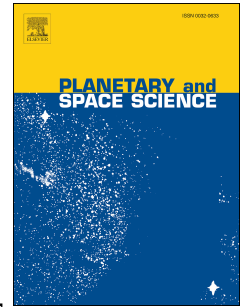


# Accepted Manuscript



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PII: S0032-0633(17)30285-4

DOI: [10.1016/j.pss.2018.02.009](https://doi.org/10.1016/j.pss.2018.02.009)

Reference: PSS 4477

To appear in: *Planetary and Space Science*

Received Date: 5 August 2017

Revised Date: 13 January 2018

Accepted Date: 16 February 2018

Please cite this article as: Nixon, C.A., Lorenz, R.D., Achterberg, R.K., Buch, A., Coll, P., Clark, R.N., Courtin, R., Hayes, A., Iess, L., Johnson, R.E., Lopes, R.M.C., Mastrogiuseppe, M., Mandt, K., Mitchell, D.G., Raulin, F., Rymer, A.M., Todd Smith, H., Solomonidou, A., Sotin, C., Strobel, D., Turtle, E.P., Vuitton, V., West, R.A., Yelle, R.V., Titan's cold case files - Outstanding questions after Cassini-Huygens, *Planetary and Space Science* (2018), doi: 10.1016/j.pss.2018.02.009.

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## Titan's Cold Case Files - Outstanding Questions After Cassini-Huygens

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### Abstract

The entry of the Cassini-Huygens spacecraft into orbit around Saturn in July 2004 marked the start of a golden era in the exploration of Titan, Saturn's giant moon. During the prime mission (2004-2008), ground-breaking discoveries were made by the Cassini orbiter including the equatorial dune fields (flyby T3, 2005), northern lakes and seas (T16, 2006), and the large positive and negative ions (T16 & T18, 2006), to name a few. In 2005 the Huygens probe descended through Titan's atmosphere, taking the first close-up pictures of the surface, including large networks of dendritic channels leading to a dried-up seabed, and also obtaining detailed profiles of temperature and gas composition during the atmospheric descent. The discoveries continued through the Equinox mission (2008-2010) and Solstice mission (2010-2017) totaling 127 targeted flybys of Titan in all. Now at the end of the mission, we are able to look back on the high-level scientific questions from the start of the mission, and assess the progress that has been made towards answering these. At the same time, new scientific questions regarding Titan have emerged from the new discoveries that have been made. In this paper we review a cross-section of important scientific questions that remain partially or completely unanswered, ranging from Titan's deep interior to the exosphere. Our intention is to help formulate the science goals for the next generation of planetary

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