Space Weathering in the Inner Solar System.

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"Space weathering" is the term given to the cumulative effects incurred by surfaces which are exposed to the harsh environment of space. Lunar sample studies over the last decade or so have produced a clear picture of space weathering processes in the lunar environment. By combining laboratory and remote spectra with microanalytical methods (scanning and transmission electron microscopy), we have begun to unravel the various processes (irradiation, micrometeorite bombardment, etc) that contribute to space weathering and the physical and optical consequences of those processes on the Moon. Using the understanding gleaned from lunar samples, it is possible to extrapolate weathering processes to other airless bodies from which we have not yet returned samples (i.e. Mercury, asteroids). Through experiments which simulate various components of weathering, the expected differences in environment (impact rate, distance from Sun, presence of a magnetic field, reduced or enhanced gravity, etc) and composition (particularly iron content) can be explored to understand how space weathering will manifest on a given body.