CO2 COLLISIONAL BROADENING OF THE 557 GHz WATER ABSORPTION FEATURE PROFILED WITH A DIFFERENTIAL ABSORPTION RADAR PLATFORM

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Millimeter and sub-millimeter differential absorption radar (DAR) systems, which measure the attenuation of a transmitted beam as function of both frequency and range, are currently in development for a variety of Earth and planetary science applications. This talk will summarize efforts to realize a portable DAR system optimized to profile the 557 GHz 1_{10}-1_{01} pure rotational transition of water that is suited for humidity measurements between scatter targets in low-pressure Martian-like environments. This emerging class of active remote sensing instrumentation, if deployed on future Mars lander/rover missions, could provide local near-surface humidity profiles that are unresolvable to the current generation of passive orbiting sensors. This presentation will include an overview of DAR operational principles, system architecture, and deployment scenarios. Room temperature laboratory measurements recorded with the DAR prototype system of the 557 GHz pure rotational water transition broadened by carbon dioxide in a sample mixture that is reasonably analogous to that found on Mars ($\sim$200 ppm H_2O in 5 Torr CO_2) will be presented. Observed results will be discussed in the context of previously measured lineshape parameters with extrapolation made to the lower surface temperatures (200 - 250 K) found on Mars.