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Preliminary Interpretation of the MSL REMS Pressure Data

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The Rover Environmental Monitoring Station (REMS) on the Mars Science Laboratory (MSL) Curiosity rover consists of a suite of meteorological instruments that measure pressure, temperature (air and ground), wind (speed and direction), relative humidity, and the UV flux. A detailed description of the REMS sensors and their performance can be found in Gómez-Elvira et al. [2012, Space Science Reviews, 170(1-4), 583-640]. Here we focus on interpreting the first 100 sols of REMS operations with a particular emphasis on the pressure data. A unique feature of pressure data is that they reveal information on meteorological phenomena with time scales from seconds to years and spatial scales from local to global. From a single station we can learn about dust devils, regional circulations, thermal tides, synoptic weather systems, the CO_2 cycle, dust storms, and interannual variability. Thus far MSL's REMS pressure sensor, provided by the Finnish Meteorological Institute and integrated into the REMS payload by Centro de Astrobiología, is performing flawlessly and our preliminary interpretation of its data includes the discovery of relatively dust-free convective vortices; a regional circulation system significantly modified by Gale crater and its central mound; the strongest thermal tides yet measured from the surface of Mars whose amplitudes and phases are very sensitive to fluctuations in global dust loading; and the classical signature of the seasonal cycling of carbon dioxide into and out of the polar caps.