Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PPS001-07 会場:101 時間:5 月 27 日 10:00-10:15

Polar motion of Titan forced by the atmosphere
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Titan’s atmosphere possesses an equatorial component of angular momentum, which can be transferred to the surface and excite polar motion of Titan. The atmospheric excitation of Titan’s polar motion is calculated using the wind and pressure data prediction from a general circulation model. The polar motion equation is solved considering Titan’s triaxial shape and different hypothetical interior models. Titan’s polar motion basically consists of a superposition of diurnal wobbles and semi-annual and annual wobbles caused by seasonal redistribution of wind and pressure pattern. If the entire interior of Titan is solid, the polar motion has amplitudes of a few meters and the paths of the diurnal and seasonal wobble are intermingled. If instead there is a subsurface ocean underneath the crust, the wobble amplitude could be larger by an order of magnitude. If the crust is thin, a resonance between the seasonal and Chandler wobble further increases the polar motion amplitude and makes the polar motion path elliptical. However, the external and internal coupling and the elastic restoring torque owing to Titan’s triaxial shape strongly counteract the polar motion.

キーワード: Titan, polar motion
Keywords: Titan, polar motion