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Stability of the estimation of ocean tide loading effect baed on kinematic PPP GPS analysis

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The gravitational forces exerted by the Sun and the Moon gives rise to periodic deformations of the solid Earth at a number of well-defined frequencies. Of these deformations, the solid Earth tides caused by the direct gravitational attraction. The ocean tides loading (OTL) effect give a geodetic effect on sites located near the coast which the changes in weight caused by the changing quantity of water deform the supporting crust of the Earth.

Recently, it has been demonstrated that GPS data may be used to estimate semi-diurnal and diurnal tidal loading displacements with accuracies in each of three dimensions of 0.5-5.0mm (e.g. Allinson et al., 2004). Allison et al. (2004) suggested that the disadvantage of GPS measurements of the type is the satellite orbital period and constellation repeat period is at K2 and K1 periods, respectively, meaning that systematic errors are prone to map into tidal displacement estimates at these frequencies and their higher order harmonics. King et al. (2005) tried to estimate the tidal signal based on the kinematic and static GPS data analysis. They suggested that the kinemaitc estimates are of lower accuracy to the static estimates and the height time series is dominated by non-tidal errors.

In this paper, we investigate the precise tidal signal detection based on the kinematic precise point poisoning (PPP) GPS analysis. We selected 3 PBO (Plate boundary Observatory) sites in the southeastern Alaska region. We processed a -500 day span GPS data from each site using the GpsTools (Takasu et al. 2005) without any tidal correction. We decomposed GPS data into three components of the tide, the trend and the irregular part that is the residuals as the remaining miss fit part in the BAYTAP-G analysis. Sato et al. (2008) constructed the regional ocean tide model in this region. When we compared with this synthetic model, GPS time series works well to recover the tidal signal. Especially, M2 and O1 have good agreement (less than 1.4mm) between observation and model in each of three coordinate components. However, the K1 parameters compare poorly against other tidal components. It is consistent with results of Allison et al. (2004). In the presentation, we will show the more detail discussion about these error assessments.