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On Land Ice Mass Change in Southernmost South America, Antarctic Peninsula and Coastal Antarctica consistent with GRACE, GPS and Reconstructed Ice History for Past 1000 years.

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The improved spatial coverage provided by high-quality Global Positioning System observing systems on exposed bedrock has allowed these space geodetic experiments to play an increasingly important role in constraining both glacial isostatic adjustment (GIA) processes and viscoelastic responses to present-day glacial mass changes (PGMC). Improved constraints on models of ice mass change in the Southern Hemisphere at present-day, during the Little Ice Age, and during the Late Holocene are invaluable for reconciling climate and sea-level variability on a global scale during the present solar radiation forcing and Milankovic orbital configuration. Studies by Jacobs et al. (1992), Whitehouse et al. (2012), King et al. (2012), Boening et al (2012), and others, support the contention that GRACE observations of both GIA and PGMC in the Southern Hemisphere are dominated by the geography and climate of coastal environments. This makes the proper masking of those environments for GRACE-determinations of secular mass balance especially sensitive, and downscaling, rescaling, and use of correlation mascon methods a non-trivial part of the analysis. Here we employ two analysis methods to determine the mass balances of the Antarctic Peninsula and Patagonia and incorporate GPS observations of ongoing uplift for GIA correction into both. Using data that roughly span 2002-2013, we determine -25 $\pm$ 5 Gt/yr for the uncorrected Antarctic Peninsula (AP) and -12 Gt/yr for southern Patagonia and the Cordillera Darwin (PCD). With corrections for GIA these are increased to -34 $\pm$ 8 Gt/yr for AP and -22 $\pm$ 6 Gt/yr for PCD.