THE EARTHLIKE SHORELINE MORPHOLOGY OF TITAN'S ONTARIO LACUS. S. Wall[1,*], A. Hayes[2], C. Bristow[3], R. Lorenz[4], E. Stofan[5], J. Lunine[6], A. Le Gall[1], M. Janssen[1], R. Lopes[1], L. Wye[7], L. Soderblom[8], P. Paillou[9], O. Aharonson[2], H. Zebker[7], T. Farr[1], G. Mitri[1], R. Kirk[8], K. Mitchell[1], C. Notarnicola[10], D. Casarano[11], B. Ventura[12]
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Introduction: Using recent Cassini radar synthetic aperture radar (SAR) images at 350 – 500 m resolution, we report and interpret features on and near the shoreline of Ontario Lacus, near Titan's S pole, revealing morphological evidence for active material transport and erosion. Asymmetry in the two longer shorelines of the lake provides evidence for preferred wind direction; the northeastern shore is dominated by a gently sloping, possibly wave-generated beach, while the southwest shore shows Earthlike rivers, deltas and flooded topography, indicative of very low slopes. We show numerous comparisons with terrestrial analogs to conclude that Ontario is a dynamic lake, similar in many ways to terrestrial lakes, with active shoreline processes.

Lakeshore Features: Several hundred lakes have been identified on Titan [1], with more in the N hemisphere [2]. Ontario Lacus, at 74S, 180W, has an area of 14000 km^2, making it the largest in the S hemisphere. The gross aspects of its shoreline, and evidence for changes to it, have been reported [3]. Ontario's northeastern side (Fig. 1) has a constructional wave-dominated shoreline with a raised beach, with indications of former lake shorelines at multiple levels. Beach development along the northeast shore suggests onshore winds and wave activity, consistent with global prediction [4]. In contrast, the southwestern shore is an indented coastline with ria-like flooded valleys and local delta development at the river mouth. Here the morphology lacks wave-formed sedimentary structures, rather suggesting a drowned coast indicative of a relative rise in lake level -- possibly due to offshore winds. The different shoreline morphologies suggest a tilting of the basin floor towards the west and an epoch of winds from the south to southwest.

All of these morphologies characterize a dynamic lacustrine environment on Titan, and all are familiar, even though the working fluid is almost certainly an ethane-methane mixture. The Indus, Mississippi, Irrawady, and Song Hong (Red) Rivers have depositional deltas similar to Ontario's but with areas nearly two orders of magnitude larger, indicating sediment flux into Ontario is comparatively smaller than that for similar-sized transportation systems on Earth. Similar flooded valleys appear in Utah, USA and along the south coast of England. Wave-dominated beaches dominate the E Lake Michigan and New Jersey (US) shores.

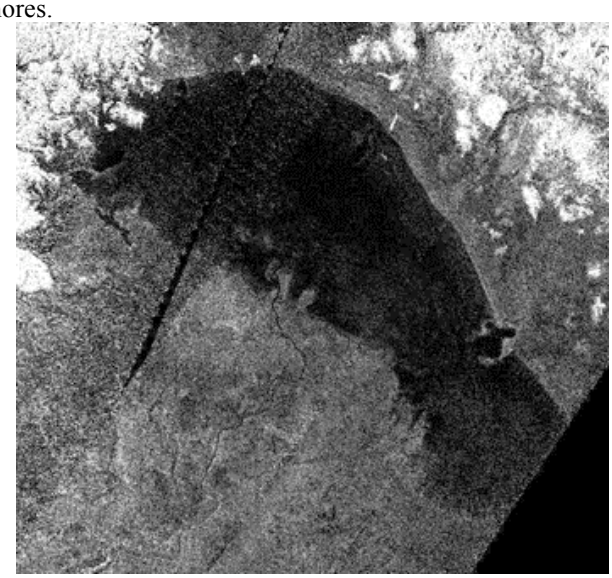

Figure 1.- Mosaic of SAR from Titan passes T57 and T58; north is up. Left portions of lake and shore contain processing artifacts in this preliminary version.

The depth profile of Ontario Lacus is poorly constrained, but if we extrapolate from the shore topography the lake is likely to be relatively shallow and thus could accommodate a large delta. The lobate morphology of the delta is consistent with a shallow-water delta, suggesting low sediment discharge and thus probably low sediment supply, slow flow velocity and a low sediment transport capacity.

As shown here, Ontario presents one more piece of evidence for the Earthlike balance of geological processes that are modifying Titan's surface. As Cassini's

proposed second extended mission continues to study Titan, we expect to see further examples of the dynamic nature of its surface and the liquid bodies on it.

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