Investigations on Rotational Normal Modes of Different Triaxial Three-Layered Earth Models

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Previously we formulated a new triaxial three-layered Earth rotation theory, and provided four rotational normal modes. Here in this report, we investigate the rotational normal modes based on different Earth models and different kinds of couplings among the inner core, outer core and mantle. We choose two kinds of Earth models, triaxial anelastic three-layered Earth model (TATM), which consists of anelastic mantle, fluid outer core, and elastic inner core, and triaxial rigid three-layered Earth model (TRTM), which consists of rigid mantle, incompressible fluid outer core, and rigid inner core. There are two kinds of core-mantle couplings in our model, electromagnetic couplings (EMC) and the pressure and gravitational couplings (PGC). The rotational normal modes, including the Chandler wobble, free core nutation, free inner core nutation and inner core wobble (ICW), based on the TRTM are consistent with the results of Escapa et al. (2001), who used the Hamiltonian approach. The ICW period based on TATM with considering EMC and PGC together is 2412.0 mean solar days (d); if only considering PGC, the ICW period becomes 2409.3 d; if only considering EMC, the ICW period becomes 412.2 d; and without considering any coupling, the ICW period becomes 411.8 d. The period of the ICW based on TRTM with considering EMC and PGC is 2411.9 d; if only considering PGC, the ICW period becomes 2409.2 d; if only considering EMC, the ICW period becomes 412.2 d; and without considering any coupling, the ICW period becomes 411.8 d. This study is supported by NSFC (grant Nos. 41631072, 41721003, 41574007 and 41429401), the Discipline Innovative Engineering Plan of Modern Geodesy and Geodynamics (grant No. B17033) and DAAD Thematic Network Project (grant No. 57173947).