ONGOING MEASUREMENTS OF DUNE WIDTH AND SPACING ON TITAN REVEAL DUNE FIELD PROPERTIES. N.T. Mills[1], J. Radebaugh[1], C.J. Savage[1], A. Le Gall[2] Department of Geological Sciences, Brigham Young University, Provo, UT 84602, ntannermills@gmail.com, jani.radebaugh@byu.edu, [2]Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS-UVSQ), Paris, France.

Introduction: Saturn's moon Titan is home to many morphologies similar to those found on Earth. One of Titan's most notable landforms are dune fields, which cover perhaps 20% of Titan's surface [1,2,3]. These dunes are linear in form and can stretch to hundreds of kilometers in length [4]. They are located in equatorial regions and can be found between latitudes of ±30º [1,2,3,5]. Modeling of dune parameters on Titan, such as dune width, spacing, and length have yielded important results concerning dune field maturity [6,7]. The emerging pattern analysis results and the uniformity of dune form across Titan indicate these dunes may be in an equilibrium condition that has persisted for a long time. The duration of aeolian dune processes on Earth is also relatively long lived [8], so how Earth-like processes relate to those on Titan is the subject of current study [6,8,9]. The following are results from a geomorphological study of Titan's dunes, presented along with a new method for measuring crest spacing of Titan's linear dunes.

Methods: New measurements of dune width and spacing have been obtained, using the USGS program ISIS, in the Cassini Synthetic Aperture Radar (SAR) T25 swath (2º S - 7º S, 38º W - 40º W, Fig. 1a,b). This is a continuation of a previous study, in which dune width and spacing were measured in various locations in six different SAR swaths across Titan [6]. The previous study utilized measurements obtained at approximately 5 km intervals, yielding ~7,000 each width and spacings [6]. Dune widths were measured from one light/dark boundary to the next across SAR-dark areas perpendicular to the long axis of the dunes. After widths were measured, interdune spacing was obtained for each region using the same method, across SAR-bright areas. Crest-to-crest dune spacing was approximated by adding the average dune width for a particular degree of latitude to the average interdune spacing for that same degree of latitude [6]. These methods were used because Cassini SAR resolution (~300 m.) is not good enough to distinguish actual dune crests.

Current measurement methods differ from those of Savage et al. [6] in that crest-to-crest spacing is now being measured differently. It is now done by measuring from a SAR light/dark boundary through the SAR-dark and SAR-light area to the next SAR light/dark boundary perpendicular to the long axis of the dunes (Fig. 1c). As dune widths were measured we also measured dune spacing from the same starting point (Fig 1c). We believe this will provide us with a more accurate measurement for crest spacing, and will enable us to precisely correlate dune width and spacing.

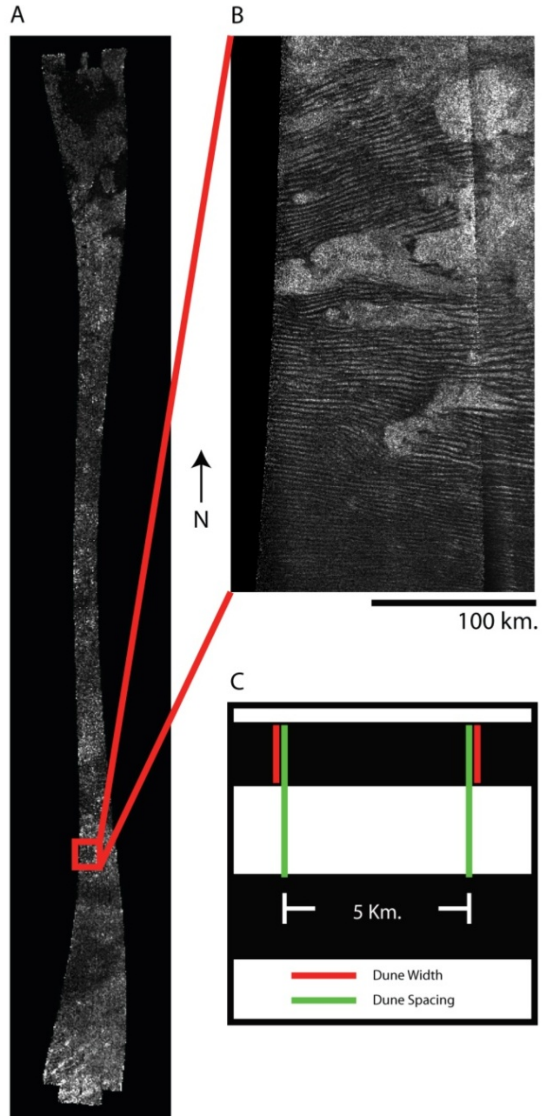
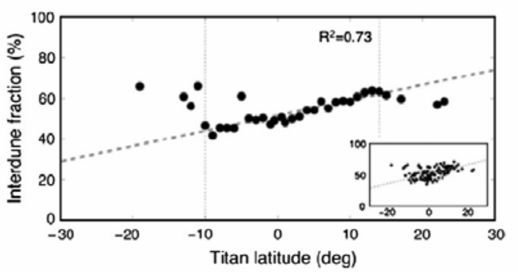


Figure 1 A) Cassini (SAR) T25 swath. B) Close up view of where measurements have being taken thus far. C) Illustration of our new method for measuring dune spacing.

Results and Discussion: Using the new method, we have 191 measurements of each dune width and spacing, made on the T25 swath ranging between -2º and -7º latitude. Dune widths are on average 1.51 km and the average dune spacing is 2.79 km, comparable to average width and spacing values across Titan [6]. These results are consistent with a study by Le Gall et al [3]. However, when we plot interdune fraction (interdune width divided by dune spacing) with latitude our results do not appear to be consistent with those of Le Gall et al. (Fig 2).

A



B

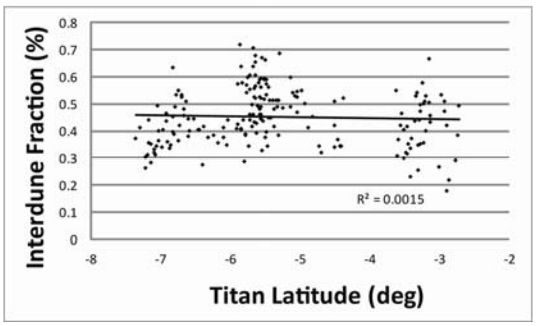


Figure 2 A) A figure by Le Gall et al. plotting interdune fraction and latitude, as latitude increases to the north interdune fraction also increases. B) A plot of interdune fraction and latitude using 191 measurements from our new method of measuring dune spacing, these results are inconsistent with Le Gall et al.

There may be a few factors contributing to these inconsistencies. We only have 191 measurements to report (more may be presented) and they have all been made within 300 km of each other on the T25 swath while Le Gall et al. [3] used data averaged from multiple swaths. Thus, our values for interdune fraction may average to those of Le Gall et al. [3] at that latitude range. Also, the measured area has a few topographical features influencing wind regimes, which may be causing some of the width and spacing measurements to be irregular.

Conclusions: Averages of dune width and dune spacing are consistent with previous studies. However, some results, specifically interdune fraction, are inconsistent with previous work, perhaps a result of a small sample size or because of the effects of surface topographical conditions. We plan to complete measurements of all dunes in the T25 swath and then other swaths, including T8/T61, the Belet Sand Sea, a region lacking parametric measurements. This will help expand the database of dune parameters across Titan. It will also help make inferences about Titan's climate and be used as an analog to similar processes on Earth.

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