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Mesospheric CO_2 ice clouds on Mars observed by Planetary Fourier Spectrometer onboard Mars Express

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We investigate mesospheric CO_2 ice clouds on Mars detected by the Planetary Fourier Spectrometer (PFS) onboard Mars Express (MEx). The relatively high spectral resolution of PFS allows firm identification of the clouds' reflection spike. A total of 279 occurrences of the CO_2 ice clouds features has been detected at the bottom of 4.3 μm CO_2 band from the MEx/PFS data during the period from MY27 to MY32. 115 occurrences out of them are also confirmed by simultaneous observations by MEx/OMEGA imaging spectrometer. The spatial and seasonal distributions of the CO_2 ice clouds observed by PFS are consistent with the previous studies: the CO_2 ice clouds are only observed between Ls=0° and 140° at distinct longitudinal corridors around the equatorial region ($\pm$20°N). The CO_2 ice clouds are preferentially detected at local time between 15-17h. The relatively high spectral resolution of PFS allows us to investigate the spectral shape of the CO_2 ice clouds features. The CO_2 ice clouds reflection spike is peaked between 4.24 and 4.29 μm, with no evidence of the secondary peak at 4.32-4.34 μm observed by MEx/OMEGA (Määttänen et al., 2010). In most of the cases (about 75%), the peak is present between 4.245 and 4.255 μm. Moreover, small secondary peaks are found around 4.28 μm (about 15 occurrences). These spectral features cannot be reproduced by the synthetic spectra with the assumption of a spherical particle shape in our radiative transfer model (DISORT). This can be due to the fact that the available CO_2 ice reflective indexes are either inaccurate or inappropriate for the mesospheric temperatures, or that the particle shape is not spherical. Accurate measurements of the reflective index depending on temperature and detailed comparison with the model taking into account non-spherical shapes will give a clue to solve this issue.