



A local Case Study for environmental Effects on Reference Systems at Medicina / Italy

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To study tectonic movements, land subsidence or other processes changing the Earth's surface, space, airborne and terrestrial techniques will be used together in the future which takes advantage of the complementary strengths of the different techniques. The various techniques have to be analyzed and interpreted in a unique reference system with a common centre of origin, identical scale and orientation. Moreover the observations have to be reduced in a consistent way such that the final results are not affected by, for example, different models for reducing environmental effects.

At Medicina and Wettzell, which are stations contributing to the ITRF as well as to European and national networks, different observational techniques, including CGPS (continuous GPS), VLBI, superconducting gravimetry and InSAR in combination with several meteorological data series are reviewed and compared. The data series are investigated to separate seasonal height and gravity variations from the long-term trends.

To study the origin of the variations in height and gravity local environmental parameters are included in the data analysis. At Medicina, a clear seasonal signal is visible in the data series, caused by seasonal fluctuations in the atmosphere, the ocean, and groundwater including mass redistribution, but also by geo-mechanical effects such as soil consolidation and thermal expansion of the structure supporting the antennas. At Wettzell, no seasonal effect could be clearly identified, and the long-term trend in

height and gravity is mainly caused by ground water variations. The successful combination of height and gravity series with the derived ratio of gravity to height changes indicates that the long-term trends in height and gravity at the investigated stations are most likely mainly due to mass changes rather than to tectonic movements.

As a result of these investigations, recommendations can be made as to which parameter types should be used to reduce local effects and which if not considered are mapped into global and regional networks. Models based on the present IERS Conventions will be compared with the models implemented to demonstrate the need for further improvements. Studies of the time variability of the investigated parameters will demonstrate the need for in-situ registration of environmental parameters.