The Altiplano-Puna Plateau of the Central Andes as an Analog Laboratory for Mars S. L. de Silva[1], M. Spagnuolo[1], N. Bridges[2] J. Zimbelman[3], J.G. Viramonte[4], B. Bills[5] , and J. Bailey[6] [1]College of Earth, Ocean, and Atmospheric Science, Oregon State University, Corvallis, OR 97331-8507, USA; desilvas@geo.oregonstate.edu; [2]JHUAPL, Laurel, MD 20723; [3]CEPS/NASM MRC 315, Smithsonian Institution, Washington D.C. 20013-7012; [4]Universidad Nacional de Salta, Av Bolivia 5150, 4400 Salta, Argentina; [5]JPL, Pasadena, CA 91109; [6]University of Alaska Fairbanks, 3352 College Road *Fairbanks* Alaska, 99709

Introduction: The Altiplano-Puna Plateau of the Central Andes of Peru, Bolivia, and Argentina (~10° to 28°S) has experienced a climatic and geologic evolution that has resulted in an enticing array of potential Martian analog geologic environments and features. Elevated ~2 to 3 km above the adjacent Atacama desert, the Altiplano-Puna is the highest plateau in the world associated with extensive volcanism; it is second only to Tibet in height and extent. The Andes mountains act as a large meriodinal barrier to low level moisture transport and so the Altiplano-Puna plateau (4000m average a.s.l) receives little precipitation (<300mm/year). The high elevation adds extreme cold and lower atmospheric pressure to a hyper-arid climate making this region a compelling analog environment for Mars. The plateau consists of two interrelated major physiographic provinces: the *Altiplano* basin, which developed as a major intermontane basin, and the *Puna*, the higher volcano-tectonic plateau.

The analog features of the Altiplano-Puna: The Altiplano basin preserves a long Pleistocene lake history recorded in a well-preserved lake shore geomorphology consisting of both erosional and depositional features [1,2] These features are easily identified and studied in the field and on remotely sensed images and may lend valuable insight into the debate over putative paleoshorelines in the northern plains of Mars. Throughout the basin are several smaller volcanic features (maars, cinder cones, buttes) and rare large composite cones. These monogenetic and polygenetic features represent potential analogs to smaller volcanic features on Mars.

Major volcanic provinces dominated by regionally extensive ignimbrite sheets and associated eruptive centers are amongst the largest known volcanic features in the world. Of particular interest are ignimbrite shields with a central lava dome complex and an apron of gently dipping ignimbrite that are potentially analogous to Hadriaca, Alba, and Tyrrhena paterae. The region has proven to be an excellent natural laboratory for remote sensing and field-based studies of volcanism with analogs for regions on Mars like Amazonis Planitia, as well as the enigmatic Medusa Fossae Formation (MFF) materials.

The Puna is proving to be a fantastic aeolian field laboratory with strong analogs for Mars. The surface is dominated by thick Neogene ignimbrites of varying degrees of induration in which the peristent and powerful northwesterly winds have carved spectacular yardang fleets. These have informed about the enigmatic Medusa Fossae Formation (MFF) materials [3,4,5]. A by-product of aeolian erosion of ignimbrites on the Puna are extensive lag gravels that are eventually organized into aeolian megaripples [6,7,8]. These are morphologically and contextually similar to small ripple-like Transverse Aeolian Ridges (TARs) on Mars. Moreover, the Puna gravels are bimodal and have similar equivalent weight (*mg*) to clasts composing granule ripples at Meridiani Planum [9]. Their local origin may have implications for the origin of sediment in martian aeolian bedforms [10]. Finally, the stable yet dynamic character of the Puna megaripples could help reconcile current models of TARs with periodic bedrock ridges (PBR) [11] that may be produced by aeolian erosion .

Other features of the Altiplano-Puna plateau hold similar promise. We suggest that several science themes of critical relevance to understanding the surface of Mars can be addressed in this region. 1) Physical weathering, erosion, and depositional features in cold deserts dominated by volcanic deposits; 2) The geomorphology, volcanology, and remote sensing of volcanic deposits and associated eruptive centers; 3) The geomorphic expression and features of a major paleolake basin; and 4) The geomorphology, volcanology, and remote sensing of small-scale volcanic phenomena

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