

Observing Post Little Ice Age Glacier Rebound in Southeast Alaska

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Extreme uplift and sea level changes in southeast Alaska have been documented by 1) a regional GPS deformation array consisting of 74 sites (average $1\text{-}\sigma$ uncertainties: horizontal = ± 0.8 mm/yr, vertical = ± 2.1 mm/yr); 2) 18 tide gauge measurements of sea-level changes ($1\text{ }\sigma = \pm 5$ mm/yr); and 3) 27 raised shoreline measurements of total uplift ($1\text{ }\sigma = \pm 0.3$ m). The GPS data show peak uplift rates of 30 mm/yr in Glacier Bay, and also delineated a second center of rapid uplift east of Yakutat with peak rates of 32 mm/yr. The recent magnitude and distribution of regional sea level rates (up to 25 mm/yr) based on decadal averages of tide gauge measurements in the Glacier Bay area are similar to those found in an earlier study of tide gauge measurements. A combination of dendrochronology and geomorphology was employed to identify and date raised shorelines throughout the region. These studies documented rapid and continuous total sea level changes of up to 5.5 m, and constrained the age of the ongoing uplift to less than 250 yrs. The raised shorelines show a pattern of higher uplift surrounding the region of peak GPS uplift rates in Glacier Bay, while the dating of these shorelines shows that they began uplifting at the same time the massive Glacier Bay Icefield began its retreat. This is a direct observation of glacial isostatic rebound processes acting on timescales of only a few hundred years in southern Alaska.

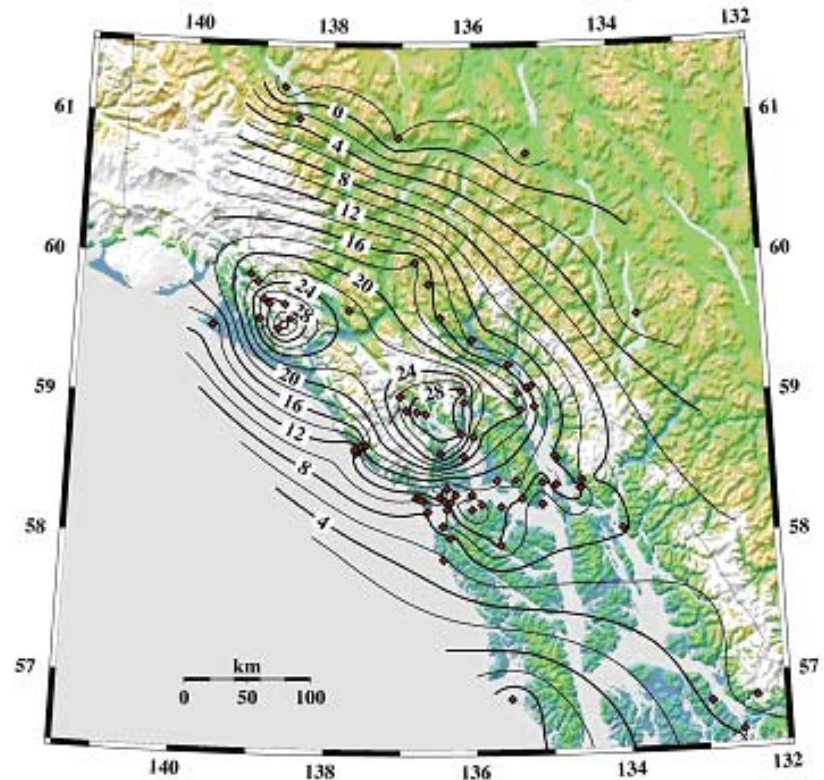


Figure 1. GPS uplift rates (mm/yr). GPS stations are shown with red diamonds. Contour interval is 2 mm/yr. Peak uplift rates are found in Glacier Bay (southern peak) and the Yakutat Icefield (northern peak).

References

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