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Study of the ice changes in Southeast Alaska based on the geodetic observations on the ground

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Southeast Alaska (SE-AK) shows very rapid uplifting (peak rate exceeding 30 mm/yr), which is mainly caused by Glacier Isostatic Adjustment (GIA) due to the unloading effects of the past-ices and the present-day ice changes. Geodetic observations with GPS and Absolute Gravity (AG) carried out in SE-AK clearly detect the effects of ice changes. Comparisons between the observed rates and the model predictions indicate that, in the order of the magnitudes, three of the LIA ices, the present-day ices (PDI) and the LGM ices contribute to the observed gravity and uplift rates. An important result obtained from the comparisons is; The observations clearly detect not only the effects of the PDI changes but also their rate changes that is considered to be an effect of the recent global warming. From the study in SE-AK, we have confirmed that combining the GPS observation with the AG observation provides useful data to study the ice changes in the glacial areas and to discuss the effects of the past-ices and the PDI separately. On the other hand, the AG and GPS observations on the ground will also provide useful data to be applied to the calibration and the validation of such satellite measurements as GRACE, GOCE and IceSat and so on.

Keywords: Southeast Alaska, glacier changes, Absolute gravity observation, GPS observation, load deformation, global warming