Geophysical Research Abstracts,
Vol. 10, EGU2008-A-06993, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-06993
EGU General Assembly 2008

Capacities of the Iranian permanent GPS network for atmospheric monitoring

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Atmospheric Precipitable Water Vapor (PWV) plays a crucial role in the formation of clouds, precipitation and severe weather. In addition, atmospheric events have important effects on agriculture, safety, transportation and commerce. Therefore, improving the weather forecast can prevent or mitigate some weather-related disasters provoked e.g. by flash floods. There are various techniques for estimating PWV such as radiosounding, Water Vapor Radiometers (WVR) and GPS meteorology. GPS meteorology uses the tropospheric propagation delay of GPS signals from well known stations to monitor the quantity of PWV above each station. GPS meteorology in comparison of other methods can reliably calculate PWV with low cost, good accuracy, intrinsic stability and high temporal resolution even under active weather conditions.

The Iranian Permanent GPS Network (IPGN) was established for geodynamic purposes in 2004 by the National Cartographic Center (NCC). IPGN consists of 108 stations that include one nation-wide base network and 3 denser regional networks. At more than 40 stations meteorological sensors are co-located. These sensors record pressure, temperature and relative humidity at each station and permit a direct transformation of delay estimates into quantities of precipitable water vapor. Moreover, the most recent GPS analysis strategies (e.g. GAMIT version 10.3) take advantage of

meteorological measurements to improve tropospheric delay estimation and vertical positioning.

In this work, we will show methodological tests of tropospheric delay estimates concerning different mapping functions (Niell's, Vienna and Global mapping function) and different evaluations of a priori tropospheric delay (Global Pressure and Temperature model, Vienna mapping function parameters and meteorological observations). Then we will present precise maps of PWV. This information on tropospheric water vapor could be generated in an operational way and assimilated into numerical weather prediction models to improve the prediction of precipitation in Iran.