MEX/PFS 観測による火星大気内酸化成分の検出

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Oxidant Component In The Martian Atmosphere Observed By MEX/PFS

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Previous observations have been suggested that the large and fast variations of methane in the Martian atmosphere would be caused by oxidation loss with H2O2. These results also suggested that H2O2 would be produced in quantities much larger than foreseen by water photochemistry during dust storms and dust devils by means of electrostatic charging of the dust grains. However, past ground-based observations of H2O2 mixing ratios were few and contradictory with photochemical model.

In this study, we tried to detect the Martian H2O2 from the continuous observations with Planetary Fourier Spectroscopy (PFS) onboard Mars Express (MEX) over several Mars years. Based on the possible H2O2 line at 362 cm-1 which is not contaminated by strong water lines, the derived H2O2 mixing ratio shows varies between 0 and 50 ppb with an average and standard deviation of ˜20-30 ppb, respectively. The result itself is good consistent with the photochemical model. However, the credibility of this innovative result shall be established. We tried to evaluate the results with the one in other lines at 379, 416 and 433 cm-1. At the moment, the results from these four lines are inconsistent. In order to clarify the true absorption of H2O2, the following two things are tried: (1) The removal of the side lobe effects in the instrumental function (i.e. Adoption of the apodization into the interferogram analysis.) (2) Identification of the artificial enhancement at the H2O2 absorption lines (i.e., the H2O2 absorption in the condition with very low H2O mixing ratio. Less absorption shall be expected in average.). This paper will reflects the updated results based this trials.

In addition, we will also briefly report our recent ground-based activities, i.e., (1) submm observations of Martian minor elements and (2) the development of infrared heterodyne spectrometer.