

## Are Saturn's rings really young?

**Aurélien Crida** (1,2), Sébastien Charnoz (3), Hsiang-Wen Hsu (4) and Luke Dones (5)

(1) Université Côte d'Azur, Observatoire de la Côte d'Azur, CNRS, Laboratoire Lagrange – Boulevard de l'Observatoire, CS34229, 06304 Nice cedex 4, FRANCE ([crida@oca.eu](mailto:crida@oca.eu)), (2) Institut Universitaire de France, 103 Boulevard Saint-Michel, 75005 Paris, FRANCE, (3) Institut de Physique du Globe, Sorbonne Paris Cité, Université Paris Diderot/CNRS, 1 rue Jussieu, 75005 Paris, FRANCE, (4) Laboratory for Atmospheric and Space Physics, University of Colorado Boulder, Boulder, CO, USA, (5) Southwest Research Institute, Boulder, CO, USA

### Abstract

The age of Saturn's rings is a fascinating topic, which is subject of a vivid debate in the scientific community. Recent claims that the rings may be less than hundred million years old got a lot of attention. However, this is not firmly established, as the data can be interpreted in different ways.

The age of the rings should first be properly defined. The formation age, the age of the structures, and the exposure age may actually differ. These three different concepts will be here clarified. We will then show that the recently measured mass of the rings[1] argues in favor of old rings from the point of view of their dynamical evolution, but in favor of young rings in terms of exposure age.

In the light of our understanding of Solar System dynamics, there is no obvious way out of this contradiction. However, new results from Cassini's "Grand Finale" may provide a hint: it has been found that silicate nanograins[2] and organics[3] fall into Saturn from the rings, at a rate of the same order of magnitude as the bombardment rate. Therefore, a potential ring cleaning mechanism may disconnect the young exposure age of the rings from their real age.

In this presentation, we will put all these recent results into perspective, discuss their implications on the age of the rings, and show the questions that remain open.

### References

- [1] Iess, L. et al. : Measurement and implications of Saturn's gravity field and ring mass, *Science*, in press, 2019.
- [2] Hsu, H.-W. et al. : In situ collection of dust grains falling from Saturn's rings into its atmosphere, *Science*, Vol. 362, eaat3185, 2018.
- [3] Waite, J. R. Jr. et al. : Chemical interactions between Saturn's atmosphere and its rings, *Science*, Vol. 362, eaat2382, 2018.