

## The passage through the 5:3 resonance between Ariel and Umbriel with inclination

*Tuesday 27 June 2023 14:00 (40 minutes)*

Ariel and Umbriel have almost certainly passed through the 5:3 mean motion resonance in the past, owing to the tidal evolution of their orbits. However, the exact mechanism that allows the system to evade capture in this resonance is a great puzzle. For coplanar orbits (zero inclinations), the eccentricity of at least one satellite must be close to 0.01 at the time, which is unlikely because tides are expected to quickly damp the eccentricities to near zero. For non-coplanar orbits, the inclinations appear to grow to high values, which is unlikely because tides are very inefficient to damp the inclinations to the presently observed near zero values. Assuming circular orbits for both satellites, we show that, if the inclination of Umbriel was higher than  $0.1^\circ$  at the time of the resonance encounter, capture in the 5:3 mean motion resonance can be avoided. Moreover, after the resonance crossing, the inclination of Umbriel drops to a mean value around the presently observed one.

**Presenter:** GOMES, Sérgio (CFisUC, Department of Physics, University of Coimbra, 3004-516 Coimbra, Portugal)