

Prospects for Abrasion on Titan. S. M. MacKenzie¹, K. Runyon¹, X. Yu², R. D. Lorenz¹, J. Radebaugh³ ¹Johns Hopkins University APL, Laurel, MD, USA (shannon.mackenzie@jhuapl.edu), ²UC Santa Cruz, CA, USA, ³Brigham Young University, Provo, UT, USA

Like Earth and Mars, Titan is a sediment-rich world. The *Cassini* spacecraft discovered that longitudinal dunes of organic sands almost entirely encircle the moon's equator [1, 2] and that lacustrine processes seem to create new sediments [3,4]. The image of Titan's surface captured by the Huygens probe shows rounded cobbles, suggesting fluvial erosion from the water-ice bedrock clasts [5]. Thus, with both active aeolian processes and an abundance of sediment available, it is perhaps unsurprising that putative yardangs have also been identified on Titan's surface [6,7]. Titan's candidate yardangs resemble terrestrial examples in Chad and Iran both in their linear morphologies and radar scattering properties [6], though they have also been interpreted as stabilized linear dunes. These features lie primarily in the mid-latitude regions, far from where dunes and sand are found at the resolution of Cassini imaging, raising many questions: when these features were formed, to what materials are being eroded, and what sediments abrade?

In this work we seek to describe possible scenarios of abrasion on Titan. A grand unified theory of yardang formation and evolution remains elusive, but several key factors of the process have been identified, including mechanical properties of the host lithology [e.g. 8] and the mechanical properties of the ablaters [e.g. 9], and sediment availability in the corridors [10]. Thus, following the kinetic model of [9], we begin by exploring the known endmember compositions of surface material (water ice and organics) and the range of known clast sizes (dust to cobbles). The Titan environment is much less energetic than Mars or Earth, with saltation speeds 10x smaller than Earth and thus specific kinetic energy 100x less; the mechanical strength allowed may scale accordingly. We then consider, in conjunction with Runyon et al. (2020; this conference), where and how often winds are sufficient to mobilize sand and gravel sized particles. These investigations will allow us to constrain the likelihood of abrasion and yardang formation on Titan.

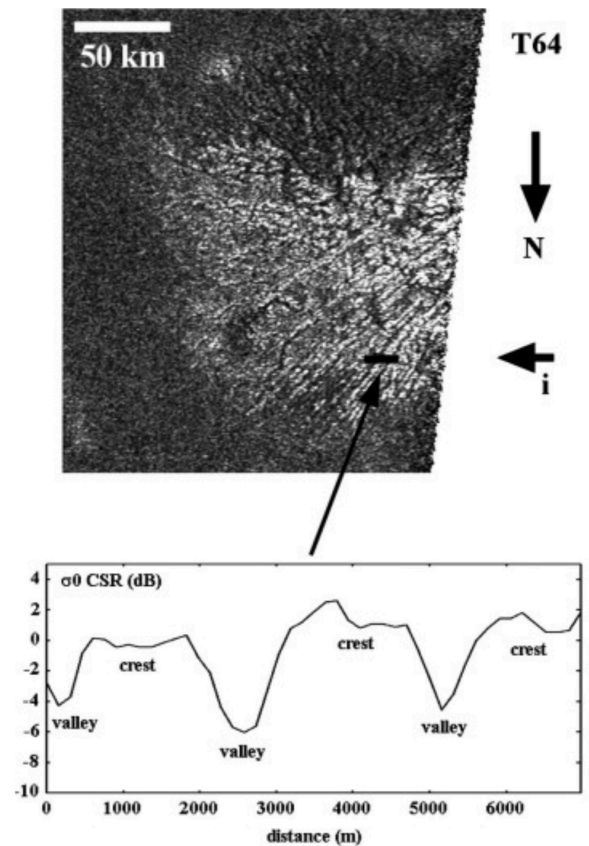


Figure 1: Putative mega-yardang on Titan analyzed by [6].

References:

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