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Changes in Present-Day True Polar Wander

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One of the most important mechanisms acting to cause a linear trend in the path of the pole on time scales of a few thousand years is glacial isostatic adjustment. The isostatic adjustment of the solid Earth as it responds to the decreasing load on it following the last deglaciation causes the figure of the Earth to change, and hence the pole to drift. Models of GIA show that its effect on the pole path is sensitive to the assumed value of lower mantle viscosity, to the assumed thickness and rheology of the lithosphere, to the treatment of the density discontinuity at 670 km depth, and to the assumed compressibility of the Earth model. Observations of the trend in the pole path can therefore be used to constrain these properties of the solid Earth. Here, the linear trend in the path of the pole is estimated from historical optical astrometric observations of the position of the pole as well as from modern space-geodetic observations. Particular attention is paid to deriving an estimate that is unbiased by the presence of interannual and decadal signals in the pole position observations. A change in the direction of the pole path, most noticeable in the y-component, is found to occur in the mid-1990s. Before 1995.0 the observed linear trend in the pole path is found to be 4.23 milliarcseconds (mas) per year towards 72.2 degrees W longitude, consistent with the pre-1997 trend estimated by Gross and Vondrak (1999) of 4.12 mas/yr towards 73.9 degrees W longitude. But the post-1995 linear trend is found to be 2.92 mas/yr towards 64.8 degrees W longitude, about 30% slower and 7.4 degrees more eastward than the pre-1995 trend. Possible mechanisms that could be acting to cause this change in the path of the pole will be discussed.