Geophysical Research Abstracts
Vol. 15, EGU2013-3886, 2013
EGU General Assembly 2013

Experience with snow depth sensing using GPS multipath gained at some permanent stations in Central Europe

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Multipath in GPS observations is generally considered as a disturbing effect systematically influencing static and kinematic positioning. The broadcasted satellite microwave signal directly reaching the GPS antenna is interfered with the satellite signal reflected from the terrain around the antenna. Motion of the satellite in the sky and features of the reflection surface significantly affect the multipath characteristics. Recently, several studies have shown that the analysis of multipath at permanently observing GPS sites allows to infer the properties of the environment of the antenna, namely the variability of depth of the reflecting surface and consecutively to deduce the variations of soil moisture or the changes of snow cover. Two types of observed GPS data are efficient for such analysis of multipath behavior – the signal-to-noise ratio (SNR) and the geometry-free linear combination of carrier phases (L4) since the centimeter accuracy is expected. Our paper is focused on possibilities snow depth sensing on some selected permanent GPS stations in the region of Central Europe located in various environments. We examined both approaches – analysis of SNR and L4 time series and the experience with both kinds of input data will be presented.