Title: Polar wander prediction based on the solution of the Liouville equation

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Abstract: The present thesis seeks numerical solution of the Liouville equation for selected processes. Tisserand's axes are chosen as frame of reference. The only approximation made in the equation is assumtion of zero external torque. It is shown in the present work that it is reasonable to predict the polar wander of the studied models by applying standard numerical methods to this non-simplified equation, and even for long-term processes. The results are compared with solutions gained by approximative methods developed by previous authors. Because free wobble is not filtered out from the Liouville equation, its excitation and damping is observed and may be analyzed. Body's response to centrifugal potential must also be determined in order to treat the Liouville equation properly. This response, i.e. the rotational deformation, is computed using spectral finite-difference method, Eulerian approach is employed to formulate the appropriate set of field equations. Viscoelastic mantle and fluid core are assumed, mantle can have radially dependent density, viscosity and shear modulus. The deformation is computed directly in the time domain, where it is easily coupled with the Liouville equation. In the first chapter, non-traditional derivation of the Liouville equation is developed. It is based on evaluating the effect of fictious forces in the law of balance of angular momentum.

Keywords: Polar wander, Liouville equation, viscoelastic relaxation