224.15 – Search for Short-term temporal evolution of Pluto's surface

Kuiper Belt Objects (KBOs) outnumber other bodies within our Solar System; however, studies of KBO temporal evolution are limited. At present, Pluto is moving farther away from the Sun and the sub-observer latitude is increasing quickly, therefore we might expect to see ongoing changes in the atmosphere and on its surface. In order to search for these changes and minimize the effects of rotational phase and viewing geometry, we observed Pluto at approximately the same sub-observer latitude and longitude between June 2014 and August 2016 with the TripleSpec spectrograph at the Apache Point Observatory. These "matched pairs" correspond to the June observations in one year and the August observations of the following year and allow us to search for purely temporal changes. We investigated how absorption features of the volatile ices changed over the course of one Earth-year and place constraints on the timescale for observable surface-atmosphere interactions of these ices on Pluto.

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225 – Enceladus Posters

225.01 – Explorer of Enceladus and Titan (E^2T): Investigating the habitability and evolution of ocean worlds in the Saturn system

The NASA-ESA-ASI Cassini-Huygens mission has revealed Titan and Enceladus to be two of the most enigmatic worlds in the Solar System. Titan, with its organically rich and dynamic atmosphere and geology, and Enceladus, with its active plume of water vapor and ice laced with organics, salts, and silica nano-particles, both harbouring subsurface oceans, are prime environments in which to investigate the conditions for the emergence of life and the habitability potential of ocean worlds as well as the origin and evolution of unique complex planetary systems. Explorer of Enceladus and Titan (E^2T) is a space mission concept dedicated to investigating the evolution and habitability of these Saturnian satellites and is proposed as a medium-class mission led by ESA in collaboration with NASA in response to ESA's M5 Cosmic Vision Call. E^2T has a focused state-of-the-art adapted payload that will provide in-situ sampling, high-resolution imaging and radio science measurements from multiple flybys of Enceladus and Titan using a solar-electric powered spacecraft in orbit around Saturn. With significant improvements in mass range and resolution, as compared with Cassini, the Ion and Neutral Gas Mass Spectrometer (INMS) and the Enceladus Icy Jet Analyzer (ENIJA) time of flight mass spectrometers will provide the data needed to decipher the subtle details of the aqueous environment of Enceladus from plume sampling and of the complex pre-biotic chemistry occurring in Titan's atmosphere. The Titan Imaging and Geology, Enceladus Reconnaissance (TIGER) mid-wave infrared camera will map thermal emission from Enceladus' tiger stripes at meter scales and investigate Titan's geology and compositional variability at decameter scales. The Radio Science Experiment (RSE) measurements will provide constraints on the ice shell structure and the properties of the internal oceans of Enceladus and Titan. We will present the concept and discuss the major improvements to our understanding of these two unique worlds around Saturn that the mission could provide.

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225.02 – Porous flow of liquid water in Enceladus rock core driven by heterogeneous tidal heating

Surface heat flux estimates in excess of 15 GW (e.g. Howett et al., 2016) raise the question of the origin of Enceladus' heat production. While strong heating by tidal dissipation is probably the only viable source, whether the maximum production occurs in the outer ice shell or, deeper, in the ocean or in the rock core, is however unclear. While the analysis of measurements by the Cassini mission (gravity and topography data, observed libration), seems to favor an extremely thin shell at Enceladus South Pole (a few kms only, cf. Thomas et al., 2016, Cadek et al., 2016), the distribution of heat sources remains a major issue in the light of the evolutionary trend that led to this present-day physical state of the moon.
Here, we build up on a recent evaluation of tidal deformation in a porous rock core saturated with liquid water indicating that, owing to its unconsolidated state, plausible core rheologies could lead to significant heat production there (typically 20 GW, Tobie et al., in prep.). We describe porous flow in a 3D spherical model following the work of Travis and Schubert (2015). Compaction of the rock matrix is neglected. Water characteristics (density and viscosity), and the bulk thermal conductivity of the porous core are temperature-dependent and the effect of non-water compounds can be considered. Tidal heating is introduced as a heterogeneous heat source with a pattern inferred from numerical models of the tidal response. Our analysis focuses particularly on the heat flux pattern at the ocean/core interface where water is advected in/out of the porous medium.

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225.03 – Global Tectonics of Enceladus: Numerical Model

Introduction: Enceladus, a satellite of Saturn, is the smallest celestial body in the Solar System where volcanic and tectonic activities are observed. Every second, the mass of 200 kg is ejected into space from the South Polar Terrain (SPT) – [1]. The loss of matter from the body's interior should lead to global compression of the crust. Typical effects of compression are: thrust faults, folding and subduction. However, such forms are not dominant on Enceladus. We propose here special tectonic process that could explain this paradox. Our hypotheses states that the mass loss from SPT is the main driving mechanism of the following tectonic processes: subsidence of SPT, flow in the mantle and motion of adjacent tectonic plates. The hypotheses is presented in [2], [3] and[4].
We suggest that the loss of the volatiles results in a void, an instability, and motion of solid matter to fill the void. The motion is presented at the Fig.1 and includes:
Subsidence of the 'lithosphere' of SPT.
Flow of the matter in the mantle.
Motion of plates adjacent to SPT towards the active region
Methods and results: The numerical model of processes presented is developed. It is based on the equations of continuous media..