

Tidal Interaction in the Earth-Moon System Treated as a Double Planet

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Our approach to the phenomenon of tides differs from the traditional one, in which an empirically tidal potential with Love numbers is introduced. We consider the motion of two viscoelastic bodies, the Earth and the Moon treated as a double planet, in the gravitational field of a massive point, the Sun. The deformations of the bodies are described by the classical theory of small deformations. The influence of viscous forces is described by the dissipative functional of the Kelvin-Voigt model. The quasi-static equation of the elasticity theory is solved for obtaining the displacements of body points. The method of averaging and separation of motion is used for solving of this equation. The displacements of each point of the deformable body consist of displacements caused by centrifugal forces, the forces due to body elasticity and dissipative forces due to body viscosity. Substituting these displacements in the potential formulae and integrating over the each body, we get the potential of the system and the moments of forces acting on the bodies.. Knowing the displacements, we determine the shape of deformable bodies, their moments of inertia and the lagging angle. The results of this approach are compared with the results of the traditional theory.

Keywords: Earth-Moon system, viscoelastic bodies, moments of forces