

## Determining Titan's Tidal Phase Lag

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The Cassini orbiter is equipped with the capability to measure the gravity field of Saturn and its satellites. Specifically, the gravity science experiment on Titan aims to determine Titan's dynamic potential Love number  $k_2$ . We show that this parameter alone does not allow an unambiguous detection of a deep ocean inside Titan. This is due to the fact that, if the high-pressure icy layer has a low viscosity, the response of the satellite to tidal forcing will be the same as if it had a deep ocean. We will illustrate what information on Titan's internal structure can be provided by the combined measurement of the dynamic Love number  $k_2$  and the tidal phase lag. We will present the conditions optimal for determining Titan's phase lag, and will demonstrate how such a measurement can be performed by the Cassini orbiter. We will also address the potential ability of other methods (e.g., overlap of VIMS images) to further constrain the measured value of the tidal phase lag.

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