



Monitoring the troposphere by space geodetic techniques

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Radio based space geodetic methods are affected by the water vapour in the atmosphere. The observations are relative measurements of time which makes the methods interesting from a calibration point of view. Furthermore, water vapour is costly to measure with a high temporal and spatial resolution. Given its characteristics of variability, researchers in the atmospheric sciences have shown interest especially in the GPS technique during the last 5–10 years, but the contributions from VLBI (Very-Long-Baseline Interferometry) and DORIS (Doppler Ranging System) observations can also be important due to the specific features of these systems. I will review the different techniques and give examples of ongoing projects using GPS data for near real-time applications (weather forecasting) and GPS data from dense ground-based networks in tomographic methods. Long term applications, such as climate monitoring, are not yet possible using GPS data although two-frequency geodetic VLBI observations have been acquired during the last 25 years. It is important to develop consistent data archives, including historic site descriptions, and processing methods in order to obtain a high sensitivity to long term changes in the zenith total delay and the atmospheric water vapour content. An interesting advantage with the GPS data is the relatively dense networks already existing in many countries and the number sites grow continuously. It is also worth noting that not only is the sampling of the atmosphere improved by adding more receivers on the ground, but there are also plans for additional global navigational satellite systems (GNSS) such as the European Galileo and the possible finalization of the Russian GLONASS. It has been shown through simulations that this will give a significant improvement for the GPS tomography application.