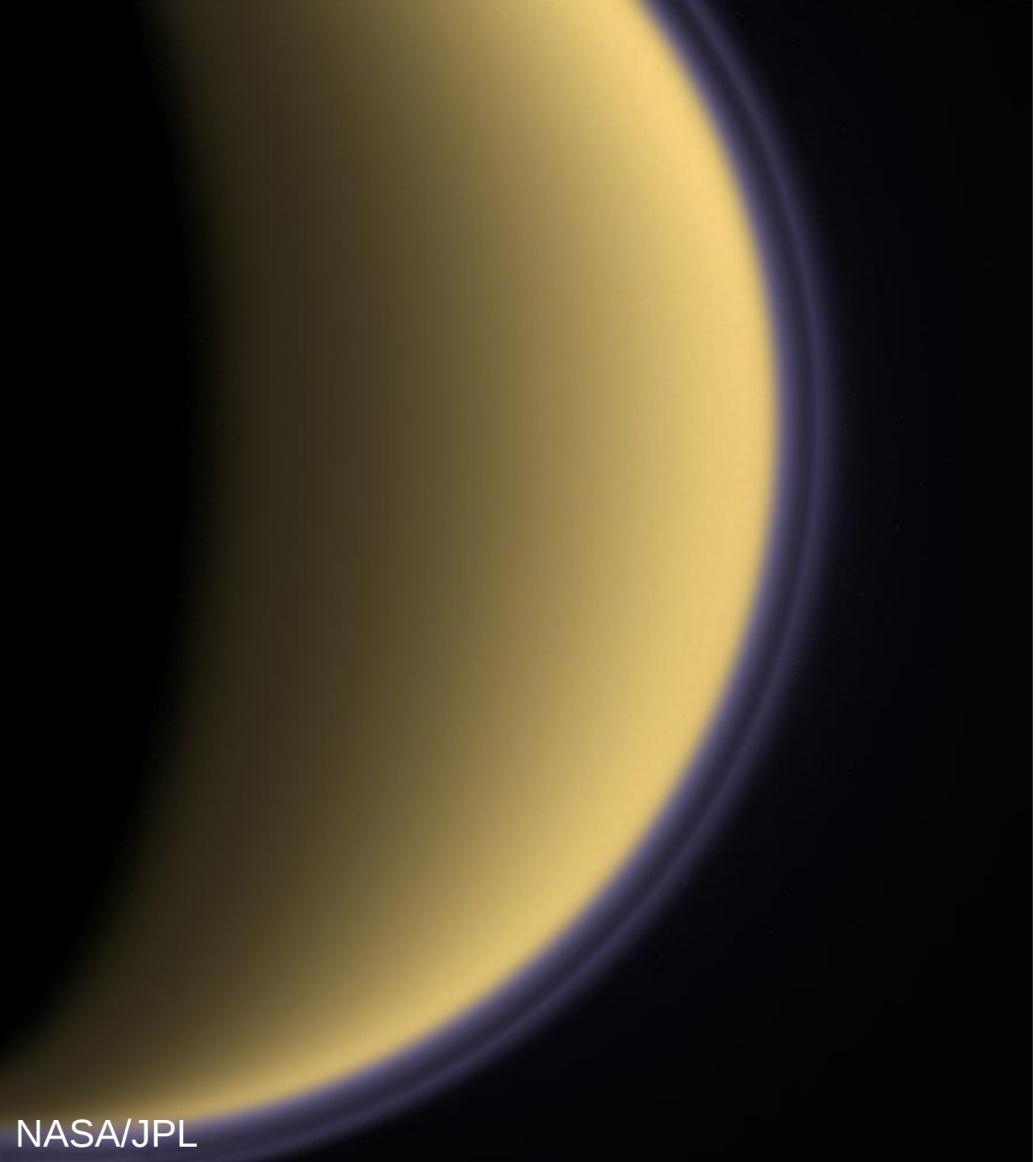
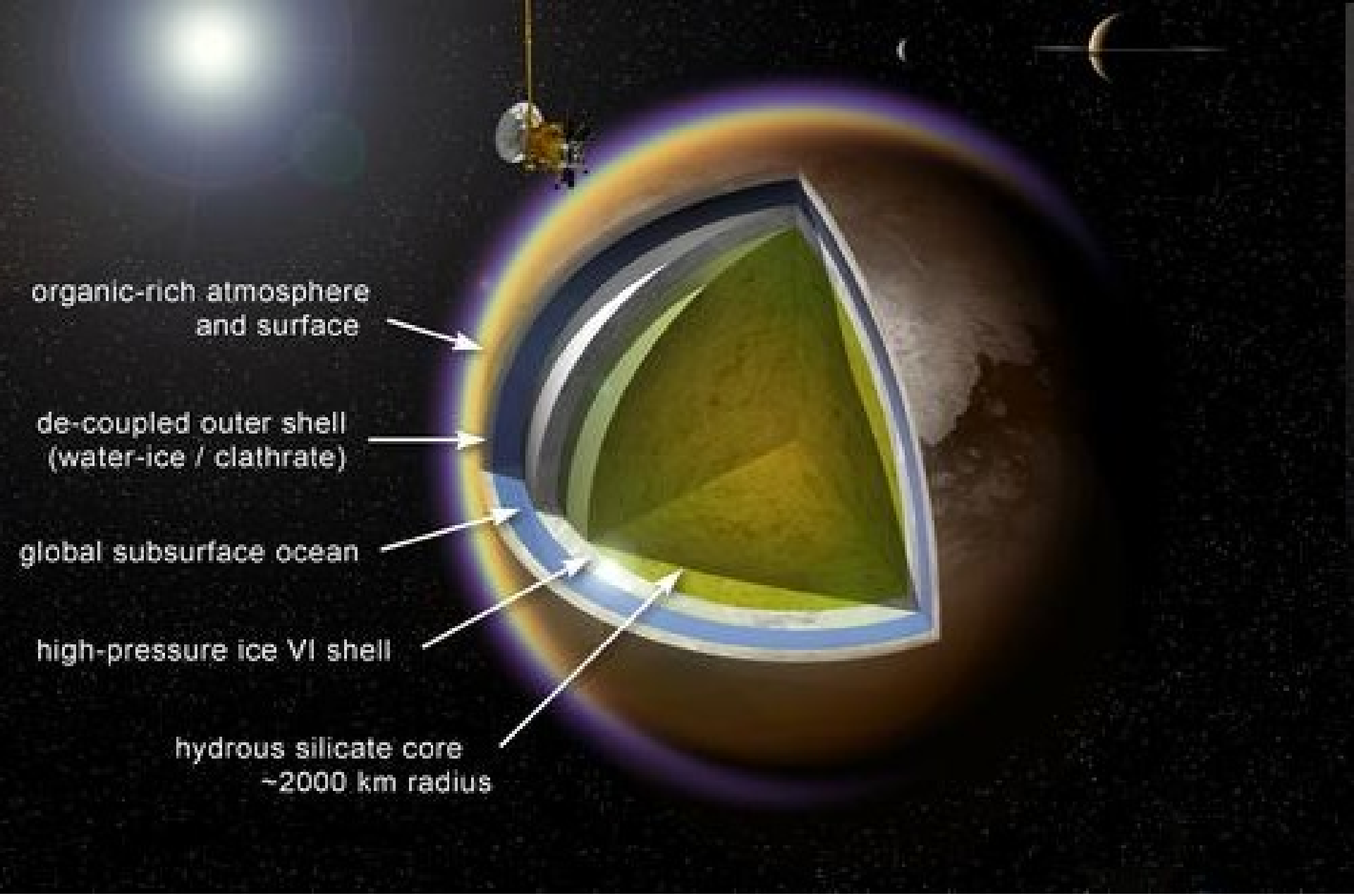


Titan: a long way from grad school at Michigan

All paths lead to where you're going!

Donna M. Jurdy
(Michigan, Ph.D., '74)
Northwestern University

Titan:
Even so far away
it's the temperature!



Cassini at Titan under a distant sun.

A. D. Fortes/UCL/STFC

Needed for habitability:

Solid surface

Atmosphere

Liquid on surface:

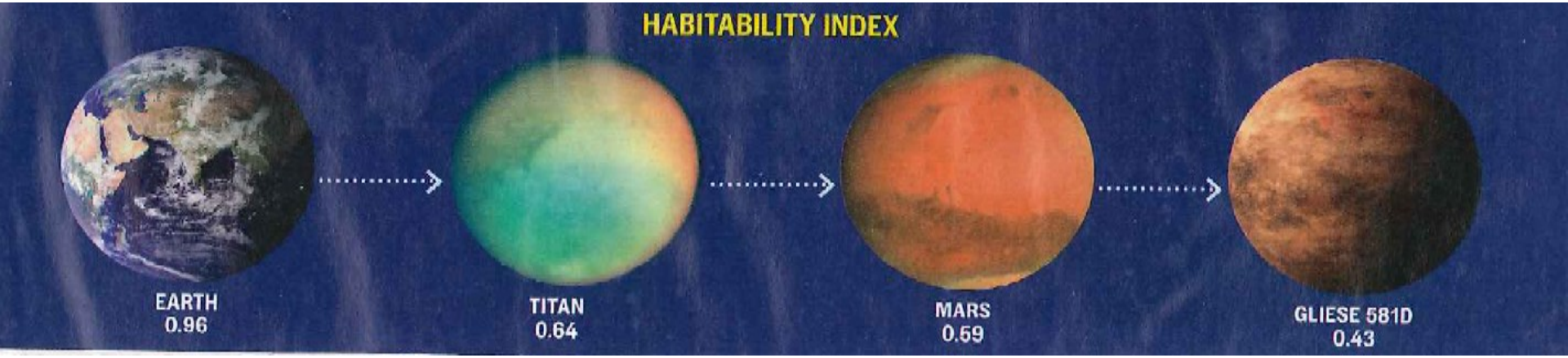
need not be water

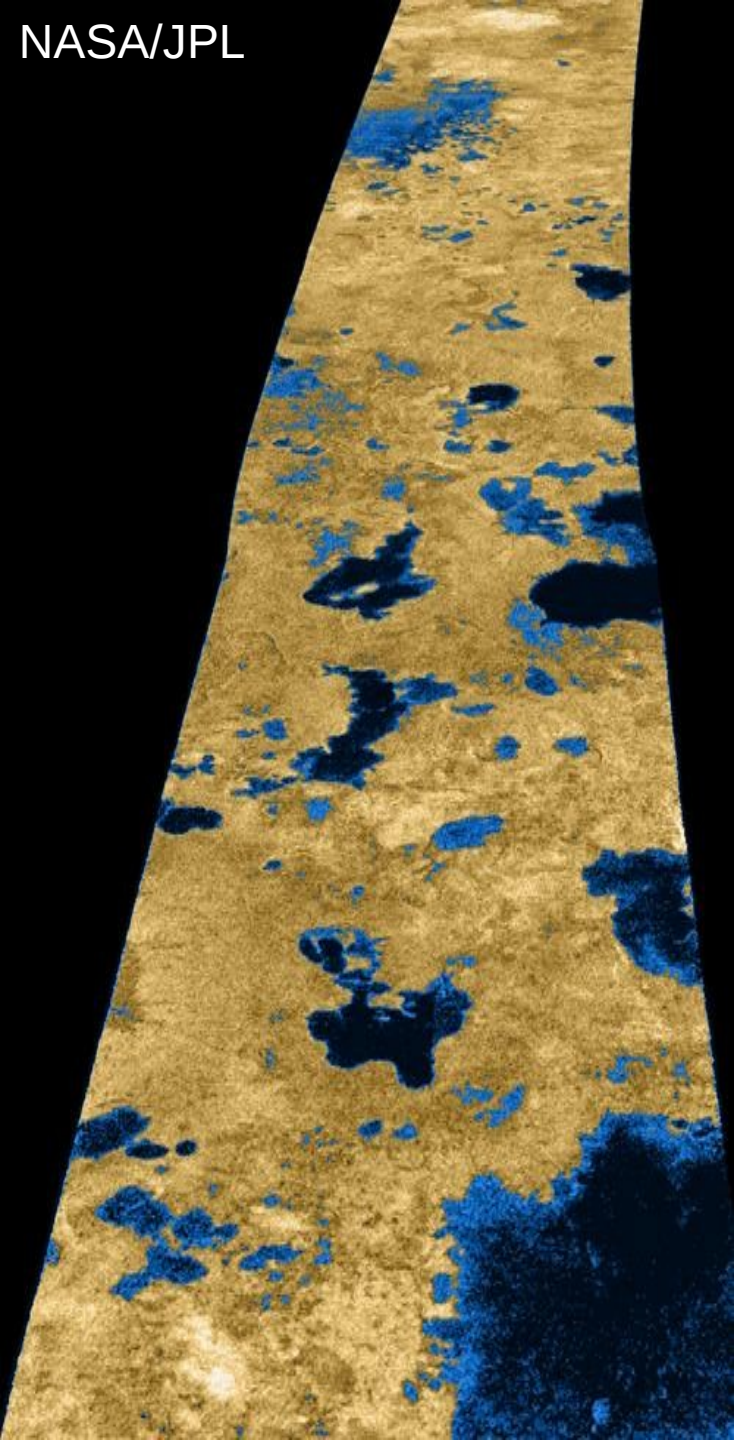
Titan:

Methane triple point!

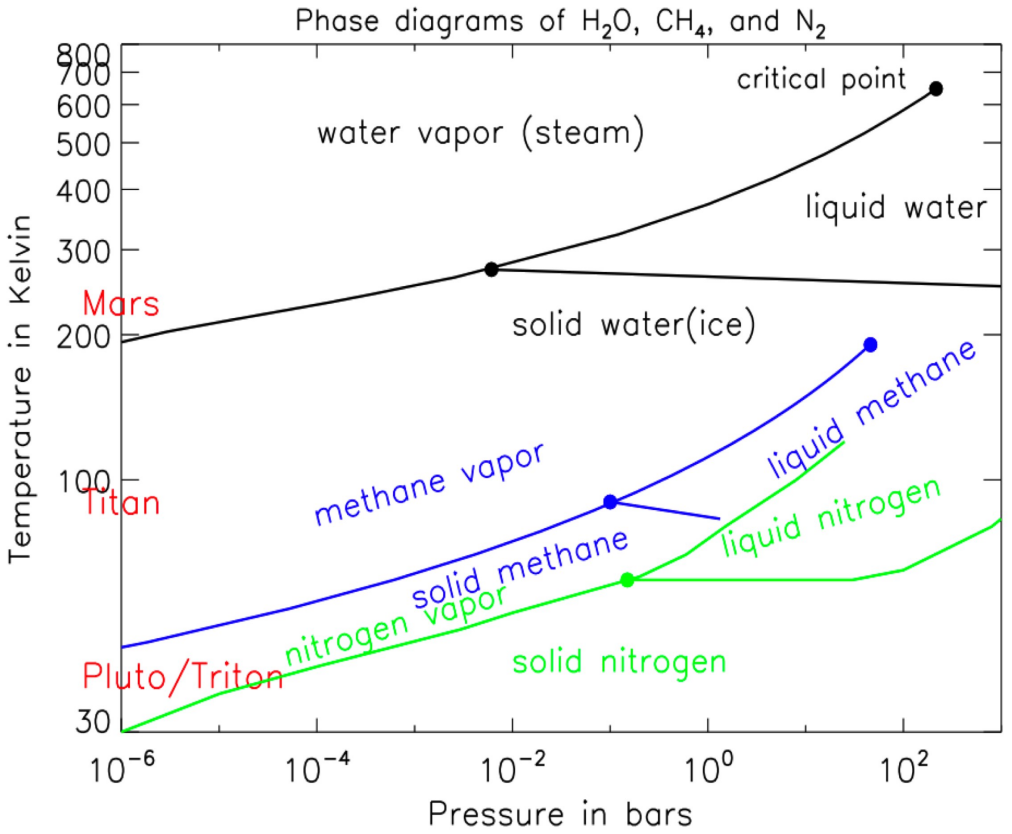
PHI - Planetary Habitability Index:

Schulz-Makuche et al., 2011





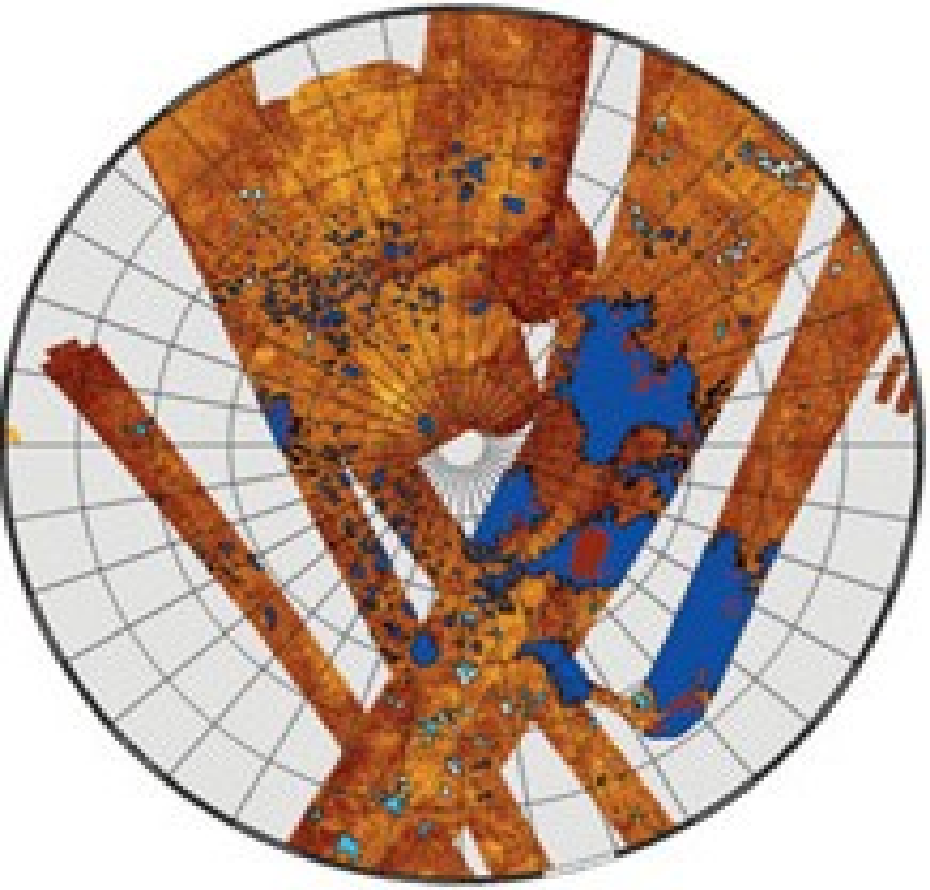
Titan's Methane Lakes

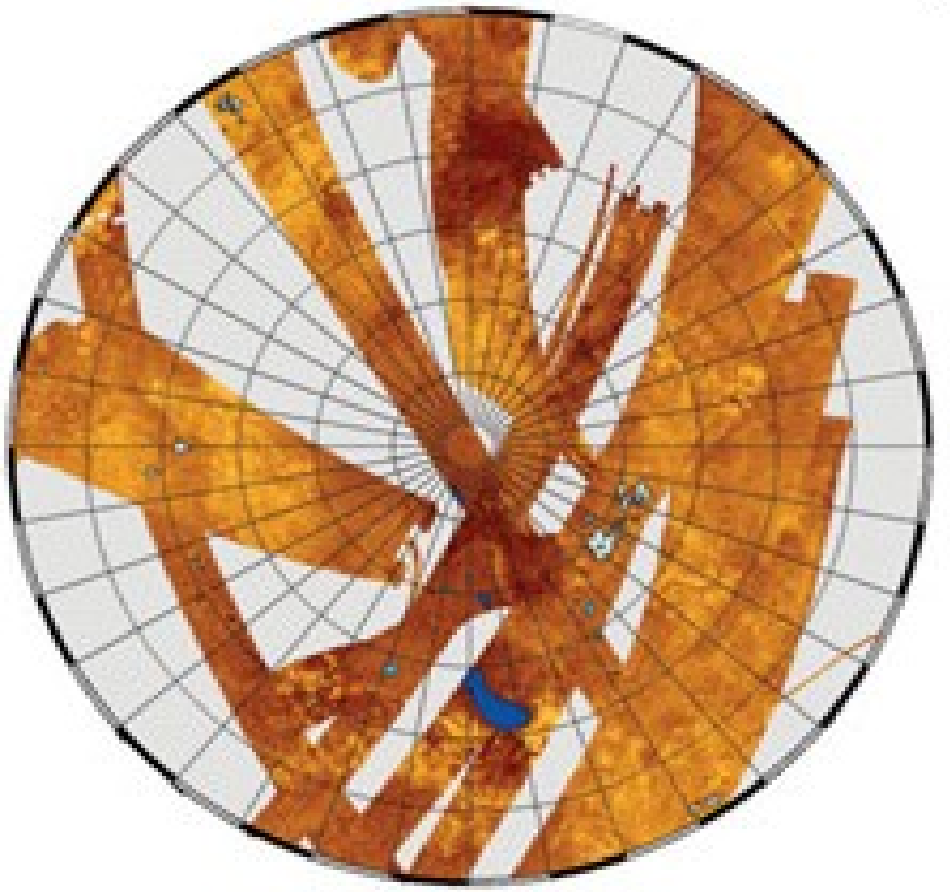


http://www.lpl.arizona.edu/undergrad/classes/spring2011/Hubbard_206/Lectures4

North Pole Lakes

South Pole Lakes

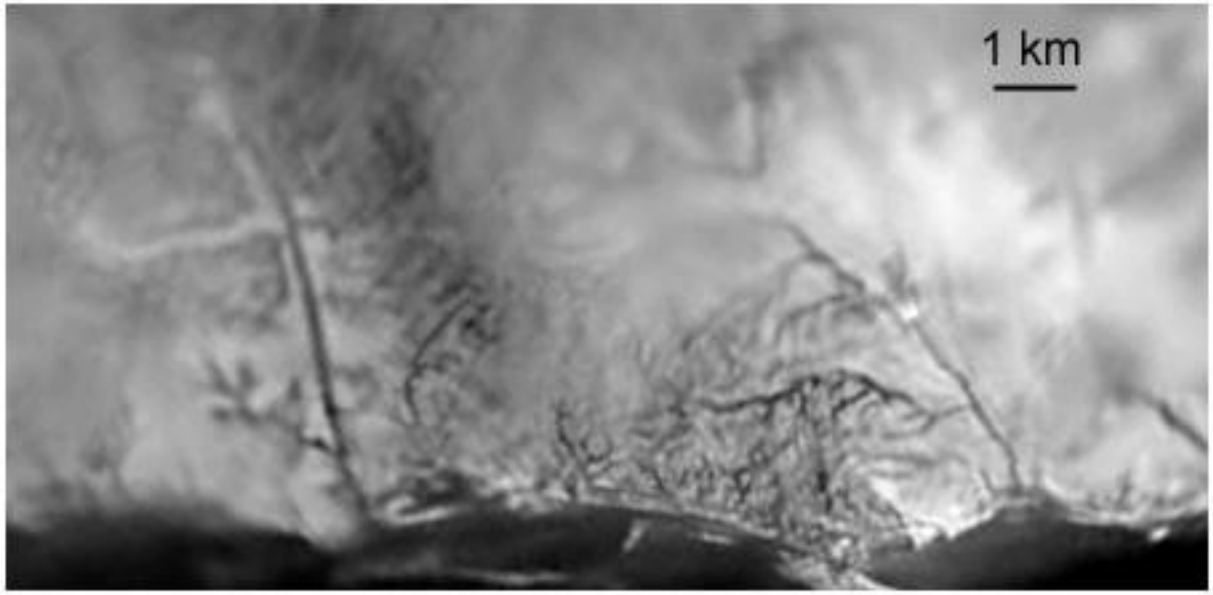


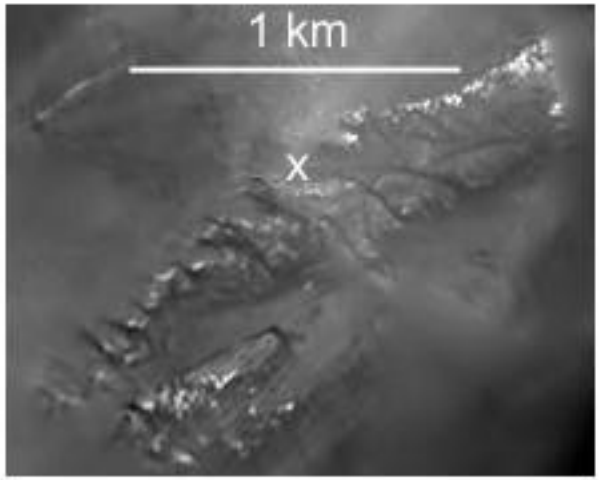


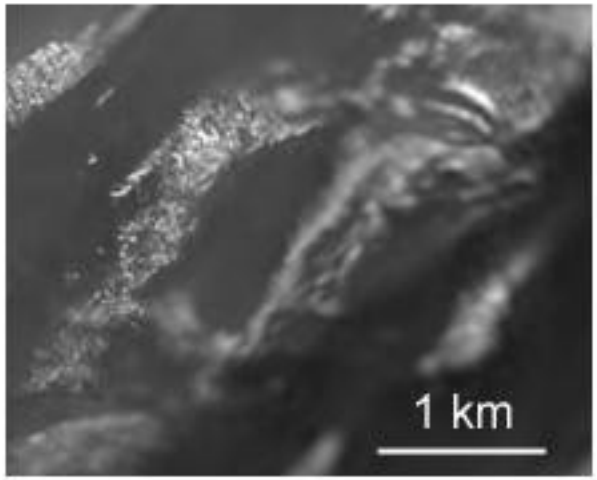
Titan Lakes

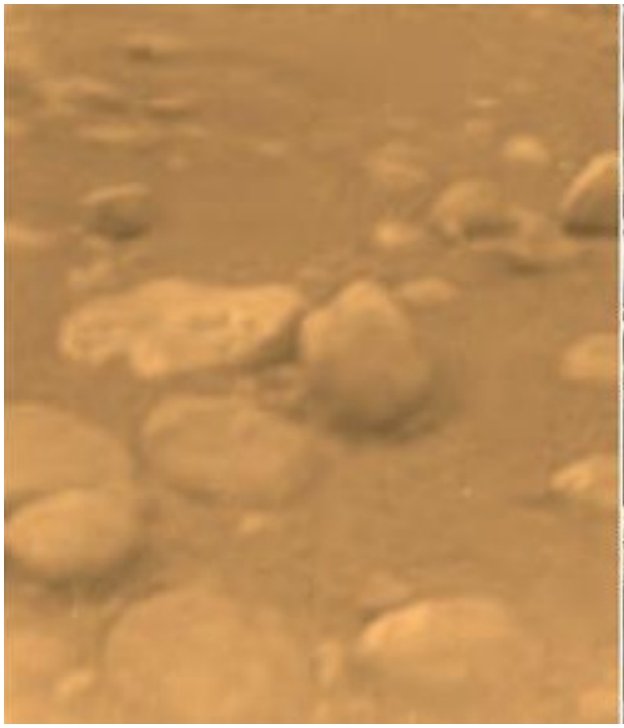
NASA/JPL/Space Science Institute

Titan's Rivers





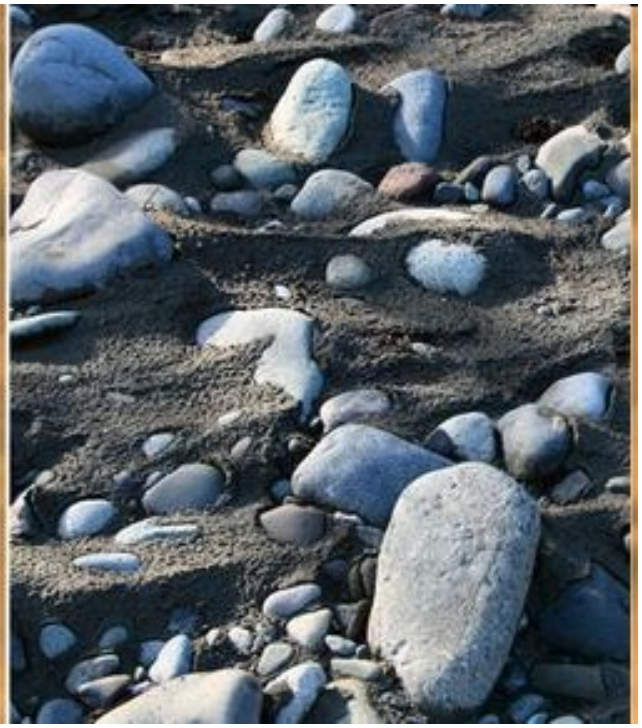




Taken by Cassini Huygens

Pebble-sized water ice
and solid hydrocarbon

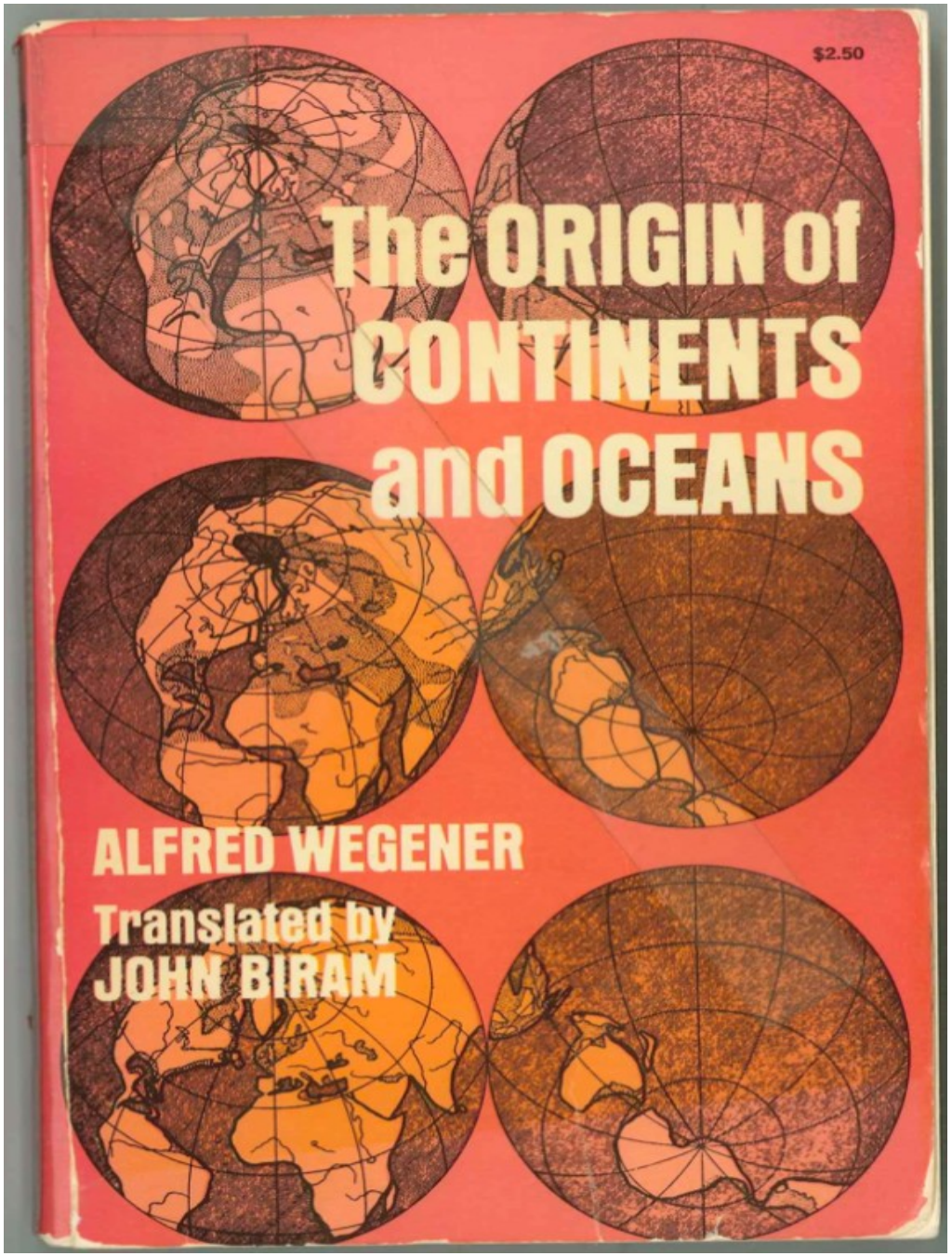
Possible dry river bed



River Rocks on Earth

Titan's Riverbeds?

NASA/JPL/ESA/University of Arizona and S.M. Matheson



Hypsography – evidence for Continental Drift

In the whole of geophysics, there is hardly another law of such clarity and reliability as this – that there are two preferential levels for the world's surface which occur … side by side, … the continents and ocean floors…"

Alfred Wegener, 1929

Terrestrial body hypsography

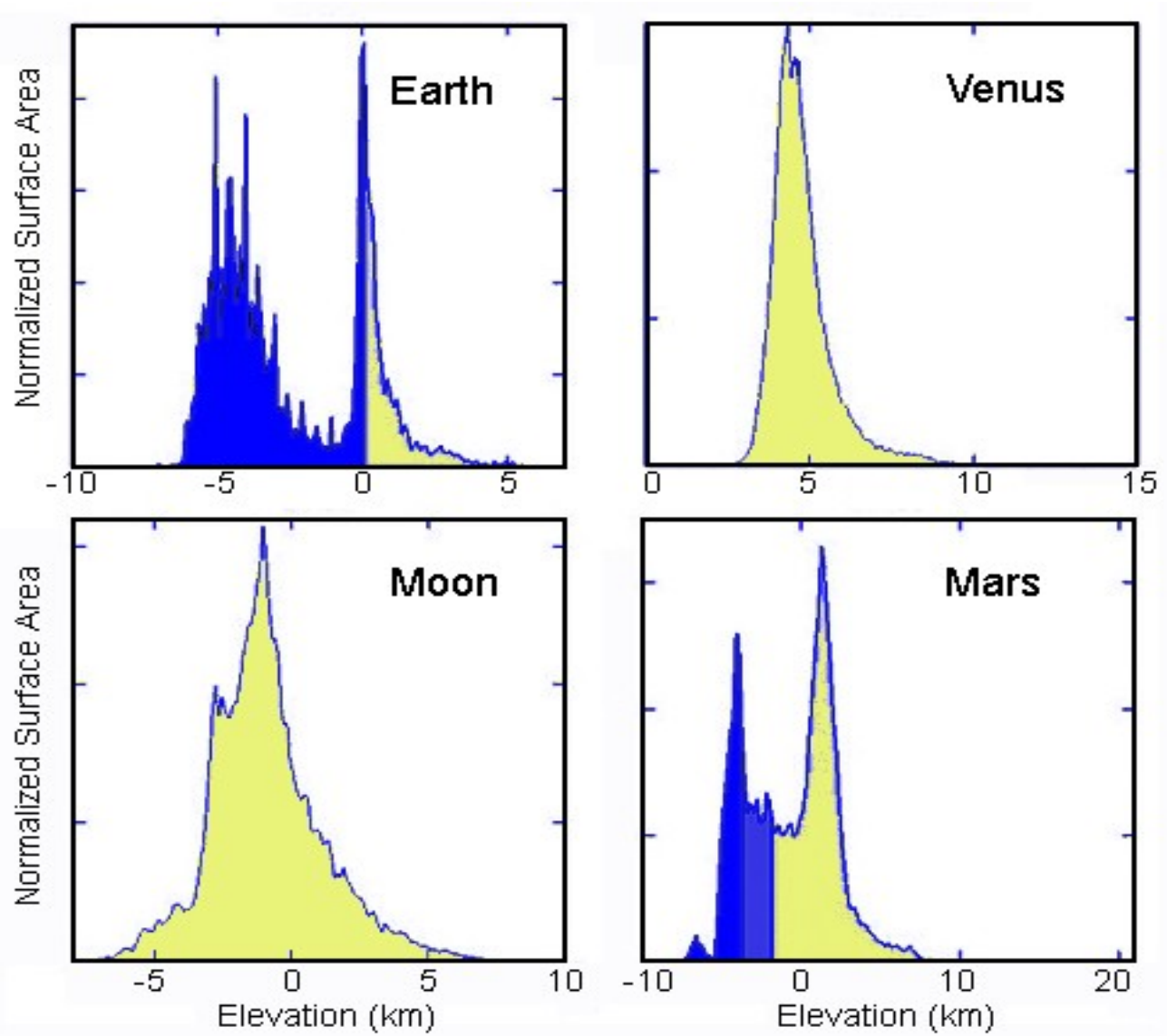
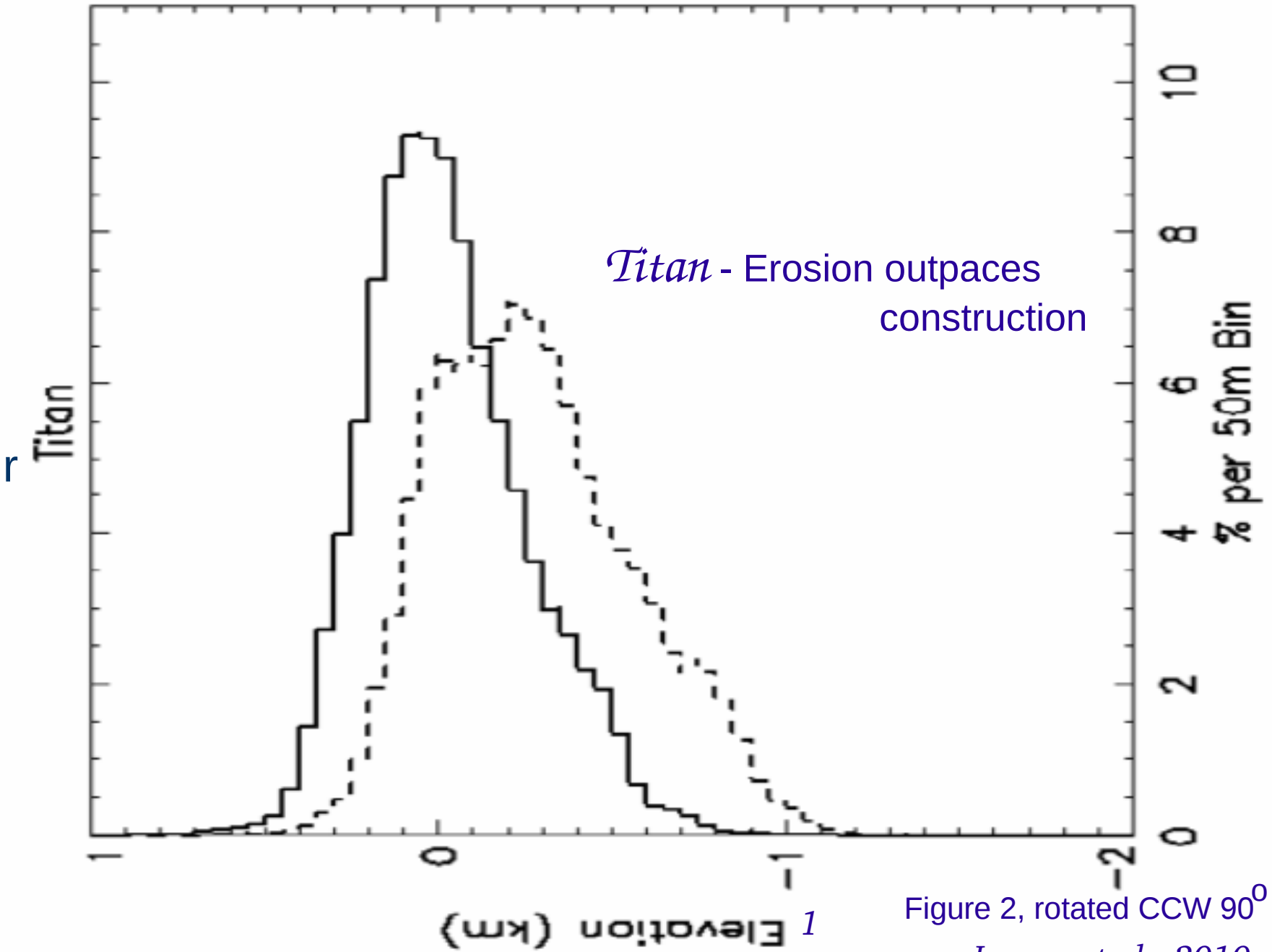


Figure 1
Stoddard and Jurdy, 2011

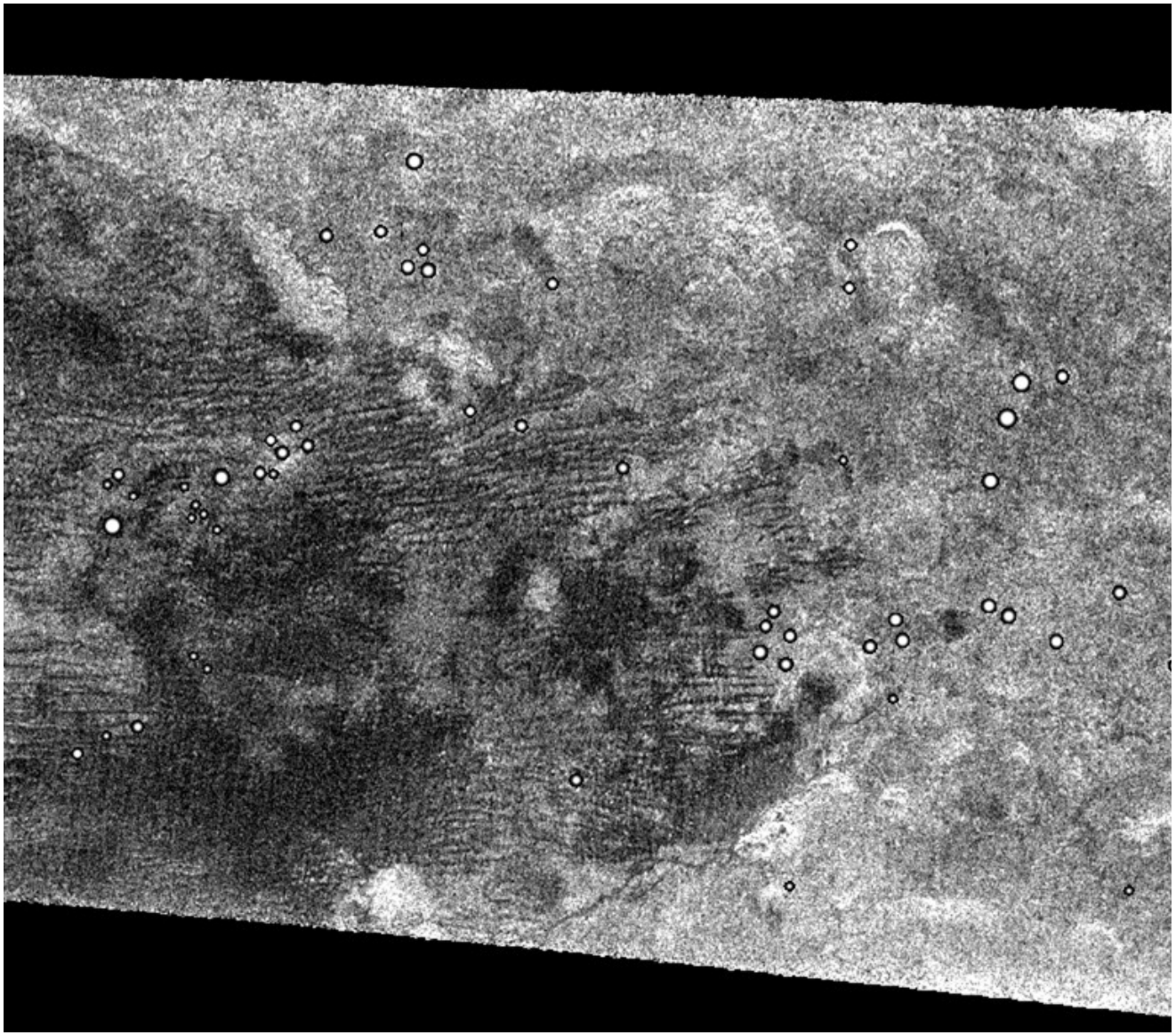


Titan - Erosion outpaces construction

Figure 2, rotated CCW 90°

Lorenz et al., 2010

Titan – it's the pits



Adams & Jurdy, 2012

Figure 10

Adams and Jurdy, 2012

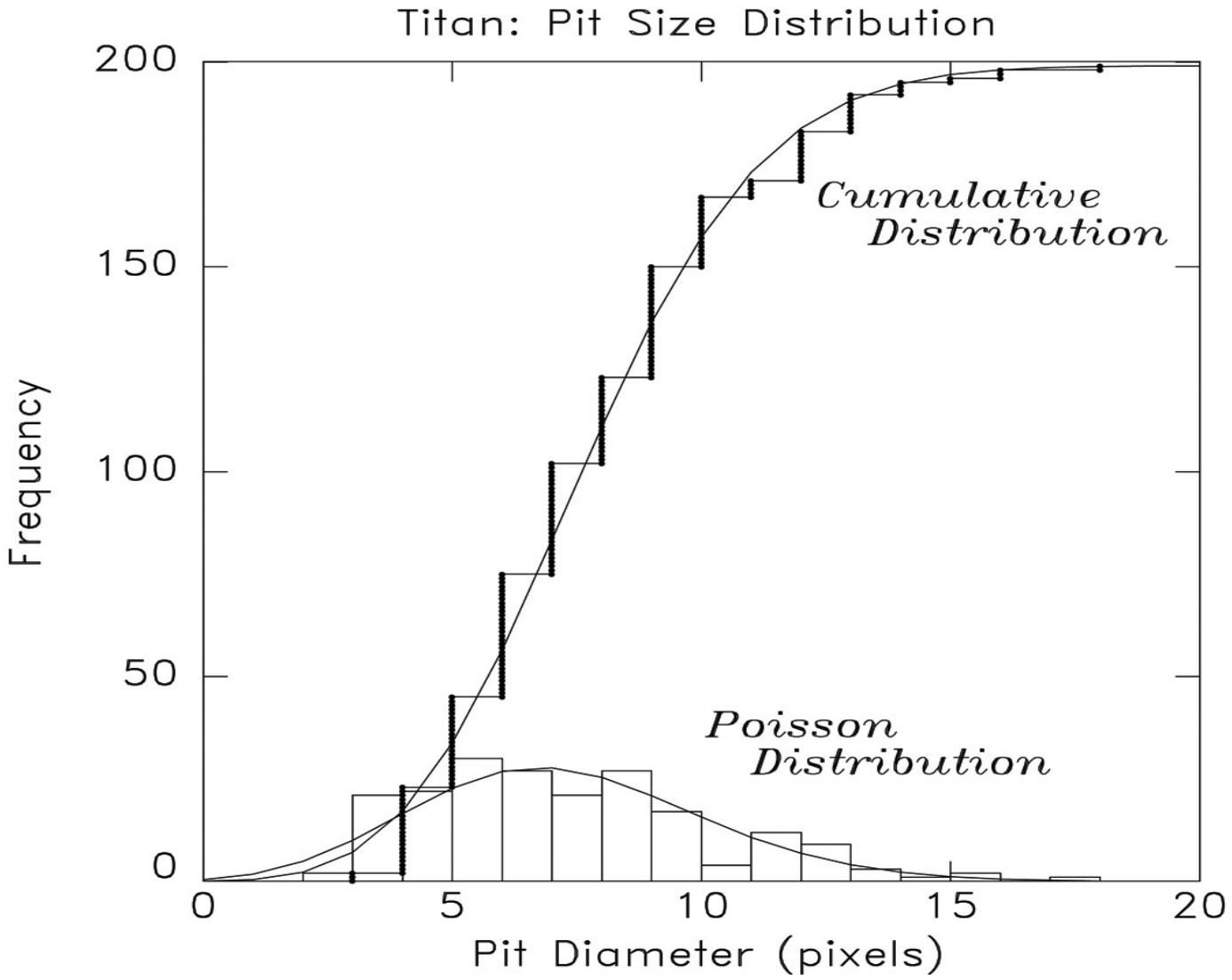
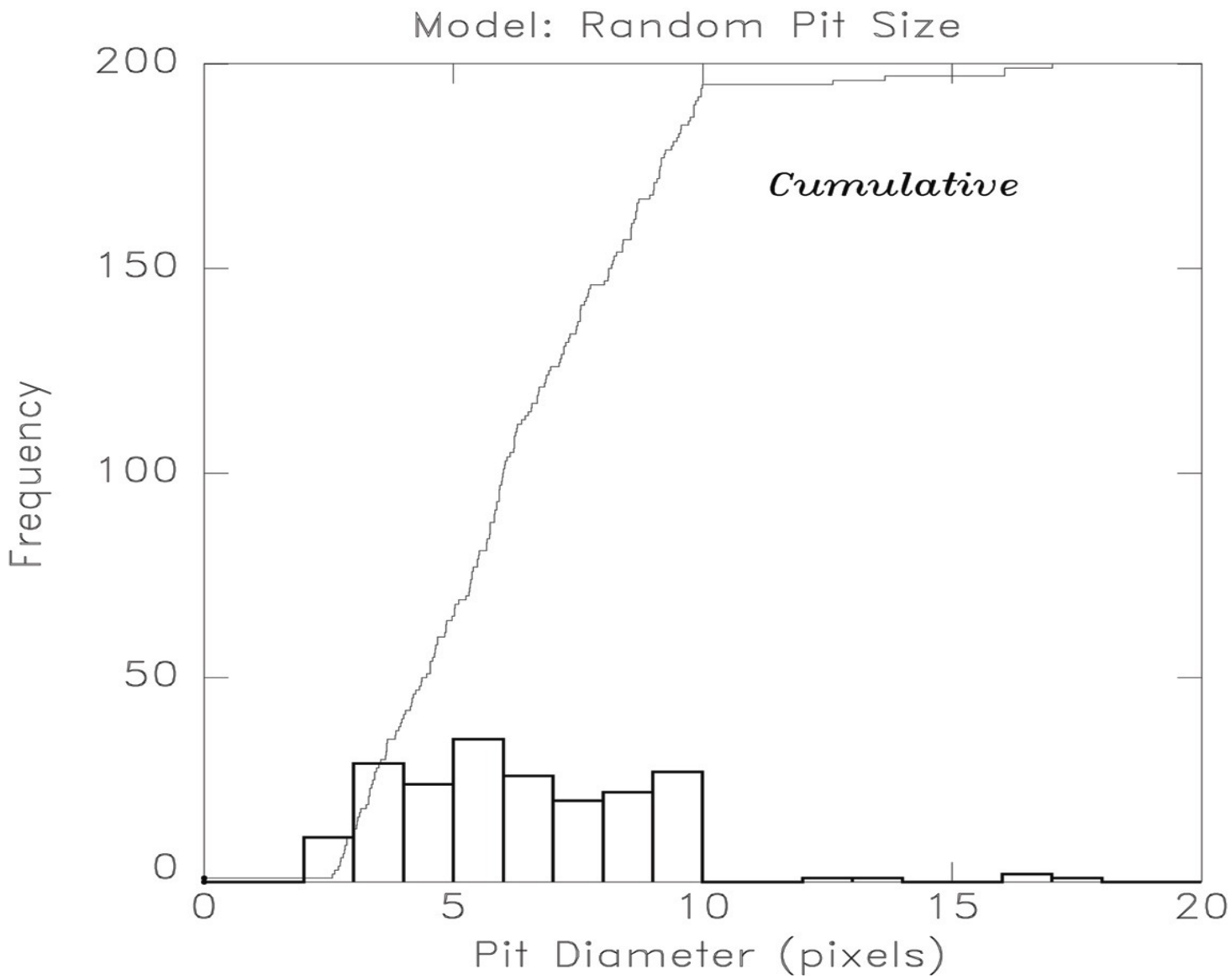
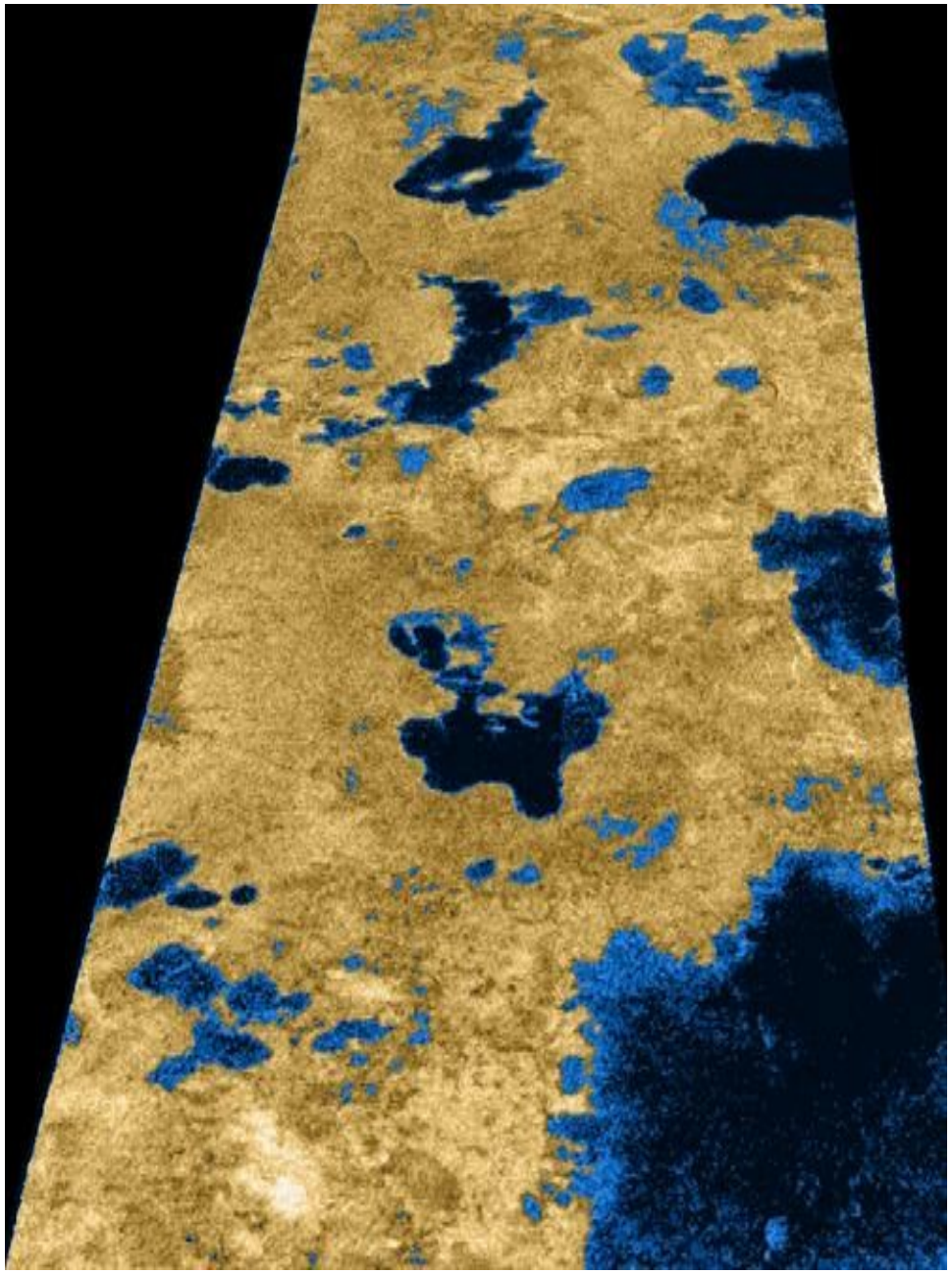


Figure 12

Adams & Jurdy, 2012





Titan -

Why are the lakes dark?

Reflectivity Measurements
Diamond anvil cell

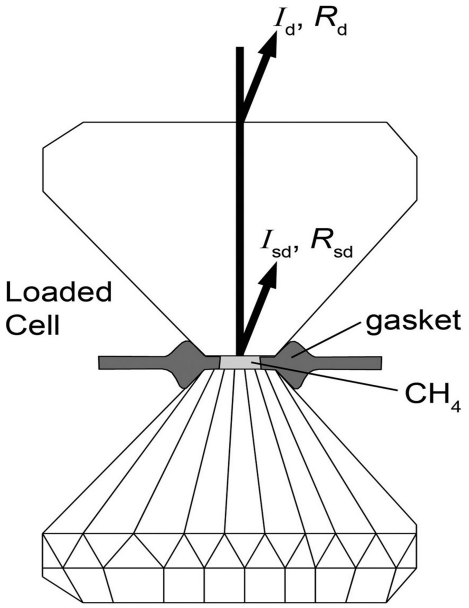
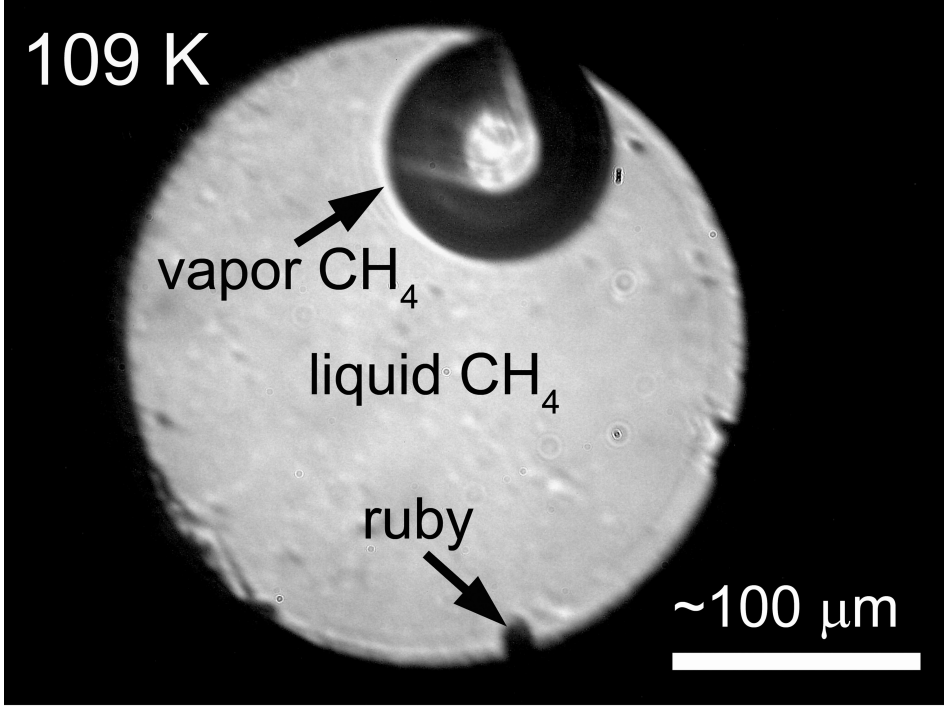


Figure 2
Adams et al. 2012

Experiment at Methane triple point conditions



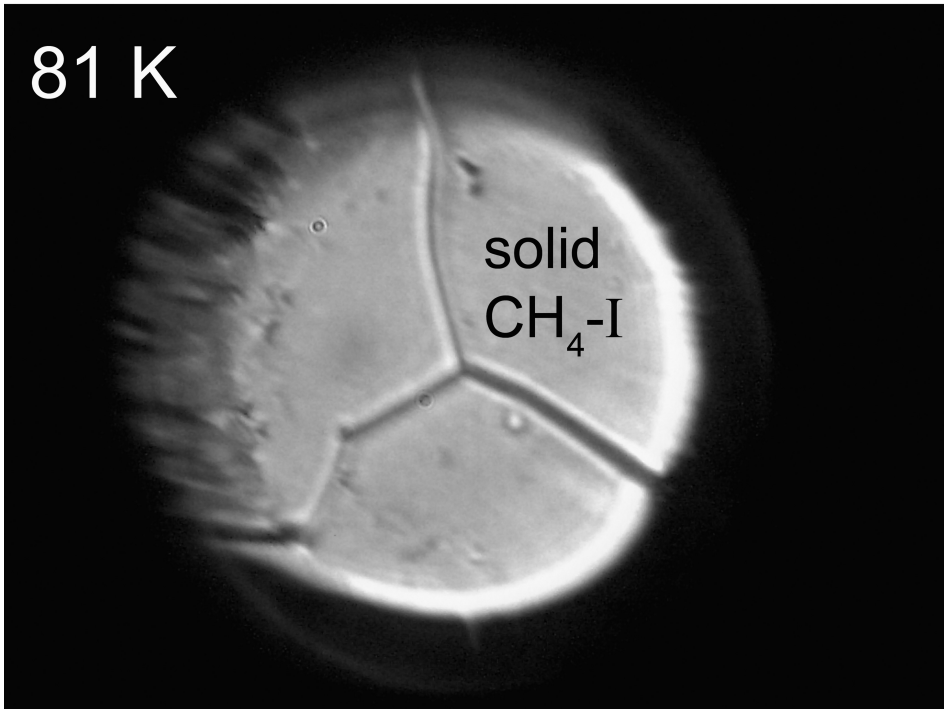


Figure 1

Adams et al. 2012

Methane: Liquid darker than solid!

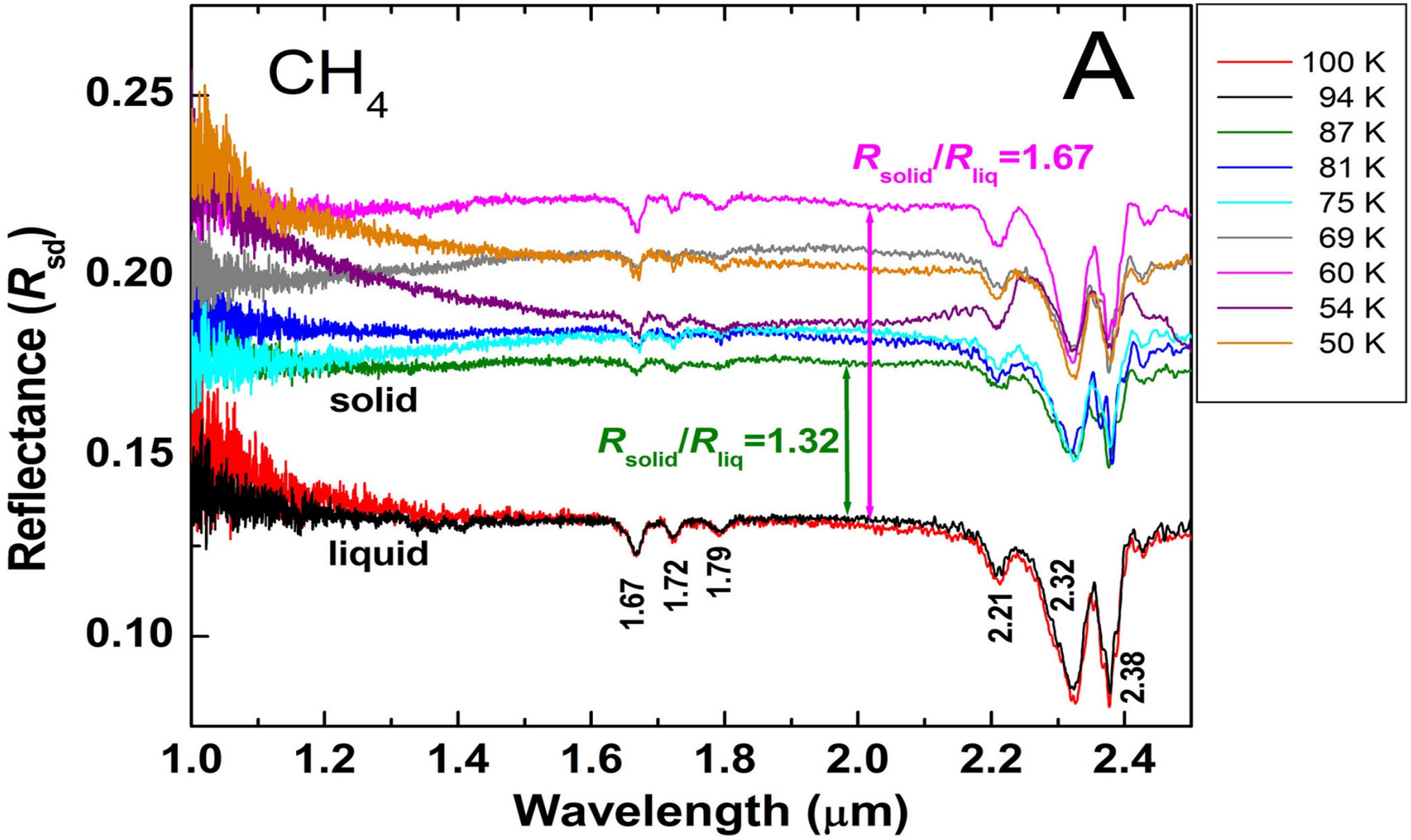
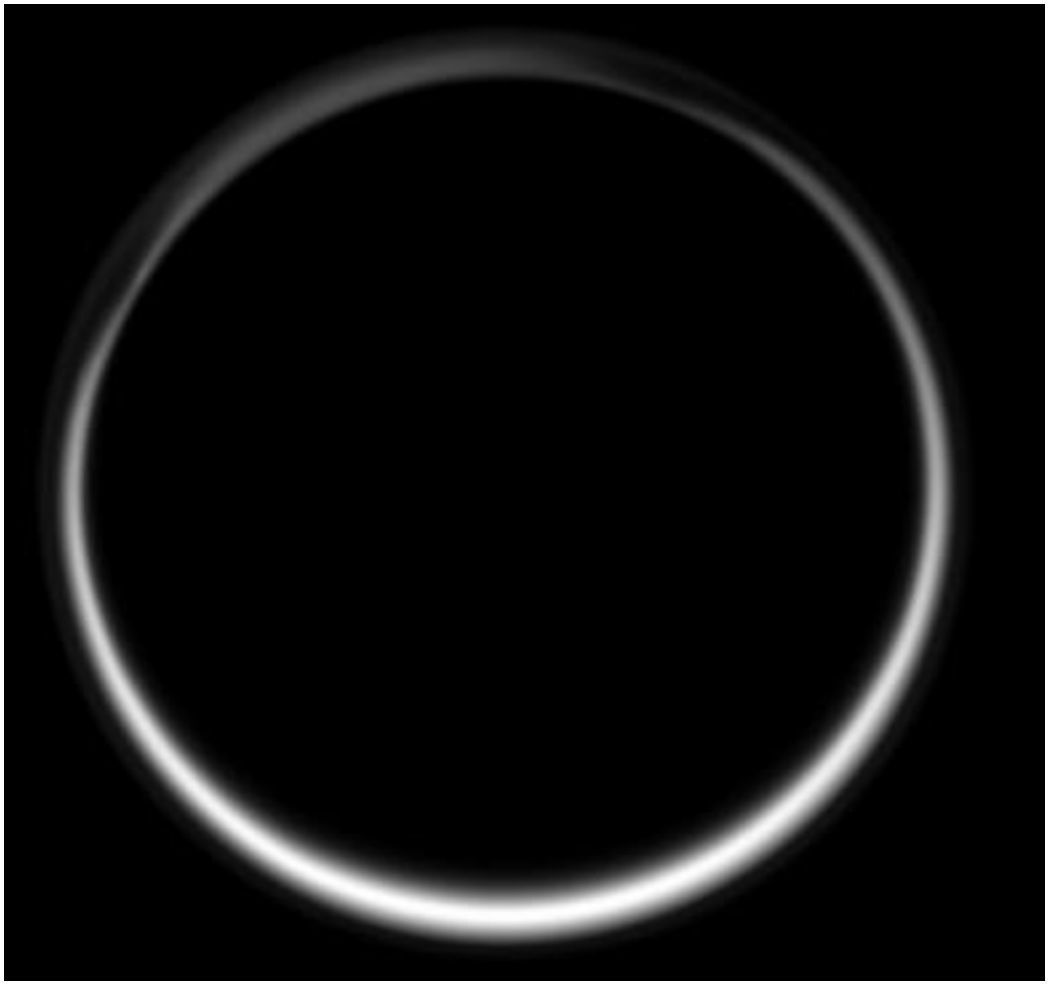


Figure 3
Adams et al., 2012



Titan -

Future work:

Mountains – tectonism linked with pits

Methane-Ethane mixtures

Impact craters – to glimpse the subsurface ocean

NASA/JPL