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Calibration and first results of relative humidity sensor MEDA HS on board M2020 rover

Maria Hieta¹, Maria Genzer¹, Jouni Polkko¹, Iina Jaakonaho¹, Andreas Lorek², Stephen Garland², Jean-Pierre de Vera², German Martinez^{3,4}, Erik Fischer⁴, José Antonio Rodríguez Manfredi⁵, Leslie Tamppari⁶, and Manuel de la Torre Juarez⁶

¹Finnish Meteorological Institute (FMI), Erik Palmenin Aukio 1, 00560, Helsinki, Finland (maria.hieta@fmi.fi)

²German Aerospace Center (DLR), Astrobiological Laboratories, Institute of Planetary Research, Rutherfordstr. 2, 12489 Berlin, Germany

³Lunar and Planetary Institute/USRA, Houston, TX, USA

⁴University of Michigan, Ann Arbor, USA

⁵Centro de Astrobiología (INTA-CSIC), Madrid, Spain

⁶Jet Propulsion Laboratory/California Institute of Technology, Pasadena, CA, USA

MEDA HS is the relative humidity sensor on the Mars 2020 Perseverance rover provided by the Finnish Meteorological Institute (FMI). The sensor is a part of Mars Environmental Dynamic Analyzer (MEDA), a suite of environmental sensors provided by Centro de Astrobiología in Madrid, Spain. MEDA HS, along with METEO-H in ExoMars 2022 surface platform, is a successor of REMS-H on board Curiosity.

Calibration of relative humidity (RH) instruments for Mars missions is challenging due to the range of RH (from 0 to close to 100%) and temperature conditions (from about -90 °C to + 22 °C) that need to be simulated in the lab. Thermal gradients in different parts of the system need to be well known and controlled to ensure reliable reference RH readings. For MEDA HS the calibration tests have been performed for different models of MEDA HS in three Martian humidity simulator laboratories: FMI laboratory, Michigan Mars Environmental Chamber (MMEC) and DLR PASLAB (Planetary Analog Simulation Laboratory).

MEDA HS flight model was tested at FMI together with flight spare and ground reference models in low pressure dry CO₂ gas from +22°C to -70°C and in saturation conditions from -40°C down to -70°C. Further, the MEDA HS flight model final calibration is complemented by calibration data transferred from an identical ground reference model which has gone through rigorous testing also after the flight model delivery. During the test campaign at DLR PASLAB that started in Autumn 2020, MEDA HS has been calibrated over the full relative humidity scale between -70 to -40°C in CO₂ in the pressure ranges from 5.5 to 9.5 hPa, representative of Martian surface atmospheric pressure. The results can be extrapolated to higher and lower temperatures.

In this presentation the final flight calibration and performance of the MEDA HS will be presented together with first results expected from the surface of Mars by the Perseverance rover.

