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南東アラスカ GPS 時系列の季節変動に対する荷重変形の寄与について
Mass loading contribution for seasonal variation of GPS time series in southeast Alaska

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We assess contributions of mass loading effects to GPS time series seasonal variation in southeast Alaska.

In southeast Alaska shows very rapid uplift, with peak rates exceeding 30 mm/yr based on the mainly campaign GPS observation, which are mainly caused by GIA due to the effects of past and present-day ice melting [1]. The almost continuous sites, however, clearly shows the strong seasonal variation in vertical components. It may be interfered with precise vertical velocity estimation. In this study, we consider well-known mass loading for the GPS time series correction, which contain atmosphere, snow and soil moisture loading effect.

We re-analyzed the PBO (Plate Boundary Observatory) GPS data in and around Alaska region using PPP (Precise Point Positioning) approach implemented in GIPSY-OASIS II Ver. 6.0. We applied VMF1 mapping function and reproduced JPL precise orbit and clock products (flinnR products). Obtained GPS vertical component time series clearly show seasonal variation. The Green's function approach is adopted to calculate site displacements from various mass loads [2]. We used the NCEP/NCAR reproduced product as atmospheric pressure data for loading calculation. Mass redistribution from variations of snow cover (snow water equivalent, SWE) and soil moisture is derived from the assimilated model of GLDAS (Global Land Data Assimilation System [3]). Compared with GPS and synthetic displacement time series generated by all loading component, both time series are basically agreement with each other. The synthetic time series, however, underestimate seasonal variation amplitude. The mass loading can explain only 30 % of annual signal amplitude. The one of the inconsistency reason include the inaccurate GLDAS SWE data set because of GLDAS SWE amount is not consistent with ground observation result.

[1] Larsen et al. (JGR, 2005)
[2] Farrell (Rev. Geophys. Space Phys, 1972)
[3] Rodell et al. (Bull. Amer. Meteor. Soc., 2004)