Several of the geophysical fluids are known to be excitation sources for polar motion, including the land-based hydrosphere, atmosphere, and ocean. For land-based hydrological signals, principally from groundwater, soil moisture and snow, we estimate regional monthly polar motion excitation functions over land using output from the U.S. NOAA Climate Prediction Center and NASA Global Land Data Assimilation System models. A second technique for estimating land hydrology is an indirect approach that determines equivalent water thickness (EWT) from the Gravity Recovery and Climate Experiment (GRACE)-based RL04 gravity fields EWT from Center for Space Research. The influence of different geographic regions of the ocean, particularly on the seasonal and the broad band around the Chandler period, on the excitation of polar motion was estimated with the ECCO/JPL data-assimilating model.

A catalogue of our regional results includes:

1. hydrology—large variability in the lower latitude Southeast Asia, South Asia, and the South American Amazon. However, important differences occur between modeling and GRACE-based results.
2. atmosphere—strong variability over the high topography regions of Eurasia and North America.
3. oceans—variability, in the case of the annual oscillation from changes in regions such as the southern Indian Ocean. For the Chandler band, the southeastern Pacific, southern Indian Ocean, and North Atlantic dominate each other.