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Numerical modeling for episodic thermal convection in enceladus ice shell

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In 2005, Cassini's mission made a historical finding in one of the Saturn's moons. The probe evidenced geothermal activity on the South Pole of Enceladus while circling its orbit. It also produced images showing fractures in Y shape in Enceladus South Pole terrain, which is geologically younger than the rest of the surface. These fractures were designated as "Tiger Stripes". The material emerging from these fractures were studied by spectroscopy, being consistent with a composition of pure water, ice grains of the order of micrometers and organic material. Some authors attribute this geological activity to the tidal forces on Enceladus when they enter into resonance with other satellites, establishing a variable and unstable eccentricity of the orbit that generated the observed heat. In this research, we seek to explain how Enceladus maintains the observed heat, the existence of an episodic thermal convection in the Enceladus crust is proposed, with numerical models of finite differences in spherical coordinates, which include geodynamical parameters such as tidal forces, a non-uniform viscosity in the crust and a type of convection under a layer not convective. In addition, it is included in the model that the convection is taking place episodically, giving rise to events of maximum heat transport in a span of a few million years and a consequent stability, allowing that the high heat flow can be explained as the release of heat stored in the past. The model is designed to obtain an energy value close to the data obtained by the Cassini mission.

Biography

Mariana C Villamil Sastre is completing her two majors in Physics and Geoscience at University of the Andes, Colombia. Since she started the university she showed great interest in planetary science, in 2016 was the speaker in the III International Astrobiology Congress in Manizales, Colombia, with the conference named: "What hides inside Enceladus? Geysers, a small part of the puzzle". Her undergraduate thesis is based on a numerical model of heat convection in Saturn´s moon, Enceladus, with geodynamical parameters that fits with the data showed by remote sensing instruments of Cassini mission

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