



EGU General Assembly 2021

JPL Caltech

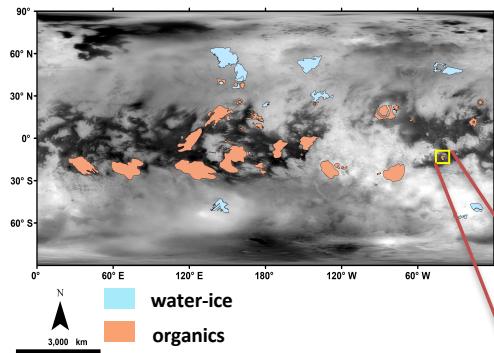
A chemical composition map for Titan's surface

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A. Coustenis, R.M.C. Lopes , M.J. Malaska, A. Le Gall, S. Rodriguez, P. Drossart, C. Elachi, B. Schmitt, K. Lawrence, S. Wall, C. Sotin, S. Le Mouélic, A. Schoenfeld, J. Radabaugh, O. Witasse, C. Matsoukas

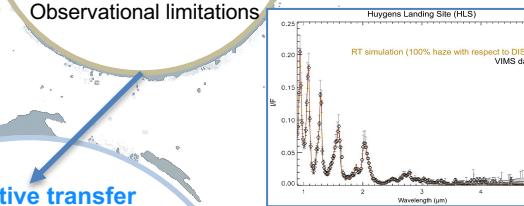


Preliminary view of Titan's chemical composition map in the making
(starting with two major components)

Questions
Is Titan's surface changing?
What materials are present?
What are the geological processes?

VIMS observations

Atmosphere + Surface
Observational limitations

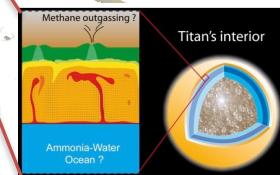


Radiative transfer

Code Plane-parallel (1D)

Temperature profile	HASI (Fulchignoni et al. 2005)
CH4 mixing ratio	GCMS (Neimann et al. 2010)
Haze parameters	DISR (Tomasko et al. 2008, de Bergh et al. 2011)
Atmospheric gases	$^{12}\text{CH}_4$, $^{13}\text{CH}_4$, $^{13}\text{CH}_3\text{D}$, CO, and collisions N ₂ -N ₂ & N ₂ -H ₂ (de Kok et al. 2007; Lafferty et al. 1996, McKellar et al. 1989)
CH4 NEW UPDATED absorption coefficients	(Boudon et al., 2006, Campargue et al. 2012, 2015 & Rey et al., 2017, HITRAN, GEISA, etc)
Surface component candidates	ices and tholins (Bernard et al. 2006; Coll et al. 2006; Brasse et al. 2015; B. Schmitt & S. Philippe private communications)

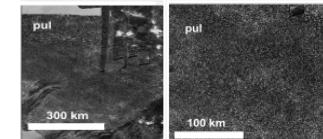
Titan's internal structure (Tobie et al. 2006)



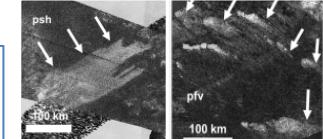
Identification of surface constituents leads to distinction between endogenic and exogenic processes =
Surface – Interior connection (ocean)

Regions of Interest

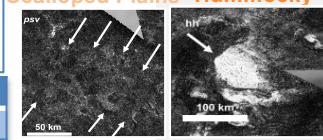
Undifferentiated Plains



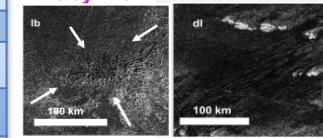
Streak-like Plains Variable Plains



Scalloped Plains Hummocky



Labyrinth Dunes



Alluvial fans Maculae

