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The rotation and interior of Ganymede

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The rotation rate of Ganymede, the largest satellite of Jupiter, is on average equal to its orbital mean motion but cannot be constant on orbital time scale as a result of the gravitational torque exerted by Jupiter on the moon. Here we discuss small deviations from the average rotation rate, evaluate polar motion, and discuss Ganymede's obliquity. We examine different time scales, from diurnal to long-period, and assess the potential of using rotation as probes of the interior structure.

The ESA JUICE (JUpiter ICy moons Explorer) mission will accurately measure the rotation of Ganymede during its orbital phase around the satellite starting in 2032. We report on different theoretical aspects of the rotation for realistic models of the interior of Ganymede, include tidal deformations and take into account the low-degree gravity field and topography of Ganymede. We assess the advantages of a joint use of rotation and tides to constrain the satellite's interior structure, in particular its ice shell and ocean.