Mapping of the Martian disk near opposition with EXES aboard SOFIA: Water distribution and measurement of the D/H ratio

Therese Encrenaz (1), Matthew Richter (2), Curtis DeWitt (2), Thomas Greathouse (3), Thierry Fouchet (1), Franck Montmessin (4), Bruno Bézard (1), Sushil Atreya (5), Michael Case (2), and Nils Ryde (6)

(1) Paris Observatory, LESIA, Meudon, France (therese.encrenaz@obspm.fr), (2) University of California Davis, CA, USA, (3) Southwest Research Institute, San Antonio, TX, USA, (4) LATMOS, IPSL, Paris, France, (5) University of Michigan, Ann Arbor, MI, USA, (6) Lund Observatory, Lund, Sweden

The high-resolution imaging spectrometer EXES (Echelon Cross Echelle Spectrograph) had its first commissioning flight on the Stratospheric Observatory for Infrared Astronomy (SOFIA) on April 7, 2014. This instrument covers the 5 - 28 μm range with a resolving power as high as 100,000 in the high-resolution mode. These observations have a spectral resolving power of R=85,000. During this first flight, a map of Mars was recorded at 1383 - 1391 cm-1 (7.20 - 7.23 μm). Data were recorded near opposition, when the diameter of Mars was 15 arcsec, and slightly after northern summer solstice (Ls = 112°), when the water vapor content is maximum in the northern hemisphere. The map was recorded by centering on the planet, offsetting beyond the limb, and then stepping perpendicular to the 14" long slit across the planet. Two separate stripes were done with an offset along the slit to ensure full coverage of the Martian disk. The 1383 - 1391 cm-1 spectral range contains lines of H2O, HDO and CO_2 of various intensities. HDO and H2O mixing ratios will be retrieved from a measurement of the H2O/CO_2 and HDO/CO_2 line depth ratios. Comparison of both maps will provide information about the spatial distribution of D/H over the disk. Results will be compared with theoretical models and other D/H observations.