

Monitoring the Changing World

More than 200 researchers from over 24 countries congregated at the biennial POLinSAR workshop held at European Space Agency's (ESA) centre for Earth observation in Italy. The workshop aimed to provide an opportunity to review the advances made in the technique of Synthetic Aperture Radar (SAR) polarimetry which facilitates monitoring geographical characteristics that may influence changes in the world and climate.

SAR allows polarised information to be measured in the signals backscattered from Earth to a satellite sensor. Polarimetric interferometry is achieved by using two polarimetric images, acquired from slightly different angles, to provide information on the 3D structure of the view.

Currently, data come largely from Canada's Radarsat-2 and Japan's ALOS mission. However, Germany's newly launched TanDEM-X promises to play an important role in the future of SAR polarimetry.

Results demonstrate how the techniques are becoming more useful, in particular for assessing water resources and carbon stocks. For example, a year's worth of data from Radarsat-2 has been used to create a time-series of images of an area of wetland in northern France.

Prof. Eric Pottier from the University of Rennes 1, France, explained, "Collaboration between ESA and the Canadian Space Agency within the Science and Operational Applications Research for Europe project has yielded, for the first time, time-series of data to closely monitor wetlands. These new time-series have demonstrated that we can monitor the water levels in the area, which helps to improve management practices. Moreover, the data can also be incorporated into models to help predict emissions of methane to the atmosphere."

Another exciting result has been the discovery of historical forest fire scars. Dr Shane Cloude from AEL Consultants said, "Using data from ALOS for test sites in remote northern Canada, we have been able to detect scars from fires set 10 to 20 years ago, thus allowing a time sequencing technique. Even through new tree growth we can easily detect these old scars, which help us work out how often fires occur and, thus, how much carbon is being put into the atmosphere, which is important for climate change."

Polarimetric interferometric data may also be used to map urban environments in 3D, as the animation at the top shows. This 3D reconstruction of Toulouse, France, was derived from SAR data collected by the airborne system RAMSES from ONERA, the French Aerospace Lab.

Looking to the future, results from some of ESA's airborne campaigns to support the development of the candidate Earth Explorer BIOMASS mission were presented. These results show how the mission could, if selected as the seventh Earth Explorer, detect and map changes in forest biomass over time.

It was also demonstrated that, through tomography data acquisition and processing, a full 3D image of some forests could be achieved.