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Comparing Earth and Titan's atmospheric inventory

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Titan is currently the only confirmed exobiotic environment known to us. It is also perhaps the most intriguing object in our Solar System. Our understanding of Titan, and of the kronian system as a whole, has been greatly enhanced by the data returned by the Cassini/Huygens mission since 2004 and still operating on the spot.
Thus, we know today that the thick atmosphere layer - covering the satellite's mysterious surface - is essentially made of nitrogen, with small amounts of methane and hydrogen. The combination among these mother molecules produces an exciting organic chemistry in Titan's atmosphere, with hydrocarbons and nitriles (one of the latter, HCN, is a prebiotic molecule). The organic chemistry, climate conditions, meteorology, methane cycle and other aspects of the surface make Titan an extremely important astrobiological place. We will summarize our current understanding of the analogues between Titan and Earth's atmospheres focusing on some compositional and climatological issues. After the Cassini/Huygens mission, there will remain several unanswered questions on the astrobiological aspects of the satellite that will require a future mission with an optimized orbital tour, specific in situ elements and advanced instrumentation, such as the Titan Saturn System Mission (Coustenis et al, 2009; Reh et al., 2009) studied in 2008. The TSSM orbiter with hi-resolution imagers and IR spectrometers onboard and the TSSM Montgolfier with an aerosol analyser and a meteorology package aboard will deeply investigate the Titan organic factory and its atmospheric diversity by performing long-term observations. Definitely, as Titan is a unique earth-like body in the solar system, the long experience of studying the terrestrial atmosphere gives us the tools to unveil the satellite's mysteries. On the other hand, Titan's science will significally contribute to the Earth's atmospheric knowledge, its evolution and chemistry and to the origin of life, as it certainly resembles a unique planetary scale-size atmospheric laboratory.

References:
Coustenis, A., et al., 2009, Ex.Astr., 23, 3, 893-946.
Reh, K. et al., 2009, DPS, 41.