NUMBERS, DISTRIBUTION AND MORPHOLOGIES OF IMPACT CRATERS ON TITAN C.A. Wood[1], R. Kirk[2], and R.D. Lorenz[3], [1]Planetary Science Institute, Tucson, AZ and Wheeling Jesuit University, Wheeling, WV (chuckwood@cet.edu), [2]US Geological Survey, Flagstaff, AZ, [3]Johns Hopkins Unuversity Applied Physics Lab., Laurel, MD.

Introduction: Titan has very few impact craters [1]. With more than 30% of the surface now imaged by Cassini Radar through data take T44 there are only seven certain impact structures known. Fifty additional possible craters also have been identified. The certain craters have two distinct morphologies, and the probable craters appear to mostly be more degraded version of these two types. The craters do not appear to be randomly distributed.

Crater Morphologies: Sinlap, Afekan and Ksa (Fig. 1) have morphologies that are familiar from the Moon and Mars. Ksa (29 km diameter) is the youngest crater, possessing an extensive ejecta blanket, a little-eroded raised rim, a large central peak, and a radar dark smooth floor. Sinlap (80 km) appears next youngest, with an ejecta deposit, eroded raised rim, and flat floor with no central peak visible on Radar. The ejecta blanket of Afekan (115 km) is largely covered by surrounding surface materials, its rim is extensively cut by chutes, and the broad flat floor carries a small central peak.

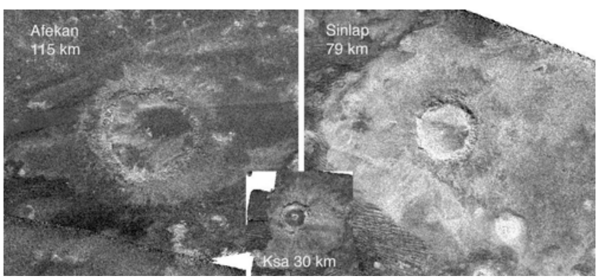

Fig. 1: Afekan, Sinlap and Ksa to scale.

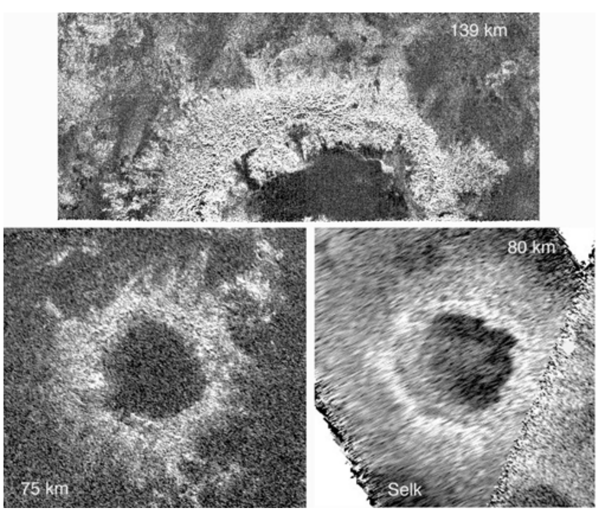

Fig 2: Radar bright rim craters to scale.

Selk and two unnamed craters (Fig. 2) have Radar-bright and apparently jagged rims with smooth floors. These rims – seen best at the 139 km wide crater – are not like crater rims on other planets; they lack terraces and other indications of collapse. Their floors are Radar dark/smooth. The largest crater occurs at the edge of a Radar swath and shows a hint of a central peak. These jagged rim craters are amongst the largest on Titan – about the same diameters as the more normal looking Afekan and Sinlap. Are the differences in rim morphology evidence for different crustal properties or thicknesses across Titan?

Previously [2], it appeared that Radar-bright/rough-textured terrains contained numerous eroded craters and thus were old. Systematic examination of all Radar images shows that these *ghost circles* (Fig. 3) are common and frequently have non-circular and incomplete outlines. They probably are not eroded impact craters, but their origin is unknown.

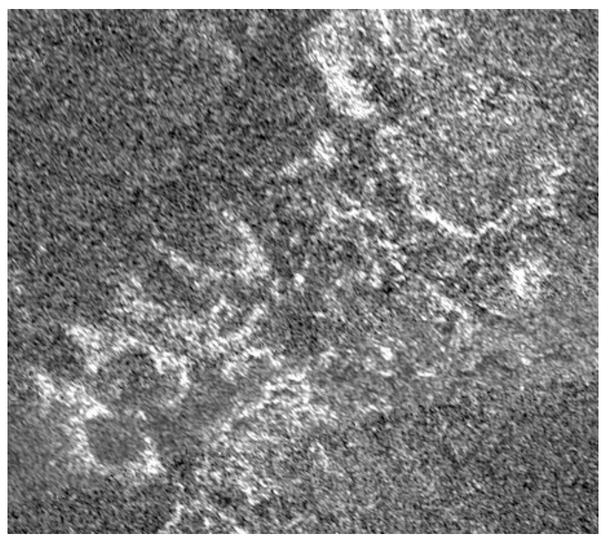

Fig. 3: Ghost rings on swath T16; image 175 km wide.

Crater Distribution: The distribution of Cassini Radar swaths is uneven, with little coverage south of 30°S, and more over the leading hemisphere (0-180°) than for the trailing. Presently, cartographic mapping is complete only through the T39 data take, which includes 49 craters. Based on those craters and the actual areal cover of data takes up through T39 we make the following observations. Craters are found in proportion to the areas of coverage in equal area latitude bins, except there is a 17% deficiency between 42°N and

90°N. There is a 14% excess of craters between 42°N and 19.5°N. Again, these are deviations in the expected distribution of craters of all diameters based upon the actual areas of Radar coverage.

The paucity of impact craters in the northern polar region may be due to the abundance of lakes and seas which may submerge craters; indeed, a 10 km diameter crater is revealed by its circular rim rising above a lake surface. A large area of the surface north of 60° is also composed of circular and irregular depressions that may be of karstic origin [3]. In any case, few other types of landforms exist in these northern areas, implying that these surfaces may be relatively young.

Longitudinally, there is an excess of 20% of craters on the leading hemisphere compared to the trailing. Although Titan has few craters, there are many areas with Radar coverage that lack any craters so this may be evidence for a significant leading-trailing hemispheric difference. Further statistical testing is required at the end of the mission when presumeably more craters will have been discovered and we will have detemined the areal coverage of all data takes.

References: [1] Wood C.A. et al. (2005) *LPS XXXVI*, Abstract #1117. ([2] Wood C. A. et al. (2008) *LPS XXXIX*, Abstract #1990. [3] Mitchell K. L. et al. (2007) *LPS XXXVIII*, Abstract #2064. [5]

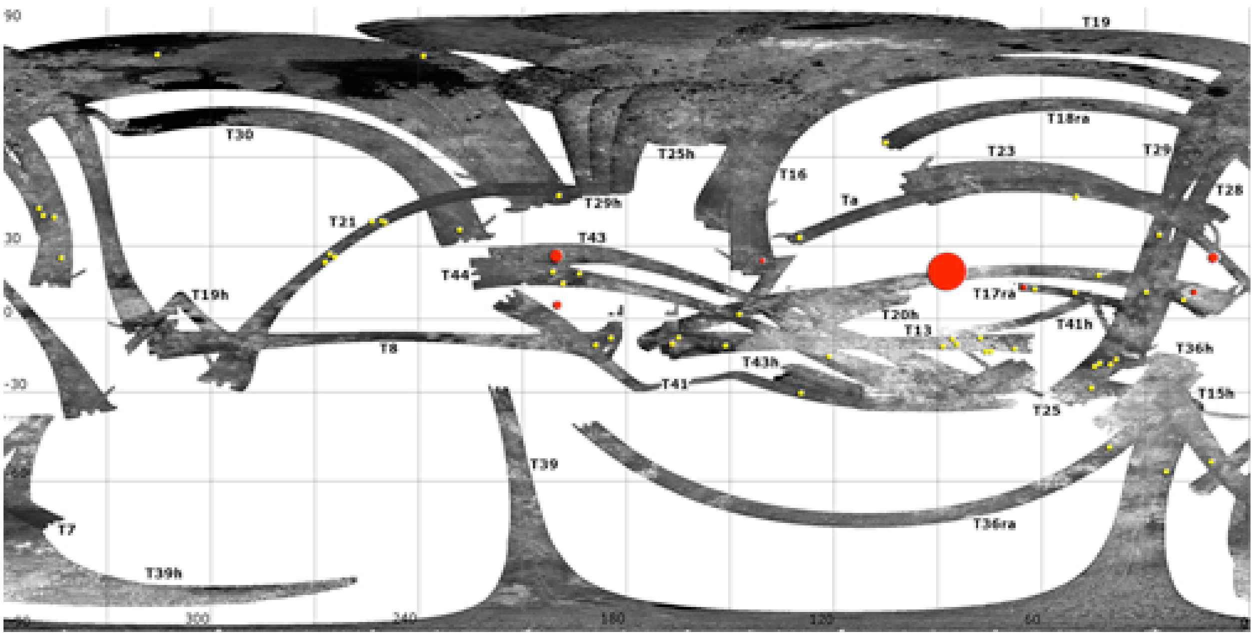

Fig. 4: Red dots are certain impact structures (the big one is Menrva Basin) and yellow dots are probable impact craters.