TITAN'S ENIGMATIC 5-MICRON-BRIGHT TERRAIN. Jason W. Barnes, Robert H. Brown, Elizabeth P. Turtle, Jason Perry, *Lunar and Planetary Laboratory, University of Arizona, Tucson, AZ 85721, USA, (jbarnes@lpl.arizona.edu)*, Bonnie J. Buratti, Kevin H. Baines, *NASA/JPL, Pasadena, CA 91109, USA*, Christophe Sotin, *Laboratoire de Planétologie et Géodynamique, 44072 Nantes, France*, Roger N. Clark, *United States Geological Survey, Denver, CO 80225, USA*, Phillip D. Nicholson, *Cornell University, Ithaca, NY 14853, USA*.

Abstract: Using Cassini's Visual and Infrared Mapping Spectrometer (VIMS) instrument, we have identified two, possibly three, regions on south of Xanadu that are spectrally distinct from the rest of Titan's surface in that they are relatively highly reflective at wavelengths near 5 microns (see Figure 1). These areas are the brightest on Titan when viewed in each of the infrared spectral windows, but are nearly twice as bright as Xanadu at 5 microns. This may, however, be due more to the unusual nature of Xanadu than that of the 5-micron-bright areas.

The western 5-micron-bright region is located due south of Xanadu and extends from 140°W to 110°W longitude and from 13°S to 30°S latitude. The IAU has provisionally named this area Tui Regio (see Figure 2). Its eastern portion is an arcuate shape and is brighter than the more diffuse western portion. Located within the arc of east Tui Regio is a unique sharply bounded dark area first identified by Cassini's Imaging Science Subsystem (ISS) and now named Eir Macula. VIMS shows Eir Macula to be spectrally different from surrounding dark features; its presence near Tui Regio may mean that these two unusual features are related.

The eastern region, near 80°W 25°S, contains a bright arc similar in length, radius of curvature, and orientation to east Tui Regio when viewed by ISS at 0.938 microns. The arc is provisionally named Hotei Arcus. The VIMS view of the area shows a broader zone of enhanced 5-micron reflectivity extending toward the center of curvature. Analyses of this region's spectra showed that the spectral variation is indeed the result of surface markings (Barnes *et al.*, 2005) , but the identity and nature of the reflecting surface material has not yet been determined (McCord *et al.*, submitted).

The multiple instances and varying intensities of 5-micron-bright terrain implies that the process that formed them was not rare. If the southern 5-micron-bright region belongs to the set, then it could represent an evolutionary continuum whereby 5-micron-bright areas are formed and later regress toward the planetary norm. The regression could be the result of either erosion from or deposition onto the surface.

The two primary 5-micron-bright regions show arcs hundreds of km long and are surrounded by darker-than-surrounding terrain that might represent a 'moat'. The southern bright region is bordered on the ENE by a linear dark area of similar character. If these neighboring dark areas are indeed associated with the 5-micron-bright areas then they may either cause or be caused by large-scale regional tectonics.

Research into the nature of Titan's surface is only just beginning. Our understanding of the processes that control surface formation and evolution is poor. We think that the existence and nature of Titan's 5-micron-bright terrain may provide insight into those global-scale questions.

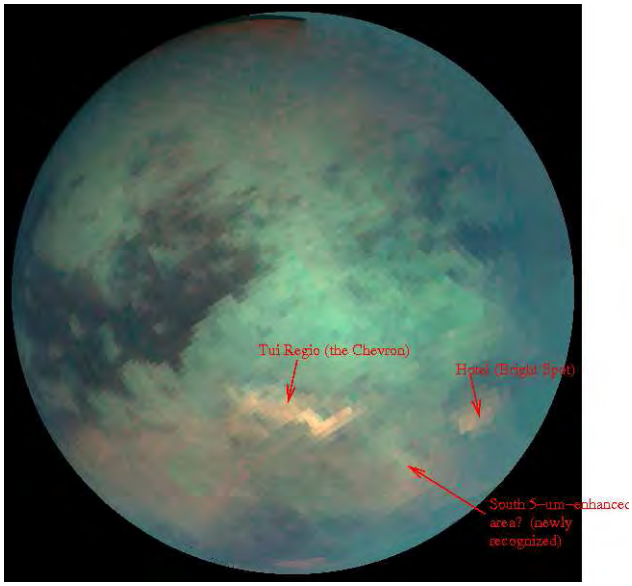

Figure 1: Titan's 5-micron-bright terrain. This is a mosaic of images taken by VIMS during Cassini's T8 Titan flyby on 2005 October 28. The color mapping paints 5.0 microns as red, 2.0 microns as green, and 1.6 microns as blue.

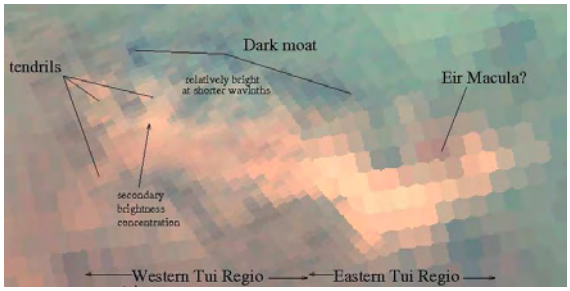

Figure 2: Tui Regio mosaic, with same coloring as Figure 1, created from VIMS' highest resolution spectral maps of the area from the Ta and Tb flybys. Tui Regio has been viewed on Ta, Tb, T3, T8, and T9, and shows no evidence of alteration at the 10s of kilometer scale.

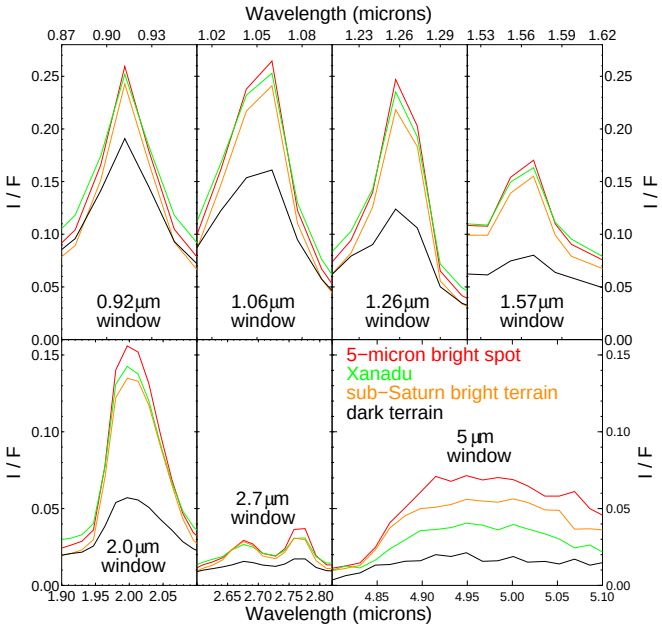

Figure 3: Spectral comparison between Titan dark terrain (black line), Xanadu (green line), Hotei Regio (red line), and typical Titan mid-south-latitude terrain (orange line).

Figure 4: This unusual image of Tui Regio was obtained by VIMS during its most recent (as of this writing) Titan flyby, T9, on 2005 December 26. The instrument is looking back at Titan's illuminated crescent, and hence the phase angle for this observation is 140°. Colors are the same as in Figures 1 and two, but with a proportionally higher maximum stretch value to not saturate with the increased atmospheric forward-scattering. The bright areas shown here are within eastern Tui Regio, but we are not yet sure how well these bright patches correlate with those seen at low phase angle. North is at right, and west toward the top.