

# **GEOACTA**

## **Revista de la Asociación Argentina de Geofísicos y Geodestas Special Issue “Geomatics in Earth Sciences”**

### **Guest Editors:**

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### **EDITORIAL NOTE**

The XXVI Scientific Meeting of the Argentine Association of Geophysicists and Geodesists was held in Tucuman, November 5-9, 2012. It included numerous contributions from representatives from the neighboring countries. The first issue of GEOACTA Volume 2014 is a Special Edition based on papers carefully selected from the scientific program. These thirteen articles from engineers and scientists in five countries were carefully selected to provide a review of recent developments in state-of-the-art techniques and methods of Engineering Geomatics and their applications to Earth Sciences in the South American continent.

In the past ten years, rapid technological developments have produced significant advances in sensing and data acquisition, resulting in intensifying algorithmic research and statistical analysis to primarily support decision-making at both the local and global scales. The new geodetic and geophysical tools and methodologies provide powerful capabilities to observe the Earth in unprecedented detail not available until now. Advanced sensor systems, such as GNSS, LiDAR, airborne and satellite imaging, and IfSAR, can simultaneously acquire both redundant and complementary data, allowing for robust data integration and fusion. Using advanced feature extraction and statistical methods, accurate and reliable information can be obtained to monitor changes in the Earth geodetic model and geophysical behavior and, thus, to effectively support climate-change research, detection and monitoring natural hazards, etc. In addition, sensors are increasingly used in networks, as the complexity of the geophysical and geodetic processes requires high-resolution observations in both the spatial and temporal domains.

This special issue includes eleven full papers and two technical notes falling into four major categories: gravity and geophysics, radar and its applications, image analysis and mapping technologies, and GNSS developments. Pereira et al. provides a regional analysis of water variation storage by analyzing the spatial and temporal changes detected from the satellite mission GRACE (Gravity Recovery and Climate Experiment) in the Salado River basin, in La Pampa, Argentina during the 2003-2010 period. Anci et al. characterize the depocenters of the Andean Northwest border of the Neuquén Basin, Argentina, by studying the cortical displacement using a 3D model obtained by gravimetric measurements. Detection of reflector basaltic wedges, inclined towards the sea (seaward-dipping reflectors, SDRs), is a significant finding by Arecco et al.; their delineation of the edge of the passive volcanic margin of Argentina surpasses the former techniques by Bouguer, and 2D gravity modeling. The interpretation of regional aeromagnetic data of Sierras de Chepes and Ulapes-Mines, Argentina, by Fanton et al. allowed by using advanced techniques (high-pass filter, derived vertical, fractional derivative, analytic signal amplitude and phase of the analytical signal), provided precise definition of geological features that are related to the presence of gold deposits in this region. To infer crustal distribution for different outcrop lithological units, a double inversion model in the northeastern North Patagonian Massif border, Rio Negro province, Argentine, was built using terrestrial gravimetric and aeromagnetometric data by Klingner et al.

Radar imagery has seen strong growth in recent years. Sophisticated radar systems produce a variety of images, and powerful tools are available for geological information extraction. Marchionni et al. present the foundations and results of experiments aimed at analyzing the potential of radar imagery to sense lithologic variations and enhance the detection of structural and morphological features. Ríos develops a polarimetric update tool used to optimize the information extraction from images of Synthetic Aperture Radar (SAR), interferometric SAR, and polarimetric InSAR at L-band SAR (PALSAR). In addition, Ríos provides a review on Polarimetric SAR calibration and proposes schemes for ionospheric correction to the wave broadcast for the synthetic aperture radar (SAR) and polarimetric SAR interferometry

(PolInSAR). Oberreuter et al. describe a newly developed airborne bow-tie type dipole antenna, with a frequency between 20 and 50 MHz, including test results for previously inaccessible glaciers (or only measured by profiles [walking]) such as the Alfa Gaciar Olivares, Chile.

Improving satellite imagery combined with advancing processing techniques allows better monitoring of an increasingly growing number of Earth processes. Glaciers in the high mountains are key fresh-water reservoirs to support the local population and their economies. Ahumada et al. present preliminary observations on the mapping and inventory of rock glaciers and periglacial landforms in the Sierra de la Aconquija, Argentina, using satellite images of different resolutions in addition to GPS data. Using Landsat 7 Thematic Mapper (ETM+) imagery, Ariza et al. apply both supervised and unsupervised classification to extract the stratigraphic and structural aspects of the surrounding areas of the headwaters of the San Juan River and were able to interpret the existence of three sets of fracturing in a sector of the western Precordillera, Argentina. The method of photogrammetric restitution for DEM generation was implemented by Soruco et al. with the aim of verifying the mass balance of Zongo Glacier, Bolivia obtained using the glaciological and hydrological methods. This glacier has the longest continuous record of measurements of mass balance in the Intertropical Zone of South America series.

Climate research has been rapidly expanding to better understand the global warming phenomenon. Eguiarte et al. investigate data from more than 5200 daily weather climatological stations, based on the database of the National Weather Service of Mexico (1902-2011) and climate data from WorldClim - Global Climate Data (1950-2000), in order to generate the monthly climate surfaces with high spatial resolution (926 m) that make up the Digital climatic Atlas of Mexico (ACDM). Herrada et al. synthesize and effectively describe the various modes of real-time GNSS data delivery in terms of transmission protocols, data formats, communication links, message structure and content between the various versions of RTCM SC-104 (Radio Technical Commission for Maritime Services Special Committee-104).

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