ESTIMATING THE PERIOD AND Q OF THE CHANDLER WOBBLE FROM OBSERVATIONS AND MODELS OF ITS EXCITATION

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Any irregularly shaped solid body rotating about some axis that is not aligned with its figure axis will freely wobble as it rotates. For the Earth, this free wobble is known as the Chandler wobble in honor of S.C. Chandler, Jr. who first observed it in 1891. Unlike the forced wobbles of the Earth, such as the annual wobble, whose periods are the same as the periods of the forcing mechanisms, the period of the free Chandler wobble is a function of the internal structure and rheology of the Earth, and its decay time constant, or quality factor Q, is a function of the dissipation mechanism(s), like mantle anelasticity, that are acting to dampen it. Improved estimates of the period and Q of the Chandler wobble can therefore be used to improve our understanding of these properties of the Earth. Here, estimates of the period and Q of the Chandler wobble are obtained by finding those values that minimize the power within the Chandler band of the difference between observed and modeled polar motion excitation spanning 1962–2010. Atmosphere, ocean, and hydrology models are used to model the excitation caused by both mass and motion variations within these global geophysical fluids. Direct observations of the excitation caused by mass variations as determined from GRACE time varying gravitational field measurements are also used. The resulting estimates of the period and Q of the Chandler wobble will be presented along with a discussion of the robustness of the estimates.