CASSINI-**VIMS MULTI-WAVELENGTH MAPPING OF TITAN.** Jason W. Barnes, *NASA Ames Research Center, M/S 244-30, Moffett Field, CA 94034-1000, USA, (jbarnes@lpl.arizona.edu)*, John Ivens, Robert H. Brown, *LPL*.

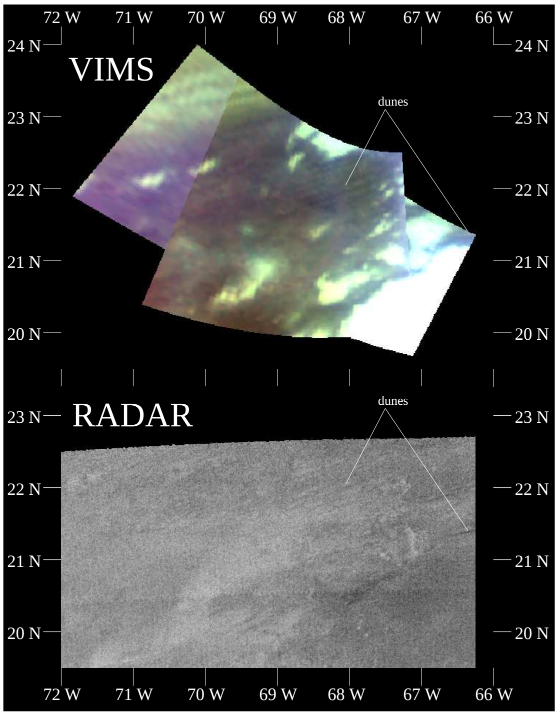

Figure 1: VIMS view of Titan's sand dunes that were first discovered by *Cassini* RADAR [3]. The RADAR view at bottom is of the same area and was taken on the T3 (2005 February 15) Titan pass.

Abstract:

Organic haze suspended in the atmosphere of Saturn's moon Titan prevents telescopes and spacecraft from seeing it's surface in optical wavelengths. In the near-infrared, absorption by gaseous methane and other atmospheric constituents limits surface visibility to discrete wavelength windows at 0.83 μm, 0.94 μm, 1.08 μm, 1.28 μm, 1.58 μm, 2.00 μm, 2.68 μm, 2.78 μm, and 5 μm.

The Visual and Infrared Mapping Spectrometer (VIMS) instrument on-board the *Cassini* spacecraft now orbiting Saturn takes advantage of these atmospheric windows to map the surface of Titan at 64 discrete wavelengths located within the windows. VIMS is a spot-scanning mapping spectrometer with spectral coverage between 0.3 μm and 5.1 μm [1].

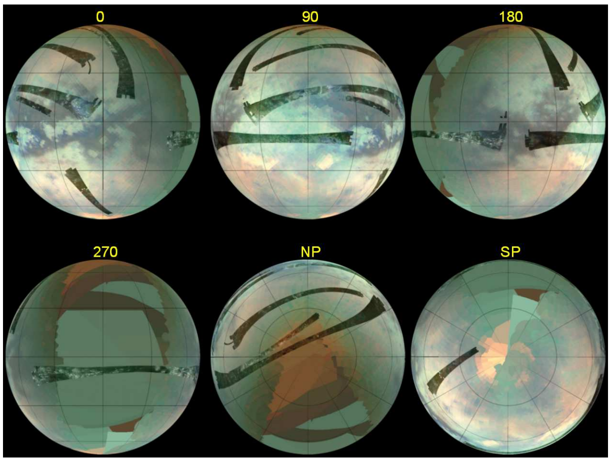

Figure 2: RADAR swaths placed in context with VIMS global maps.

We combined SPICE pointing geometry with an in-house mapping algorithm to generate global cylindrical maps of Titan at 4 pixels per degree in 64 separate wavelength channels. The maps reveal surface color variation across Titan for the first time [2] (see Figure 3).

Memory address limitations inherent in 32-bit computing limited the maximum possible resolution for full globes at 64 wavelengths to 4 pixels per degree, but new paging and windowing implimentations now allow higher-resolution maps. For sufficiently small areas, arbitrarily high resolutions are possible. In Figure 1, we show a cylindrically projected mosaic of two VIMS cubes from the T4 (2005 March 31) Titan flyby mapped at 100 pixels per degree. We found a Lanczos interpolation scheme to produce better results than linear interpolation, and that both were much better than a bicubic interpolation, which blurred small-scale features into invisibility.

Intercomparison of VIMS and RADAR observations of the same areas, like that in Figure 1, have shown the limitations of SPICE kernels for planetary geometry. RADAR geometry is superior to that of VIMS alone in that RADAR obtains time delay information that allows them more precise knowledge of the spacecraft position and pointing. When possible, we register VIMS maps to RADAR swaths (Figure 2). However, VIMS' spot-scanning architecture leads to subtle warping and variations in the pointing correction even within individual 64x64 image cubes. Improved geometric reconstruction of VIMS data is an ongoing challenge.

References

[1] Brown R.H., Baines K.H., Bellucci G., Bibring J.P., et al. (2004) *Space Science Reviews*, *115* 111–168.

[2] Barnes J.W., Brown R.H., Soderblom L., Buratti B.J., et al. (2007) *Icarus*, *186* 242–258.

[3] Lorenz R.D., Wall S., Radebaugh J., Boubin G., et al. (2006) *Science*, *312* 724–727.

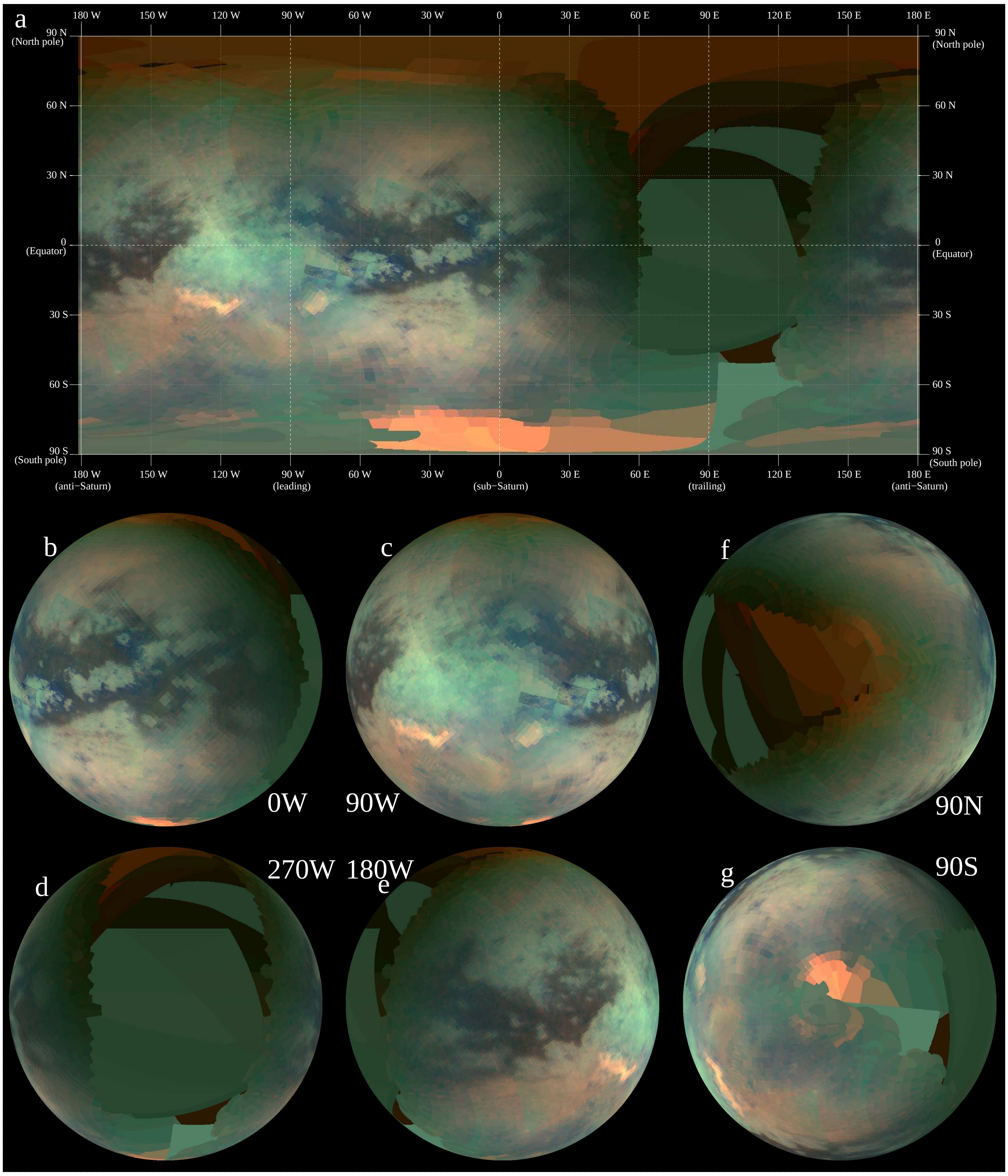

Figure 3: Global Titan maps from *Cassini* VIMS data obtained during the T8 (2006 October 28) and T9 (2006 December 29) flybys. Red has been colormapped to 5 μm, green to 2 μm, and blue to 1.3 μm.