The variation of oxidant component in the Martian atmosphere by MEX/PFS

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In recent years, a small amount of CH_4 was discovered in the Martian atmosphere [cf. Formisano et al., 2004]. Various theories about its source, i.e., biological source and so on, have been proposed. However, it is still open question. In a recent study, the seasonal variation of CH_4 was found [Geminale et al., 2008]. From its time scale, the variation might be caused by oxidation loss which is due to strong oxidants (H_2O_2 , etc.) in the low altitude. On the other hand, the electro-photochemical model with electric discharge by turboelectric process of dust grains associated with dust storm or dust devil showed the H_2O_2 abundance 200 times of that produced by photochemistry [Atreya et al., 2006]. In addition, the season of CH_4 decrease almost corresponds to that of dust storm [Geminale et al., 2008]. In order to validate those ideas, the variation of CH_4 should be compared to that of H_2O_2.

The observations of H_2O_2 in the Martian atmosphere are three cases, and the observed abundance is 0-50 ppb. But, detailed seasonal variation and global map have not been understood because they were the ground based observations. In this study, we try to evaluate the seasonal, longitudinal and latitudinal variation of H_2O_2 in the public data of Mars Express(MEX) / Planetary Fourier Spectrometer(PFS) in ESA/PSA.

First, the seasonal variation has been evaluated. Because the H_2O_2 abundance is small, the spatial averaging of 1500-2000 measurements is need to obtain enough SNR. It means that the time resolution becomes several days, and the spatial variation is not able to derive at same time. In this study, the seasonal variation is found in 0 to 50 ppb with accuracy of 5ppb in 2004-2007 (2 Martian years) was first derived. As a result, there is only gentle and irregular variations, and no correlation with CH_4. In addition, there are no enhancement of H_2O_2 during dust storm seasons.

Those results suggest that (A) the seasonal variation of CH_4 is caused by other factors; (B) the enhancement of H_2O_2 abundance at dust storm does not occur; (C) the seasonal variation of H_2O_2 might depend on UV flux and H_2O abundance thorough photochemistry. There might be short term enhancement of H_2O_2 abundance at dust storm but the current method can not identify such short events.

As next studies, we will study the correlation between H_2O_2 and UV flux, H_2O, and dust storms. Moreover, we will also research H_2O_2 longitudinal and latitudinal distributions.