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Thermal and Electrical Properties of Comet 67P/Churyumov-Gerasimenko derived from the Continuum Measurements of the Microwave Instrument on the Rosetta Orbiter (MIRO)

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ESA's Rosetta spacecraft arrived at comet 67P/Churyumov-Gerasimenko in early August of 2014. Since the approach in June 2014, the MIRO instrument has been acquiring two types of data: continuum emission thermal data from the nucleus at the two operating wavelengths of 190 and 562 GHz, and spectroscopic data near 560 GHz on the gases present in the coma. This talk focuses on the continuum data. The two continuum channels allow for probing the temperature in the shallow subsurface over two effective depths on the order of a few millimeters to a few centimeters. Since mid-August of 2014, when MIRO began fully resolving the nucleus, the continuum channels have provided a large data base of both dayside and night side temperatures of the comet nucleus with global coverage. Results based on model comparisons indicate global scale thermal inertia in the range I=5-40 J/(K m2 s0.5), consistent with a fine grain regolith cover over at least the upper few centimeters of most of the surface. Analyses of the day/night variations in the MIRO channel temperature measurements are consistent with a $\sim$ 1 cm thermal attenuation depth for the 12.4 hour diurnal cycle and electrical properties comparable to the lunar regolith surface dust layer. Strong latitude variations in the diurnal-average level of MIRO temperatures are consistent with expected seasonal effects based on comet 67P's current orbit parameters and obliquity. Continued analyses of the variations in the MIRO channel temperature measurements as the comet approaches perihelion are expected to provide constraints on surface properties and processes that depend critically on temperature.

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