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Titan's forced rotation : a 3-degrees of freedom theory

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We here present a 3-degrees of freedom theory of Titan's rotation, seen as a rigid body. Such a study is possible thanks to the Cassini data on the gravitational potential of Titan. We use for this purpose a semi-analytical model based on the recent analytical works of Henrard, numerical integration and identification of the solution by way of frequency analysis. Titan's orbital motion is modelized with TASS theory. We find that the equilibrium obliquity is nearly zero, and that the fundamental periods of the free libration around this equilibrium are respectively 2.2 years, 189 years and 346 years. Moreover, we enlight the influence of a 703-years period present in Titan's inclination, on its obliquity.