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The Impact of the Ocean Pole Tide on Various Geodetic Observables

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Long period polar motion is almost completely described by the Chandler wobble, with a period of 14 months, and an annual variation. The incremental centrifugal potential that is associated with this polar motion causes the Earth to deform, and these deformations are often referred to as the pole tide. A model for the effect of the solid Earth pole tide deformations is typically applied to most geodetic data, while the effect of the ocean pole tide deformations has often been ignored. The most notable exception is satellite altimetry data from the last two decades where a first order equilibrium model of the ocean pole tide has been adopted.

A more rigorous self-consistent equilibrium model of the ocean pole tide that takes into account self-gravitation, loading, and conservation of mass is presented. This model is used to illustrate the relative magnitude of the effects of the ocean pole tide on various geodetic observations such as sea surface height, space-based gravity recovery, and solid Earth deformations from the loading of the ocean pole tide.