TWO-DIMENSIONAL NUMERICAL STUDY OF THE ATMOSPHERIC AND SURFACE OXIDANT ON MARS. D. Moreau and D. Fonteyn, Belgian Institute for Space Aeronomy, 3 Avenue Circulaire, Brussels B-1180, Belgium.

An important step for improving our knowledge of the martian photochemistry should be the validation of the currently admited scheme of stability, originally proposed by Parkinson and Hunten (1972) and McElroy and Donahue (1972). Over twenty years ago the Viking Mission's life detection experiments proved that the Martian soil is extraordinarly oxidizing. The evolution of CO_2 from Labelled Release experiment is consistent with the presence of a thermally labile oxidant. Detection and characterisation of the chemical and physical nature of this powerful oxidant is therefore of great interest not only in the exobiology point of view but also to understand exchanges between the atmosphere and the regolith on Mars. In the thin cold Martian atmosphere, photochemical reactions occurring between traces of water and the ultraviolet radiation from the Sun probably lead to the production of H_2O_2 which in turn can condense onto soil grain and airborne dust. This molecule, in fact, may be the key constituant for the chemical regulation of H_2, O_2 and CO in the Martian atmosphere as well as for the photochemical stabilisation of the atmosphere. Today, hydrogen peroxide has not yet been detected in the Martian atmosphere. Tentative detection has been carried out few years ago using IRAM radiotelescope. These observations only allow to determine a global upper limit for this molecule a factor of three below any one dimensional and two-dimensional model calculations. This new upper limit seem however to confirm the assumption that, due to the low thermal conditions prevailing on Mars these last years, H_2O_2 probably condensed out of the atmosphere. The purpose of this paper is to presents results of our model showing the regulation of H_2, O_2 and CO in the current Martian atmosphere due to hydrogen peroxide photochemistry. From our simulations, H_2O_2 appears as an interesting tracer for chemical reactions related to water vapor and possess an absorption continuum between 150 and 200 nm. Its presence in the atmosphere should conduct to a small decrease of the transmission in this spectral region and allow to estimate the total column of this constituant using the UV chanel of Spicam-Light experiment programmed to fly during Mars Express mission.

References

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