# Just How Significant Is Methane On Titan?

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Titan's second most abundant constituent, methane, is critical to the maintenance of an earth-like nitrogen atmosphere on this satellite. Without methane, Titan's nitrogen would condense, leaving behind a puny amount in the atmosphere.

Source of Titan's methane

The Sun's ultraviolet light should have destroyed methane in approximately ten million years-a fraction of Titan's age. Some process must be producing methane lost to photolysis. Unlike the deep, dense atmospheres of the giant planets where the photoproducts of methane are cooked in their hydrogen-rich interiors to produce methane back, photoproducts of Titan's methane do not meet the same fate.

Hence, methane came in as methane clathrates during Titan's formation, or it is manufactured in situ in Titan's interior. Noble gas data tend to favor the latter process that is based on serpentinization.

I consider low temperature serpentinization as a very promising source of methane on Titan. It occurs in terrestrial oceans, e.g. in Lost City 15-20 km from spreading centers where Black Smokers are sighted.

The process involves water-rock reactions. The type of rocks and temperatures needed are expected to exist in Titan's interior also.

In this process, hydrogen (H2) is released in the hydration of iron or magnesium rich rocks (ultramafic silicates), and this H2 then combines

with carbon dioxide or carbon in crustal pores to produce methane. Methane so produced could be "stored" as clathrate in Titan's interior for later release to the atmosphere, or the process could be going on even now.

Biology as a source of methane on Titan is not supported by the data.