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GPS analysis parameterization and models and their effect on the positioning and troposphere results

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Before the launch of Galileo and the modernization of GPS, many improvements have already been made in the geodetic processing strategies. The increasing use of GPS for various needs (active tectonic zone deformation measurements, long term vertical reference monitoring, atmospheric water vapour surveying) led to improved functionalities and modelizations over the past years. This includes new models for Earth tides, atmospheric loading effects, absolute values for satellite and receiver antenna phase centre variations, improved models of atmospheric and ionospheric behaviours. We present here these recent developments and their effects on the positioning accuracy at different time scales (from short term instabilities to seasonal signals and long term trends).

At the same time, permanent GPS networks for various purposes were established all over the world. An increasing number of time series are produced and investigated for searching of geophysical deformation or reference frame realization. Seasonal signals have been evidenced and partly explained by geophysical causes (loading effects). Remaining effects (periodic or noise) can be considered of two classes: technique related errors causing apparent short term motion of the stations, and geophysical non modelled effects. In this study, we investigate the former uncertainty sources, namely the influence of the parameters used in the GPS processing (cut off angle, network definition, parameterization of the troposphere...) on the positions and tropospheric parameters. We especially emphasize the importance of reference frame realization and its effects on the final results.