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REPORT OF THE WORKING GROUP 1: REGIONAL GEODESY

Submitted by the Permanent Committee on Geographical Information System Infrastructure for Asia and the Pacific (PCGIAP)
Working Group 1: Regional Geodesy**

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Permanent Committee on GIS Infrastructure for Asia and the Pacific

Working Group 1

Regional Geodesy

Report of Working Group at Bangkok during the 17th United Nations Regional Cartographic Conference for Asia & the Pacific and the 12th PCGIAP Meeting

18th September 2006

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REGIONAL GEODESY WORKING GROUP REPORT ON ACTIVITIES

1. Background

The 16th United Nations Regional Cartographic Conference for Asia and the Pacific (UNRCC-AP) meeting in Okinawa in July 2003 endorsed several resolutions calling for the continuation of PCGIAP regional geodetic activities for the next three years through the following projects:

- Enhancement of a regional geodetic infrastructure through annual cooperative campaigns, including ties to vertical datum origin points,
- Review the status of the regional geoid in relation to current and improved global gravity models available from satellite gravity, and the application of absolution gravity as a means of developing a regional gravity reference frame,
- Promoting the application of new geodetic adjustment techniques and datum change transformation parameters for regional spatial data integration and for geo-referencing cadastral and statistical information,
- Encourage the transfer of GPS technology to Pacific Island nations and other developing countries through regional and local geodesy workshop activities,
- Development of a catalogue of regional and local geodesy tide gauges for monitoring sea level changes and placement of GPS at key sites, and
- Review the status of geodetic networks in individual countries and upgrade the PCGIAP web site information.

To take this resolution forward several meetings/workshops were hold and actions have been taken.

2. Important meetings

- **The 10th PCGIAP meeting**

Draft work plan for WG1 was developed with identified responsibilities and milestones for the period 2003-2006. This work plan endorsed during the 10th PCGIAP meeting in Bangalore, India in January 2004.

- **The Chengdu Workshop WG1 Sessions in 2004**

Representatives from Australia, China, India, Indonesia, Japan, Korea and Vietnam attended the WG1 session, which opened on 7 September 2004. Careful discussions on the work plan were made and revised work plan as outcomes were endorsed by the EB meeting on the second day. As another important theme, the progress of WG1 projects from representatives was presented.

- **The 11th PCGIAP meeting and the Cairns workshop**

An international spatial information conference was hold in Hanoi, Vietnam on 14th December 2004 to which the vice chair of WG1 presented PCGIAP Regional Geodesy activities. After the Hanoi conference, the earthquakes in the SE Asian region and the impact of the massive Tsunami event of 26th December 2004 arouse need for better disaster monitoring in the region using geodetic techniques. This triggered the special Tsunami sessions in Bali, Indonesia in the 11th PCGIAP during 18-21 May 2005 and the WG1 workshop in Cairns, Australia during 20-21 August 2005, which was held joint with the IAG Commission 1 Sub Commission on the Asia Pacific Reference Frame and the Commission 2 Sub Commission on the SE Asia Geoid.

3. Major project progress

Since the 16th UNRCC-AP meeting in Okinawa in July 2003 WG1 has driven the projects on the way according to the work plan. The major progress of the projects is described as follows:

- **Regional geodetic networks through annual GPS campaign**

The regional GPS campaigns have carried out accompanying the VLBI observation sessions in each campaign since 1997. An integrated process and analysis for the first 6 APRGP campaigns have been made by Geoscience Australia. Coordinates/velocity vector of each station, with horizontal and vertical precision (one sigma) of ±10 mm and ±20 mm respectively, and the final report are available on PCGIAP web site. 45 individual agencies/organisations from PCGIAP member countries participated the campaigns.Total of 433 stations are included in the data processing in which 311 stations are within Asia Pacific region. Some countries improved their abilities and skills through the campaigns.

- **Geodetic adjustment techniques, datum change parameters**

By means of GPS observations, traditional geodetic network for a country can be enhanced in the accuracy point of view, and the geodetic datum can changed into the ITRF frame. Australia and China gave their technical reports in WG1 workshops. Australia tabled a web print out of known geodetic datum information for all PCGIAP countries.

- **Regional geoid and absolute gravity**

Because of the satellite gravimetry missions like CHAMP and GRACE, the earth gravity signals with long and middle wavelength can be observed efficiently and the gravity model can be improved. This project aims at two points:

  - Review the status of the regional geoid in relation to improved gravity models available from satellite gravity, and
  - Apply absolute gravity as a means of developing a regional gravity reference frame.

For the first point, representatives from PCGIAP member countries presented reports in the International Workshop of *Hight System, Geiod and Gravity of the Asia-Pacific* on 6-8 June 2006 in Ulaanbaatar, Mongolia jointly by IAG and International Gravity Field Service. For the second point, Japan as the responsibility country has carried out the project by means of its absolute gravity instruments. China also expressed that the State Bureau of Surveying and Mapping (SBSM) of China can support the project with one set of absolute gravity instrument (FG5).

4. Problems and recommendations

- The regional geodetic network was established through continuous GPS campaigns with precise coordinates and velocity field information obtained. Some countries established/densified their national geodetic network in ITRF taking benefit of the APRGP campaign. It is the time to flow down from the regional geodetic infrastructure to upgrade the national geodetic adjustments within countries onto the regional datum (ITRF) in order to provide directly related spatial data sets.

- Recognizing the importance of the study and of monitoring of earthquake and tsunami, WK1 should promote member countries engaging in this aspect including the supply of data like tidal gauge measurements together with GPS results. In addition, the APRGP campaign can be arranged including stations along the coast region in SE.

- Aiming at height datum unification in the AP region, absolute gravity, gravity model improved by satellite gravity, as well as regional geoid computation should implement further. Fund is a block for the implementation of the project. PCGIAP should take into account of the issue.