



Technical Seminar on Vertical Reference Frames in Practice

Singapore, 27-28 July 2015

Report by Tayyaba Khadim

The technical seminar on vertical reference frame in practice was held in Singapore, 27-28 July 2015. The seminar took place in Marina Bay Sands convention centre and was held in conjunction with 13th South East Asian Survey Congress.

The technical event was conducted by FIG Commission 5 as the main organizer along with International Association of Geodesy (IAG), the United Nations Initiative for Global Geospatial Information Management for Asia-Pacific (UN-GGIM-AP), the International Committee on GNSS (ICG) and Singapore Land Authority as the local organizer.

The seminar addressed the issues related to vertical datum, height system and use of GNSS. The seminar proved beneficent for all participants especially for the participants from developing countries. Generous support from ICG for travel cost was provided to some participants from developing countries which enabled them to attend the seminar.

Mr. Nic Donnelly of Land Information New Zealand welcomed all the participants and presenters and served as the host of whole event. He was also one of the presenters from around the world. Professor Chris Rizos of UNSW, Sydney, Australia gave his opening address to the attendees and finally Ms Sharafat Gadimova, executive secretariat ICG, also welcomed all participants and gave her opening remarks.

Technical Program

First of all Professor Chris Rizos presented in the seminar and focused on the introduction of vertical reference frames which includes definitions of reference systems, frames, surfaces and datums, geopotential and geoid. Highlighted the need of height system and defined the types of height systems. Talked about the use of GNSS over spirit or trigonometric leveling as they are costly, laborious and time consuming and GNSS provides locations more precisely. In second session he primarily focused on unification of vertical datum and described methodology for unification of vertical reference frame.

Presentations on case study of Japan and Hong Kong were presented by Mr Basara Miyahara and Mr. Simon CW Kwok respectively. Basara Miyahara described the current situation and challenges in maintenance of vertical datum of Japan as Japan is prone to earthquakes so deformation, both cumulative and coseismic, should be considered in realizing vertical datum of Japan. These deformations are to be monitored by CORS network and InSAR. Simon CW Kwok of Hong Kong talked about modernization system of Hong Kong by re-levelling and readjustment of the Hong Kong benchmark network, by densification of a network of points covering the whole territory of Hong Kong with leveling, GNSS and gravity observation and by the creation of geoid model for GNSS heighting in Hong Kong.

Nic Donnelly talked about the use of airborne gravity in improvement of vertical datum as it provides data for geoid computation. Gravity data also covers coastal areas and difficult terrain where occupying points physically is difficult. Data is processed to reduce systematic errors and accuracy is observed by cross-ties and calibration lines. Ms Sharafat Gadimova of ICG highlighted the vision and mission of ICG regarding best satellite based positioning, navigation, to promote and protect the use of open service applications. She elaborated on the utilization of GNSS services in developing countries and contribution to the sustainable development of the world.

Mr Victor Khoo of Singapore Land Authority introduced the height datum used in Singapore and how Singapore is overcoming the land scarcity issue. Singapore has

developed SiReNT, a National Differential GPS Infrastructure, to support its national cadastral survey system. He also described the computation of Geoid model. By using New Zealand as an example Nic Donnelly focused on the importance of measurement of vertical deformation and its impacts on global and local reference frames. He described the types of vertical displacement i.e. continuous vertical displacement and episodic vertical displacement. Vertical displacement can be monitored and modeled by various measurement techniques which include CORS network, GNSS, InSAR, Airborne LIDAR and precise leveling. Vertical deformation models can be incorporated into the local reference frame as either forward or reverse patches.

Mr Graeme Blick represented New Zealand as his case study and discussed traditional leveling based datums. He gave detailed information about New Zealand Quasigeoid 2009 and New Zealand Vertical Datum 2009. He talked about how improved vertical datum can be developed for New Zealand and discussed its benefits. In case study of Australia Dr. John Dawson described Australian Height datum (AHD) in detail with reference to ellipsoid and geoid. AusGeoid09 model of AHD was formed by combining geometric and gravimetric components. He talked about the use of InSAR technique to address the issues of local and regional ground deformation and gave option of combined approach of leveling and geoid for future Australian Height Datum.

Social Events

This seminar provided the participants with opportunity to interact with each other during lunch and tea breaks. Dinner was held at Satay by the Bay in Marina Bay Sands where all the participants get to enjoy the local dishes and socialize in a nice and relaxed atmosphere.

