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Impact of Glacial Isostatic Adjustment on North America Plate Specific Terrestrial Reference Frame

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We examine the impact of incorporating glacial isostatic adjustment (GIA) models in determining the Euler poles for plate specific terrestrial reference frames. We will specifically examine the impact of GIA models on the realization of a North America Reference frame. We use a combination of the velocity fields determined by the Geodesy Advancing Geosciences and EarthScope (GAGE) Facility which analyzes GPS data from the Plate Boundary Observatory (PBO) and other geodetic quality GPS sites in North America, and from the ITRF2014 re-analysis. Initial analysis of the GAGE velocity field shows reduced root-mean-square (RMS) scatter of velocity estimate residuals when the North America Euler pole is estimated including the ICE-6G GIA mode. The reduction in the north-south direction is from 0.69 mm/yr to 0.52 mm/yr, in the east-west direction from 0.34 mm/yr to 0.30 mm/yr and in height from 0.93 mm/yr to 0.72 mm/yr. The reduction in the height RMS is not surprising since the contemporary geodetic height velocity estimates are used in the developing the ICE-6G model. Contemporary horizontal motions are not used the GIA model development, and the reduction in horizontal RMS provides a partial validation of the model. There is no reduction in the horizontal velocity residual when the ICE-5G model is used. Although removing the ICE-6G model before fitting an Euler pole for the North American plate reduces the RMS of the residuals, the pattern of residuals is still systematic suggesting possibly that a spherically symmetric viscosity model might not be adequate for accurate modeling of the horizontal motions associated with GIA in North America. This presentation in focus on the prospects and impacts of incorporating GIA models in plate-specific Euler poles with emphasis on North America.