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Titan's Sand Seas properties from the modelling of microwave-backscattered signal of Cassini/SAR

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Titan's sand seas may reflect the current and past surface conditions. Assessing the physicochemical properties and the morphodynamics of the equatorial linear dunes is a milestone in our comprehension of the climatic and geological history of the largest Saturn's moon.

Based on enhanced SAR processing leading to despeckled Cassini RADAR data sets, we analyzed quantitatively the surface properties (e.g., slopes, texture, composition...) over the sand seas. First, using a large amount of overlaps and a wide range of incidence angle and azimuths, we show that the radar cross-section over the inter-dunes strongly differs from the one over the dunes. This strongly suggests significant difference in the physical properties between these two geomorphic units.

Then, we derived quantitatively the surface properties from the modelling of microwave-backscattered signal using a Monte-Carlo inversion. Our results show that dunes are globally more microwaves absorbent than the inter-dunes. The inter-dunes are smoother with a higher dielectric constant than the dunes. Considering the composition, the inter-dunes are in between the dunes and the bright inselbergs mainly composed of water ice, suggesting the presence of a shallow layer of sediment in between the dunes. This may suggest that Titan dunes are developing over a coarser sediment bed similarly to what is observed in some terrestrial sand seas such as in Ténéré desert (Niger, see also contribution #EGU2016-13383). Additionally, potential secondary bedforms (such as ripples) as well as avalanche faces may have been detected.