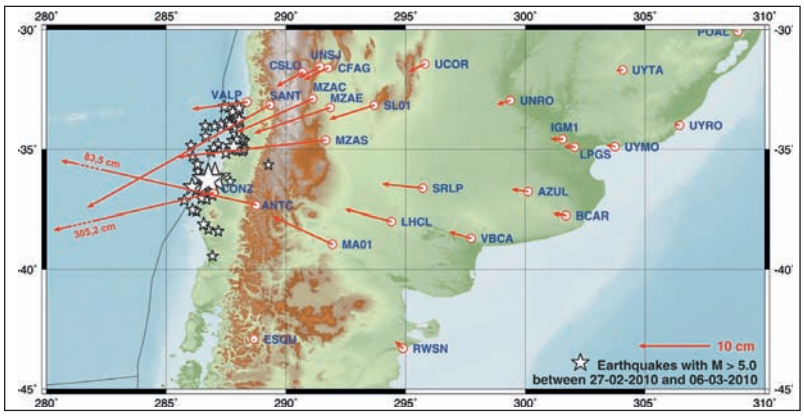
▲ *Figure 2, Mean yearly displacements of the SIRGAS reference stations.*



▲ *Figure 3, Station height variations in Brasilia and Manaus (Brazil).*

SIRGAS ORGANISATION

SIRGAS is a non-profit organisation based on the voluntary partnership of more than 50 organisations in 19 countries, including the national cartographic and other governmental agencies committed to the production of land information, as well as universities and research institutions. SIRGAS activities are mostly supported by these organisations which provide their human and material resources to carry out the working plans. ▶



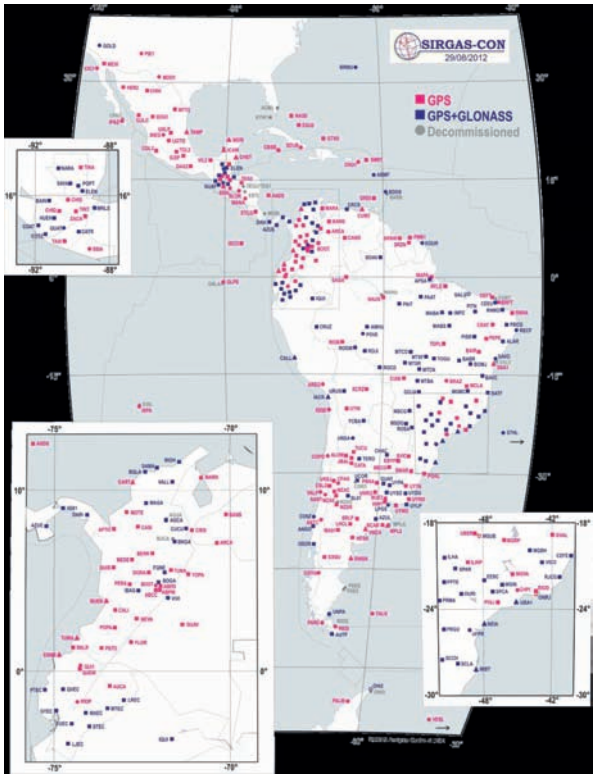
▲ *Figure 4, Station displacements caused by the earthquake of February 2010 in Chile.*

SIRGAS is integrated in the IAG as the Sub-Commission 1.3b, 'Reference System for Latin America', and in the PAIGH as the 'SIRGAS Working Group' of its Commission of Cartography. The interaction with the IAG guarantees guidance in the advances of geodesy and provides the Latin American community with all the benefits offered by the IAG's various components. The relationship with PAIGH facilitates knowledge of each country's needs regarding the use of reference frames by non-geodesist experts. The administrative issues of SIRGAS are managed by an Executive Committee, which depends on the Directing Council, the main body of the organisation. This Council is comprises one representative of each member country, one of IAG and one of PAIGH. It outlines the policies to be followed within SIRGAS. The technical activities are co-ordinated by three working groups: I) 'Reference System' devoted to the analysis and maintenance of the reference network; II) 'SIRGAS at national level' in charge of promoting and supporting the adoption of SIRGAS in the different countries; and III) 'Vertical Datum' (not considered in this article) dedicated to the unification of the existing height systems.

SUMMARY

SIRGAS is the regional densification of the ITRF in Latin America and the Caribbean. It provides the reference frame for practical applications such as cadastre and land management. In addition, it is the unique reference frame in the region capable of supporting climate-change studies (sea-level rise, water cycle, etc.) and natural disaster monitoring (seismicity, volcanic activity, etc.).

Presently, the main activities SIRGAS is involved in are: installing more continuously operating GNSS stations to monitor frame deformations; establishing a deformation model (derived from measured station positions) to transform between pre- and post-seismic frame realisations; and accounting for seasonal and other non-linear movements of the station positions.



▲ *Figure 5, The SIRGAS Continuously Observing Network (SIRGAS-CON).*

ACKNOWLEDGEMENTS

SIRGAS's achievements are possible thanks to the efforts of many people in more than 50 institutions. Special thanks are given to Hermann Drewes, Virginia Mackern, William Martínez and Roberto Luz. The support provided by IAG and PAIGH is greatly appreciated. ◀

FURTHER READING

Up-to-date and detailed information about SIRGAS can be obtained from the organisation's website (www.sirgas.org).

The following papers recently published in S. Kenyon, M.C. Pacino, U. Marti (Eds.), 'Geodesy for Planet Earth', IAG Symposia, Vol. 136, Springer 2012, are also recommended:

- Brunini, C., L. Sánchez, H. Drewes, S. Costa, V. Mackern, W. Martínez, W. Seemüller, A. da Silva: Improved Analysis Strategy and Accessibility of the SIRGAS Reference Frame, 3-10.
- Costa, S.M.A., A.L. Silva, J.A. Vaz: Report on the SIRGAS-CON Combined Solution by IBGE Analysis Center, 853-858.
- Drewes, H., O. Heidbach: The 2009 Horizontal Velocity Field for South America and the Caribbean, 657-664.
- Sánchez, L., W. Seemüller, M. Seitz: Combination of the Weekly Solutions Delivered by the SIRGAS Processing Centres for the SIRGAS-CON Reference Frame, 845-852.
- Seemüller, W., M. Seitz, L. Sánchez, H. Drewes: The New Multi-year Position and Velocity Solution SIR09P01 of the IGS Regional Network Associate Analysis Centre (IGS RNAAC SIR), 877-884.

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No 2314

MODERN METHODS AND DEVICES

Spatial Cave Mapping in Bulgaria

Caves are natural underground spaces formed and shaped over millions of years. Usually part of bigger caverns, they give a first-hand view of water, biology, oil and other subsurface distributions as well as a glimpse of the past when they perhaps offered shelter or sanctuary. Therefore, when exploring a cave, it is useful to not only collect geometric information such as gallery dimensions and directions but also to take photographs and notes of any specific features of interest. Since safe storage, easy management and proper representation of spatial data can be difficult using traditional methods, these are all key requirements in the search for a modern solution.

For this project, researchers chose the Pepelyankata cave which is situated in a karst region famous for Duhlata, the longest cavern in Bulgaria. At less than 500 metres long, Pepelyankata is not large but its two floors, narrow spaces, dusty and slippery sections nevertheless presented a real challenge for the surveying team. These conditions, in combination with the available range of devices and methods and the researchers' plans for further data analysis, updates, database development and GIS implementation, led to the final decision to apply certain technology. The project obtained accurate final results, and the method outlined proved to be fast, effective and suitable for future development.

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Atanas Rusev has a degree in engineering and is a researcher and GIS specialist at Bulgarian Geoinformation Company. He has more than 25 years of experience as a mountaineer and cave explorer in Club Extreme. His main interest lies in methodology and workflow of cave mapping, GIS for karst areas, mobile GIS and GIS server implementations.

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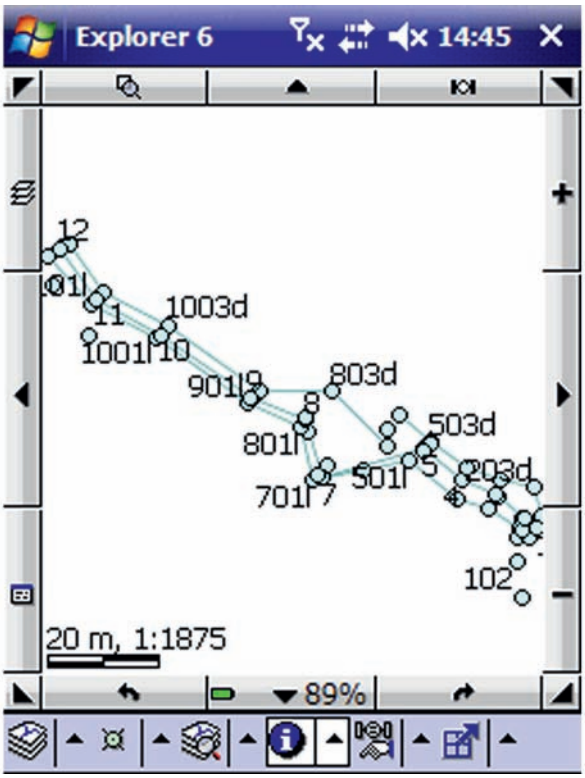
▲ *Figure 1, Setting up the Trimble GeoExplorer 3000 at the entrance to the Pepelyankata cave.*

▲ *Figure 2, Wireless data transfer between the Trimble LaserAce and Trimble Juno SC.*

▲ *Figure 3, Collecting data using a Trimble LaserAce.*

POSSIBLE SOLUTIONS

Although a wide variety of measuring tools are available nowadays, cave mapping is such a specific task that their application is delimited by a number of criteria. In line with the mapping grades of the UIS (Union Internationale de Spéléologie), of which Bulgaria is a member, surveying methods are evaluated according to their precision. The most popular is the compass-tape-clinometer method because of its accuracy to the required decimetre/degree level, ease of applying and low cost. All three of these devices are lightweight, compact and rugged; however, it is usually difficult to read the muddy tape and to take notes manually on paper. This slows the pace of work, increases the risk of damages and mistakes, and pencils are often lost. It also requires a team of at least 3 people.



▲ *Figure 4, Preview of labelled features on the map screen of the mobile software.*

Higher precision can be achieved with a theodolite or total station which also enables digital recordings. In addition, laser scanners give a 3D point cloud to allow a complete, detailed layout of a cave gallery to be produced. Nevertheless their fragility, bulky size which can cause transportation difficulties, and high costs make these instruments quite unpopular among cave surveyors, which results in them usually only being used for engineering tasks. Lower-cost scanning rangefinders are smaller, yet limited to a low range in terms of wider cave passages.

CHOSEN DEVICES

While the classic compass-tape-clinometer method is a good mapping solution, it has some weak points. Instead of these three tools, the Trimble LaserAce 1000 rangefinder was used – a dust- and water-resistant combination of laser distance meter, digital compass and clinometer, with accuracy up to 10cm, 2o and 0.2o respectively. It is operated by just one person, with passive range up to 150m. It has an optical sighting scope for precision aiming and its LCD display shows the exact measurements. The results are independent of the local magnetic field since electronic compass calibration is enabled.

The Trimble Juno SC handheld, a compact and lightweight PDA device with large touchscreen, was chosen for both sketching and data recordings via a Bluetooth connection to the rangefinder (Figure 2). DigiTerra Explorer 6 Professional software, including no-install mobile version and desktop version, was the chosen GIS solution due to its ability to integrate with external sensor,

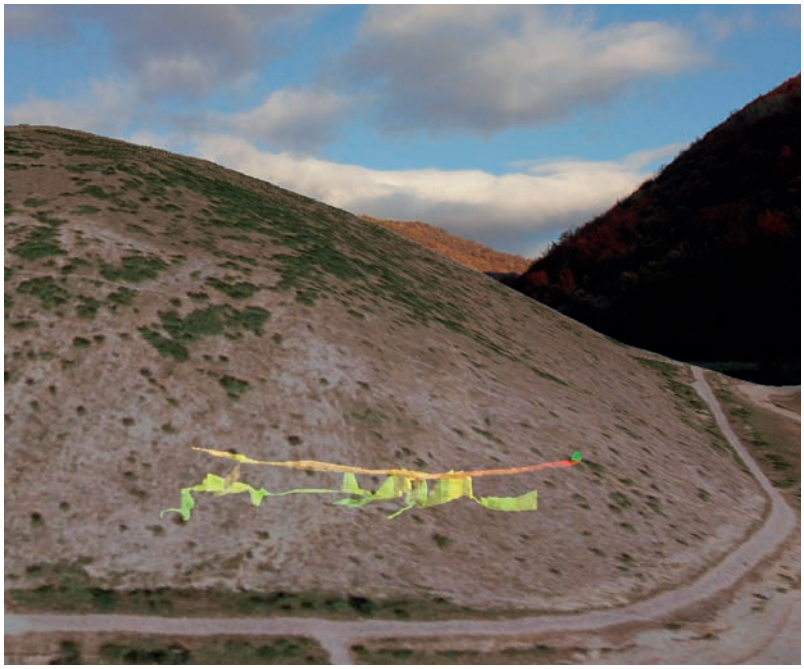


Figure 5, Project data analysed in a 3D GIS environment.

drawing tools, thematic mapping toolkit and built-in camera photos for additional attribute information. This in-cave mapping solution was expanded above ground by the Trimble GeoExplorer 3000 XH handheld with its high-accuracy GPS receiver.

EXPLORATION AND MAPPING

Outside the cave entrance, the GeoExplorer 3000 was used to determine accurate GPS coordinates of two points – one for the traverse beginning and one more in order to calibrate the rangefinder's compass (Figure 1). Inside the cave, traverse stations were then established in terms of line of sight while exploring passages. On each station, the rangefinder was used for left, right, ceiling, floor and to-station azimuth, inclination and distance measurements (Figure 3). Spatial information was recorded using an attribute table including exact measured values, notes and photos taken with the Juno camera. Each of the point coordinates were calculated by the software and previewed on the Juno's screen in real time. Features were stored in different layers for the two cave floors which enabled a clear view of the cave layout, since they were visible both together and separately (Figure 4). Both floors were surveyed in open traverses connected by a common station.

CAVE LAYOUT

Wireless data transfer from the rangefinder to the handheld enabled data to be produced which was free of human mistakes, and the preliminary calibration of the rangefinder reduced systematic errors so that high-quality results were ensured. Without any risk that measurements could be mistaken or missing, the cave layout was drawn in dynamic scale and previewed on the spot. From then on, the layout was ready for use whenever needed, and both plan and any direction view could be extracted from the 3D model.

Back in the office, the map was superimposed onto an older one to compare the results. In addition, an aerial orthophoto image and topographic map were added in order to indicate the cave's position beneath the landscape. This is particularly important in a karst region since it can aid discovery of cave entrances nearby and prospective passages which might connect caverns at depth. Vector data were also imported into the Compass cave survey software for additional analysis in terms of special cave characteristics. The project files were subsequently imported into Esri ArcGIS software and successfully visualised and used in a 3D environment (Figure 5).

FURTHER DEVELOPMENT

GIS software allows received data to be easily integrated into different geodatabases for any future updating, editing and preview purposes. Communication technologies allow immediate data transfer from the field directly to a GIS server enabling the data to be shared with governmental and non-governmental organisations, researchers and citizens with relevant data-access permission at user level. For some members of the speleological community, revealing such information is a touchy subject since caves are often the target of vandalism. Nevertheless, disinformation does not prevent vandalism occurring; on the contrary, well-structured data could lead to certain government regulations and greater controls within Bulgarian and European environmental policies.

CONCLUDING REMARKS

The 3D cave mapping method described above is accurate, fast and affordable. When considering the traditional methods and requirements in cave surveying, it offers many advantages and represents a complete solution and workflow, from initial data collection to data analysis in a 3D GIS environment. The devices and software used are modern and chosen for durability, convenience and precise measurements. Received digital data are reliable, easily manageable and safely stored, and room for human error is minimised.

ACKNOWLEDGMENTS

The authors of this paper would like to express their gratitude to Momchil Minchev and Bulgarian Geoinformation Company for their support.

MOSAICMILL

Revolutionising Mapping with Small and Medium-format Sensors

Rikola hyperspectral UAV camera, 50 bands in 500-950nm.

Evolving UAV and sensor technologies are rapidly changing the whole mapping industry. Traditional tools and methods are being challenged by low-cost platforms and high-performance consumer cameras. For the mapping of natural resources, new hyperspectral solutions are offering totally new business applications. MosaicMill Ltd. is involved in this revolution by integrating new technologies with its EnsoMOSAIC software solutions.

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.

MosaicMill Ltd. is a Finland-based technology company established in 2009. MosaicMill specialises on remote sensing and photogrammetry, and is the developer of the EnsoMOSAIC aerial mapping and survey system. EnsoMOSAIC technology was originally owned by Stora Enso OYJ, the biggest forest-industry company in the world, but in 2009 the management team decided to divert the technology into a new external company. Development of EnsoMOSAIC tools is today being continued by MosaicMill together with its partner companies.

HIGH-PRECISION TOOLS

MosaicMill supplies two products under the EnsoMOSAIC brand name, for two types of clients: one is a complete turn-key aerial mapping system and the other is photogrammetric image processing software.

IMAGING SYSTEM

The complete aerial imaging system is targeted mainly at companies and institutions who do not necessarily have previous experience in aerial mapping but who want to start their own mapping operations, for whatever reason. EnsoMOSAIC is a set of tools for carrying out aerial imaging projects, from flight planning through photogrammetric processing to stereoscopic data extraction. Some of the users in this segment are focused on selling value added services to third parties, either ortho-imagery as it is or further developed into maps and other GIS products. Some other users manage their own land assets or industrial installations and need to assess, monitor or control their resources. The operators in this segment do not usually sell their products but instead use aerial data intensively to improve their resource management.

AUTOMATIC SOFTWARE

EnsoMOSAIC software is one component of the mapping system, and in addition is sold as it is for companies which already have their

own aerial camera systems and need image processing software. These companies range from small UAV operators to professional mapping houses. Some want to process just a few images of a small farm while others run huge blocks of tens of thousands of frames. Some require cadastral sub-pixel and sub-metre accuracy whereas for others rough land-use accuracy down to a few metres is enough.

FUTURE OF UAV MAPPING

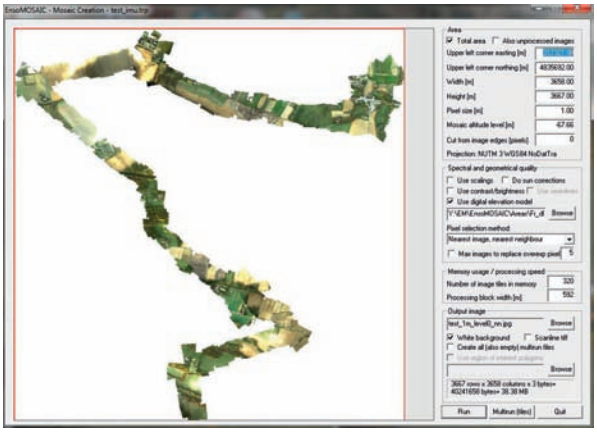
In recent years, satellite image sales has grown most rapidly as new high-resolution images have become available. In the airborne segment, however, UAV imaging is currently the fastest growing sector and will probably remain so in the near future. The UAV platform market is estimated to grow to USD18 billion over the next 10 years.

UAVs are typically flown at low altitudes of up to 150 metres. This fact, in combination with wide angle sensors, causes very different imaging geometry compared to conventional imaging. Furthermore, as one survey can generate thousands of images, the requirements for photogrammetric software are also very demanding. MosaicMill has developed EnsoMOSAIC UAV software in support of this need, to meet clients' requirements in high-end mapping applications. MosaicMill's vision is to develop tools for UAVs to enable the same measurement precision as for conventional surveys. This is possible only by applying true photogrammetric methods. As a result of careful flight planning, proper GCP measurements, careful camera calibration and automatic photogrammetric processing, horizontal accuracies of 1-2 pixels and vertical accuracies of 2- 3 pixels can be reached. In other words, UAV mapping accuracy is in the level of 5- 10cm in a typical mapping project. Thus it is now possible to apply UAVs in the most demanding survey applications, and this is underlined by the market reactions.

HYPERSPECTRAL MAPPING

Alongside the platform and software development, the sensors are also making similar progress. Large-frame cameras have evolved into huge pixel counts. Unfortunately, this has also meant that investment costs are too high for many mapping organisations. Luckily, medium-size sensors in the consumer camera segment are offering cost-efficient mapping tools in the range of 35-60 megapixels and EUR4,000-50,000. Notably, just a decade ago, these sensors were considered to be large-frame cameras. Consumer cameras naturally differ from metric ones but this is easy to compensate with a proper calibration procedure.

Another path in the development of sensors is in spectral resolution. Especially in forestry and agriculture applications, the standard blue, green, red and CIR bands cannot provide the required details of the target. As a response to this shortcoming, the Finnish Technical Research Center and Rikola Ltd. have developed a frame camera that collects spectral narrow-band images with single exposure. Camera can record up to 50 bands in the range of 500-950nm. This camera will be available in 2013, creating new business opportunities in fertiliser and pesticide optimisation, forest inventory and environmental monitoring, for example. MosaicMill is currently developing EnsoMOSAIC software to process these hyperspectral images into hyperspectral mosaics and hyperspectral 3D models.



▲ *EnsoMOSAIC UAV interface, processing 400 UAV images into mosaics.*

3D MAPPING

Visualisation and 3D mapping is a growing sector which is utilising aerial data to create high-end products such as contours and city models. Rather than producing its own software package, MosaicMill has entered into this business through strategic alliances. EnsoMOSAIC combined with a 3D photogrammetric work station offers a complete production line from imaging to high-end mapping.

END-USER NEEDS COUNT

Even if the technology itself is very exciting, the end users tend to be less interested in the technology component; instead, they are mainly looking for high-quality outputs and cost-efficient solutions. There is space for various kinds of technical solutions, from small-format UAV technology to large-scale frame cameras and scanners. MosaicMill is able to provide cost-saving tools for users working within any of these segments. ◀

▲ *XYZ point cloud of wood-chip pile calculated from 5cm-resolution UAV images, point density 100 points/m^2.*

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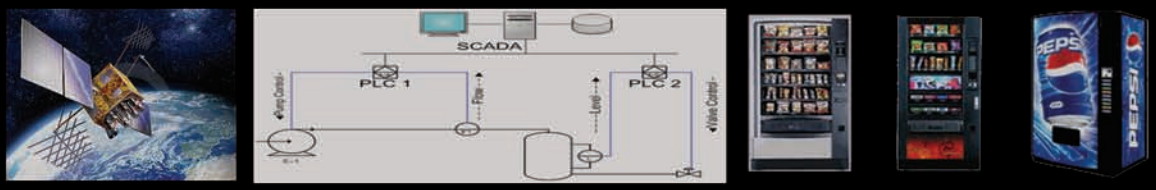

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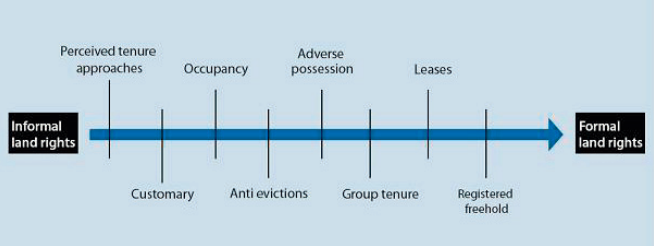
Collaborating in the Global Land Tool Network

Today's global challenges related to climate change, urbanisation, natural resources, natural disasters, violent conflicts, food, water and energy insecurity have a clear land dimension. Land is increasingly recognised as an important governance issue. Given the complexity of land rights, claims, and records, there is a need to have new forms of land administration and record systems. Modernisation should also focus on pro-poor tools. The key challenge for land administrators and land professionals is how to support various tenure types and systems to enable land reform, thus securing land and property rights for all. The Global Land Tool Network (GLTN), facilitated by UN-Habitat and with more than 50 partners, has been established to address these challenges. The specific objectives are to:

- establish a continuum of land rights rather just focus on individual land titling
- improve and develop pro-poor land management as well as land tenure tools
- unblock existing land initiatives
- improve global co-ordination on land
- assist in the development of gender-sensitive tools
- improve the dissemination of knowledge about how to improve security of tenure at scale
- develop pro-poor and gender-appropriate land tools.

The continuum of land rights will require a continuum of recording, technology, accuracy, etc., to support its worldwide implementation. In terms of innovation, the most relevant aspect in tenure and administration is the recognition of plurality of tenure systems and required alternative forms of land administration and land records. The Social Tenure Domain Model (STDM) is designed to be able to include alternative forms of land administration and record systems. STDM has the potential to support affordable, inclusive and pro-poor land policies and programmes. It can be implemented with other pro-poor land tools, such as enumeration, co-management, post-crisis, gender, grassroots, etc. It provides huge potential to provide secure tenure for all – at scale!



The continuum of land rights.

It is clear that land professionals have a huge role to play, both in the development of pro-poor land tools and in the local implementation of the continuum of land rights. Pro-poor land tools may well involve less sophisticated and less accurate methodologies, information from participatory and volunteered sources, technologies that are mobile and widely available. However, at the other range of the continuum of approaches, pro-poor tools can be sophisticated: industry and the profession have to be mainstreamed as well as ensuring good governance, gender sensitivity and grassroots participation in land professionals' work.

FIG recognises that the profession must consider the wider good, the needs of humanity rather than just its professional interests. The profession is challenged to continue contributing towards securing tenure rights for all, with appropriate, applicable and affordable approaches.

It is good to refer to the upcoming session of UN-Habitat Governing Council (15-19 April) with the theme 'Sustainable Urban Development: The Role of Cities in Creating Improved Economic Opportunities for All, with Special Reference to Youth and Gender'. Further we can highlight ongoing collaboration, including upcoming collaborative activities at FIG's 2013 Working Week in Abuja with joint sessions on participatory and inclusive land readjustment, valuation and property taxation, and STDM training workshops for young surveyors. ◂

Clarissa Augustinus, UN-Habitat/ Global Land Tool Network
Teo CheeHai, International Federation of Surveyors (FIG)

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No 2165

The Canadian Geomatics Community Round Table

Canada was early off the mark in the mid-1990s with its plans to develop its Canadian Geospatial Data Infrastructure (CGDI). Three generations of the national GeoConnections Program moved from developing the initial technology and policy frameworks through reinforcing communities of interest to looking at how the data is to be maintained and how the CGDI will evolve over the next ten years.

The path to that CGDI has been rocky over the past decade. The explosion of web mapping and location-based services, which have raised the general public's expectations with respect to geospatial data, along with prevailing economic conditions have combined to reshape Canada's geomatics sector. These are uncertain times: the sector's members have seen significant changes in market demands, funding support, and the way in which businesses and institutions are organised.

Leading representatives from industry, governments, academia and NGOs came together in mid-2011 to discuss Pan-Canadian strategic initiatives and compare notes on the direction of the geomatics sector. If the first meeting was informational, a second meeting in June 2012 highlighted complaints and concerns over everything from government policies to industry organisation and human resource needs. It was time to reinforce the elements of a shared vision for the sector.

As a result of that meeting, the Canadian Geomatics Round Table (CGCRT) was formalised. Membership of the CGCRT is voluntary, and the group has no authority to make decisions that are binding on its members or on other organisations. The value of the Round Table's discussions and recommendations lies in the diversity and collective influence of its membership.

An Interim Steering Committee was named to guide over a six-month period the rapid creation of the CGCRT's draft Terms of Reference and a 'white paper' on the measures necessary to build a sustainable, comparative advantage and national geomatics capacity for Canada – capacity in terms of informed collection, management, usage, improvement and promotion of geospatial data. That work set the stage for the 2013 CGCRT meeting which was held on 29 and 30 January in Ottawa.

Informed by the white paper, Round Table members at that meeting focused on alternative scenarios – good and bad – for the Canadian geomatics sector over the next three years. Working in breakout sessions, members worked to: (1) confirm driving forces influencing the sector; (2) identify social, political or economic elements over which they had no control; and then (3) recommend the necessary strategies for the CGCRT to move ahead collectively.

Under the leadership of CGCRT co-chairs David Harper (Natural Resources Canada) and Michael Mepham (Province of Saskatchewan), and with support from consultants Ed Kennedy, Robin McLaren and Donald Lenihan, members agreed upon early action

Parliament Hill, Ottawa.

items and terms of reference for future direction. Copies of the Discussion Paper and a summary of the meeting will be available online soon.

This is not a magic bullet, but it's a good start – and one ultimately meant to draw in a larger cross-section of the industry. Watch this column for further information about the CGCRT and its future developments.

Dr David Coleman is president of the GSDI Association, a professor of geomatics engineering and dean of the Faculty of Engineering at the University of New Brunswick in Canada.

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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.

Reference Frames for IAG Commission 1

The IAG is organised into Commissions, Services, the Global Geodetic Observing System (GGOS) and the Inter-Commission Committee on Theory, each of which has established a number of Working Groups and Study Groups. Details can be found in the *Geodesists' Handbook* [1]. The four Commissions, their goals and their activities will be highlighted in a series of forthcoming articles.

The 'Terms of Reference' for Commission 1 acknowledge the primary importance of reference systems and frames for science and society alike. A precisely defined global reference frame is needed for an improved understanding of the Earth's rotation and its gravity field, sea-level change with time, tectonic plate motion and its associated deformation, glacial isostatic adjustment, geocentre motion, earthquake deformation (pre-, co-, and post-seismic), environmental mass loading, local subsidence and other crustal displacements. While reference frames may be defined on a regional and even local level, modern geodetic practice encourages such frames to be realisations of the authoritative global frame: the International Terrestrial Reference Frame (ITRF2008 being the most recent; see Altamimi et al., 2010). The positions of all features on or above the Earth's surface can be monitored in space and time with respect to the ITRF.

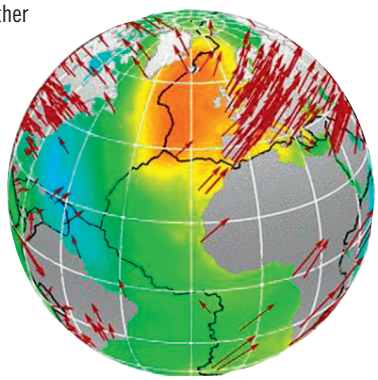
In addition to the geodynamic requirements of the ITRF, reference frames are also crucial for many geospatial applications such as national mapping, high precision positioning and navigation using Global Navigation Satellite Systems (GNSS) like GPS, GLONASS and other emerging systems.

Commission 1 is grouped into a number of sub-commissions as below (with the chairpersons listed in brackets):

- SC1.1 Coordination of Space Techniques (Tom Herring, USA)
- SC1.2 Global Reference Frames (Claude Boucher, France)
- SC1.3 Regional Reference Frames (Joao Torres, Portugal)
- SC1.4 Interaction of Celestial and Terrestrial Reference Frames (Johannes Boehm, Austria).

The Commission 1 Steering Committee comprises president Tonie van Dam (Luxembourg), vice president Gary Johnston (Australia), the chairs of the four sub-commissions, and representatives of the Services; Chopa Ma (USA), Pascal Willis (France), Jake Griffiths (USA), Graham Appleby (UK) and Oleg Titov (Australia).
The activities of Commission 1 include:

- Encouraging, initiating and supporting theoretical and applied research activities related to reference frames
- Encouraging R&D activities that impact the reference frame determination and its accuracy as well as the best and optimal use of reference frames in Earth Science applications
- Closely interacting with all established IAG Services
- Developing theory and applying the transformation between Celestial and Terrestrial Reference Systems
- Exploring advanced methodologies for the combination of products and raw observations of space geodetic techniques
- Investigating all systematic error sources and factors limiting the precision of space geodetic techniques and their combination
- Within each regional sub-commission, encouraging and assisting regional sub-commission countries to redefine and modernise their national geodetic systems so that they are compatible with the ITRF
- Establishing a dedicated website relating to all Commission 1 activities.



Coordinate vector fields in ITRF2008 (Image courtesy: X. Collieux and Z. Altamimi, IGN 2010).

Commission 1 will coordinate 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]. The Commission will also co-ordinate a workshop on global and regional reference frames sometime in 2014.

MORE INFORMATION
1. http://bit.ly/XYhh8e
2. www.iag2013.org/IAG_2013/Welcome.html
www.iag-aig.org
http://iag.uni.lu
http://itrf.ensg.ign.fr

Open to Open Source Initiatives

Since May 2009, when the topic of open source issues and cartography was last addressed in this column, there has been significant activity on the part of the ICA Commission on Open Source Geospatial Technologies. Confirmed as a full commission of ICA in 2011, one of its first important activities was to sign a Memorandum of Understanding (MoU) with OSGeo, the major co-ordinating body for developing and promoting open source solutions in geospatial data handling. The prime purpose of the link has been to ensure adoption of open source geospatial software in the cartographic community, particularly in education.

Many one-off events, meetings, joint workshops and established conference series have resulted from this linkage. A further tangible expression has been the establishment of open source geospatial laboratories and research centres for developing open-source geospatial software technologies, training and expertise, and building up momentum in open source GIS education and research worldwide.

The first of such laboratories was established at Nottingham University, UK, under the leadership of Suchith Anand, who is chair of the ICA Commission on Open Source Geospatial Technologies. The lab has developed best practices for supporting UK government organisations in evaluating and making use of the open source geospatial technologies that are emerging globally. The group also encouraged the foundation of the first OSGeo lab in Asia at the Nottingham University campus in Malaysia, where Tuong Thuy Vu is coordinating research and development.

Professor Georg Gartner (left), president of ICA, and Arnulf Christl, (now emeritus) president of OSGeo, shake hands after signing the Memorandum of Understanding between the two organisations in September 2011.

In a step to establish similar labs across the world, October 2012 saw the launch of the first African initiative at the University of Pretoria, South Africa. Serena Coetzee and her colleagues promoted two workshops to mark the occasion: the first on MapServer was led by the president of OSGeo, Jeff McKenna, who had travelled from Canada to highlight the importance of this launch; the second was facilitated by local expert Gavin Fleming, who introduced attendees to open source data for African mapping projects and open source software.

October also saw the formal creation of the first OSGeo lab in North America at the University of North Carolina under the dynamic leadership of Helen Mitasova, while in November 2012, the Czech Technical University in Prague, Czech Republic, also established its OSGeo research and education lab, managed by Martin Landa, Department of Mapping and Cartography.

Further schemes in Europe were put in place in 2012 at the University of Girona, Spain, and at Newcastle University, UK, where both teaching and research benefit from an open source approach to geospatial data handling, which is being developed further under the direction of Phil James. South America has not been left behind in this initiative: the Federal University of Paraná, Brazil, is where Silviana Comboin has been active in promoting the new educational and research lab, building on its cartographic education programmes.

These initial institutions have created impetus for further developments, and there are at least eight further centres worldwide which are close to formal recognition as OSGeo labs. The current situation, along with details of other activities, can be found on the Commission website, which is edited by joint chair Thierry Labard (Canada), at [1].

MORE INFORMATION
1. http://ica-opensource.scg.ulaval.ca
www.icaci.org

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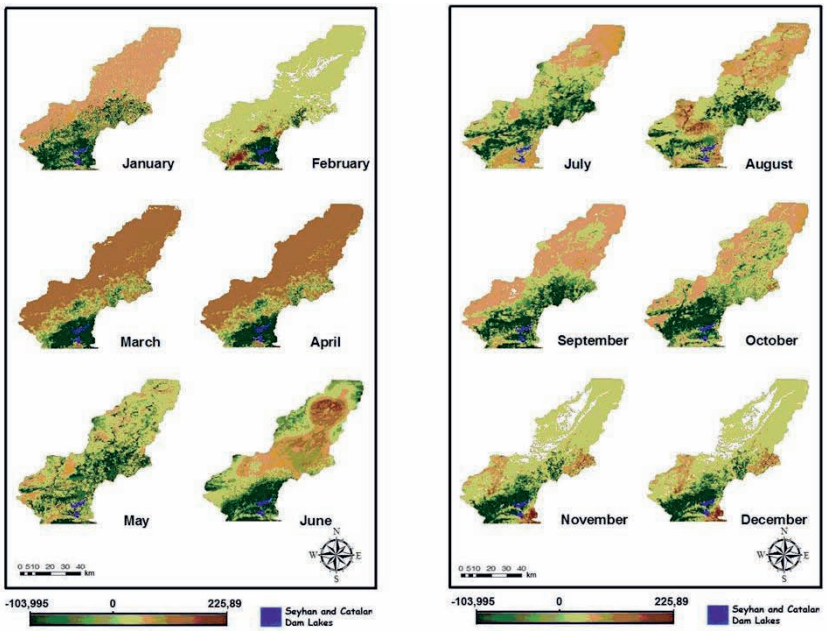
Serving Society with Geoinformatics

Geoinformatics is the synergy of data and systems from various disciplines brought together to provide information on the state of the Earth. It covers Geographical Information System (GIS), computerised databases and applications, computer science, remote sensing, photogrammetry, graphical processing, cartography, statistics and more to describe the main interface between the real and the measured – or virtual – world. It combines geospatial analysis and modelling, the development of geospatial databases, information systems design, visualisation (human-computer interaction) and communication (both wired and wireless networking technologies).



An ecosystem productivity model for pine forests along the Mediterranean coast of Turkey using 47 Envisat MERIS (300m) data recorded between March 2003 and September 2005. The CASA (Carnegie, Ames, Stanford Approach) terrestrial biogeochemical model designed to simulate the terrestrial carbon cycle using satellite data and meteorological data was used to estimate annual regional fluxes in terrestrial net primary productivity (NPP).

Applications of geoinformatics address real-world issues in the management and interaction of the natural and anthropogenic environments, encompassing the fields of natural resources management, resource planning and decision-making, etc.

Today, many government and non-government agencies have started to use spatial data in managing their daily activities. Since those concerned are often not experts in geoinformatics, there is a need to condense expert information into something the end user can work with. To achieve this, technological advances and new developments in geoinformatics applications need to become a part of the information management and decision-making process.

In order to attain these objectives, it is important that professionals from across the range of fields covered by geoinformatics share and exchange information on developments, requirements and results. It is in this context that a joint meeting of interested ISPRS Technical Commissions is being held in Antalya, Turkey, from 11 to 17 November 2013. The commissions involved are: II (Theory and Concepts of Spatial Information Science), III (Photogrammetric Computer Vision and Image Analysis), IV (Geospatial Databases and Location Based Services), and VII (Thematic Processing, Modelling and Analysis of Remotely Sensed Data). This meeting will be augmented by two ISPRS workshops on the subjects of 'Laser Scanning' and 'Object Extraction for 3D City Models, Road Databases and Traffic Monitoring (CMRT)'.

More information is available at www.ISPRS2013-SSG.org. The call for papers is open until 16 June 2013.

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www.isprs.org


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GeoViz_Hamburg 2013: Interactive Maps That Help People Think
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from **06-08 March**
For more information:
E: geoviz@geomatik-hamburg.de
W: www.geomatik-hamburg.de/geoviz/

EUROGI Conference 2013
Dublin, Ireland
from **07-08 March**
For more information:
W: www.eurogi.eu

8th International Congress on Geomatics 2013
Havana, Cuba
from **18-22 March**
For more information:
E: raul@geocuba.cu
W: www.informaticahabana.cu

ASPRS 2013 Annual Conference
Baltimore, MD, USA
from **24-28 March**
For more information:
W: www.asprs.org

APRIL

Geomatics Meeting
Rabat, Morocco
from **08-09 April**
For more information:
E: rsc2013@amjgistes.org

8th EARSeL Imaging Spectrometry Workshop
Nantes, France
from **08-10 April**
For more information:
W: http://bit.ly/Tpa6TS

World Bank Conference on Land and Poverty
Washington, DC, USA
from **08-11 April**
For more information:
W: http://econ.worldbank.org/landconference2013

AAG Annual Meeting
Los Angeles, CA, USA
from **09-13 April**
For more information:
E: meeting@aag.org
W: www.aag.org/annualmeeting

SPAR International 2013
Colorado Springs, CO, USA
from **15-18 April**
For more information:
E: lmurray@divcom.com
W: www.sparpointgroup.com/International/

International Forum "Integrated Geospatial Solutions-the future of Information Technologies"
Moscow, Russia
from **17-19 April**
For more information:
E: dmordovina@sovzond.ru
W: www.sovzondconference.ru/eng

JURSE 2013
São Paulo, Brazil
from **21-23 April**
For more information:
E: jurse2013@dpi.inpe.br
W: www.inpe.br/jurse2013

35th International Symposium on Remote Sensing of Environment
Beijing, China
from **22-26 April**
For more information:
E: isrse35@ceode.ac.cn
W: www.isrse35.org

Interexpo GEO-Siberia-2013
Novosibirsk, Russia
from **24-26 April**
For more information:
E: nenasheva@itcsib.ru
W: http://geosiberia.ssga.ru

8th International Symposium on Mobile Mapping Technology (MMT 2013)
Tainan, Taiwan
from **29 April-03 May**
For more information:
E: mmt2013@conf.ncku.edu.tw
W: http://conf.ncku.edu.tw/mmt2013/

MAY

FIG Working Week
Abuja, Nigeria
from **06-10 May**
For more information:
W: www.fig.net/fig2013

8th Annual International Symposium on Environment
Athens, Greece
from **13-16 May**
For more information:
E: atiner@atiner.gr
W: www.atiner.gr/environment.htm

ISPRS Hannover Workshop
Hannover, Germany
from **21-24 May**
For more information:
E: secretariat@ipi.uni-hannover.de
W: www.isprs.org

Oracle Spatial and Graph User Conference
Washington, DC, USA
On 22 May 2013
For more information:
E: info@locationintelligence.net
W: www.locationintelligence.net/dc/#oracle

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