Geophysical Research Abstracts
Vol. 16, EGU2014-1610-1, 2014
EGU General Assembly 2014

Exploring external time-dependent sources of H_2O into Titan's atmosphere

Luisa-Maria Lara (1), Emmanuel Lellouch (2), Marta González (1), Raphael Moreno (2), and Miriam Rengel (3)

(1) Instituto de Astrofisica de Andalucia-CSIC, Solar System, Granada, Spain, (2) LESIA, Obs. Paris-Meudon, Meudon, France, (3) Max-Planck Institut fuer Sonnensystemforschung, Katlenburg-Lindau, Germany

Recent observations (Cottini et al., 2012, and Moreno et al., 2012) and steady-state photochemical modelling (Moreno et al., 2012; Dobrijevic et al., 2014) indicate that the amounts of CO_2 and H_2O in Titan's stratosphere imply relatively inconsistent values of the OH/H_2O input flux. Moreno et al. (2012) proposed that the oxygen source is time-variable, whereas Dobrijevic et al. (2014) arrived to the same conclusion of Moreno et al. (2012) that the HSO (*Herschel Space Observatory*) measured H_2O profile is"inconsistent" with the CO_2 abundance. Furthermore, Dobrijevic et al. (2014) also found that reconciliation was possible if abundances reported by Cottini et al. (2012) are correct instead, though in this situation and for an Enceladus source, their model tended to overpredict the thermospheric abundance of H_2O , compared to the upper limit by Cui et al. (2009).

We attempt to reconcile the H_2O and CO_2 observed profiles in Titan's atmosphere by considering several time-dependent scenarios for the infux/evolution of oxygen species. To explore this, we use a time-dependent photochemical model of Titan's atmosphere to calculate effective lifetimes and the response of Titan's oxygen compounds to changes in the oxygen input flux. We consider a time-variable Enceladus source, as well as the evolution of material delivered by a cometary impact.

We will show results on effective H_2O and CO_2 effective lifetimes, on the feasibility of time-variable Enceladus source, and on an additional H_2O loss-to-the-haze. Regarding CO_2, we will analyse its production following a cometary impact.

A summary on viable scenarios to explain the H_2O / CO_2 puzzle will be given.

References

Moreno, R., Lellouch, E., Lara, L. M., et al. 2012, Icarus, 221, 753.

Cottini, V., Nixon, C. A., Jennings, D. E., et al. 2012, Icarus, 220, 855.

Cui, J., Yelle, R. V., Vuitton, V., et al. 2009, Icarus, 200, 581.

Dobrijevic, M., Hébrard, E., Loison, J., and Hickson, K. 2014, Icarus, 228, 324.