Earth rotation parameters as obtained from multi-year series of space geodetic observations contain substantial variability on subdiurnal time scales even after reducing for ocean tide effects. These residuals are in particular apparent at frequencies of 1, 2 and 3 cycles per solar day, where atmospheric tides, excited by water vapour absorption and ozone heating in the middle atmosphere, are known to occur.

By means of short-term forecasts of the latest ECMWF re-analyses ERA Interim and consistently forced numerical simulations with the Ocean Model for Circulation and Tides OMCT, the potential of atmospheric tides and the corresponding oceanic response on the excitation of polar motion variations is re-assessed. Focussing in particular on the atmosphere, tidal signals are separated into migrating and non-migrating zonal waves for individual height levels. Since contributions of wave number 1 wind variations are found particularly effective in exciting polar motion, the representation of these waves both in terms of wind and temperature variations is evaluated. By comparing statistical analyses with tidal signals from in-situ observations and complementary simulations with the Whole Atmosphere Community Climate Model WACCM, spanning the range of altitude from the Earth's surface to the thermosphere, the reliability of simulated tidal dynamics, their seasonal modulations, and their impact on rotational variations will be assessed.