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The Unconsolidated Surface Sediments of Hellas Planitia, Mars: Implications for the Origin of Hellas Basin Floor Deposits

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Hellas Planitia lies within a very large impact-formed basin measuring ~2000 km across. Some portions of the basin flor lie ~7 km below the rim and are the topographically lowest surfaces on Mars. The presence of geomorphically recognized, circumferential deposits within Hellas Basin implies that some geologic process (or processes) preferential to enclosed basins and/or areas of low topography have operated on a regional (presumably basin-wide) scale to deposit and/or erode geologic materials. The large diversity of landforms manifested in these deposits indicate a lengthy geologic history that may involve volcanism, volcano-ground ice interactions, aeolian activity, and perhaps glaciation and lacustrine deposition. A model of surface wind stress derived from the climate models (GCM) indicates that the western, and especially the northwestern, portion of Hellas Planitia is subjected to net wind erosion under present conditions. Unconsolidated material in Hellas is probably locally derived with little or no contribution from exotic sources or dust storm fallout. This affords the unusual opportunity to use *Viking* Infrared Thermal Mapper (IRTM) observations of these surfaces to infer the sedimentological characteristics of the materials eroding from the basin floor lithologic deposits. Three sets of IRTM box scans taken during periods of relatively low dust opacity were organized into 0.5° bins within the region covering the basin (20°–60°S, 260°–300°W) during predawn hours (0.0 to 6.0 H). In the regions mapped, the highest thermal inertias occur in the northern portion of the basin; the location of the highest surface wind shear. Those thermal inertia values are between 8 and 11 TI units (1 TI = 10^{-3} cal cm^{-2} $s^{-1/2}$ K^{-1}). The rest of the Hellas floor exhibits values between 5 to 7 TI units, generally indicative of an average particle size in the very fine to fine sand range. The higher thermal inertias of the northern basin floor are consistent with medium-to-coarse sand-sized particles, which are optimum sizes for aeolian saltation transport on Mars. Possible sources for these unconsolidated sediments in the Hellas region, which were in-turn derived from the *in situ* erosion of underlying lithologic units, include the fluvial channels in the eastern portion of Hellas, the volcanic Paterae on the southern rim of the basin, and material that has mass-wasted from the basin rim mountains over the past ~4 billion years since the basin formed.