Geophysical Research Abstracts, Vol. 7, 00566, 2005
SRef-ID: 1607-7962/gra/EGU05-A-00566

Sensitivity effects of chemical kinetic uncertainties on photochemical modeling results : Application to Titan's atmosphere

E. Hébrard (1), M. Dobrijevic (2), Y. Bénilan(1) and F. Raulin (1)

(1) LISA, UMR-CNRS & Univ. Paris 12 & Paris 7, 94010 Créteil cedex, France (2) L3AB, 2 rue de l'Observatoire, BP 89, 33270 Floirac, France

Kinetic parameters included in photochemical models of planetary atmospheres carry with them a certain level of imprecision. Photochemical models of the giant planets and their satellites are particularly sensitive to this imprecision as the low-temperature and wavelength-dependent photochemistry of their atmospheric compounds is still poorly constrained by laboratory evidence. This imprecision leads to some uncertainties on the mole fractions of chemical species computed in planetary atmospheres modeling, and is thus supposed to be contributing mostly to the differences between observations and computed predictions.

Our vertical distributions of hydrocarbons and nitrogen compounds present in Titan's atmosphere were obtained using an upgraded 1-D photochemical model, focused on integrating recent laboratory measurements and theoretical breakthroughs in a relevant description of the photochemical scheme. Monte-Carlo calculations are being performed on these nominal abundances in order to estimate the uncertainties on the mole fractions as a function of altitude for each compound and to pinpoint then specifically the photochemical parameters that are responsible for inducing the largest errors.

In this way, it is hoped that key reactions will arise and suggest laboratory experiments or/and theoretical studies from which the more accurate data would reduce the uncertainties of the models. This shows that we need to reform the way we think of photochemical models as a mean to study systematically the many chemical and physical aspects of Titan. It can be done mainly by integrating them among several other complementary approaches, such as experimental measurements, simulation studies and, of course, brand new in-situ observations through the Cassini-Huygens mission.