Geophysical Research Abstracts
Vol. 12, EGU2010-9218, 2010
EGU General Assembly 2010

New insight mapping of the Arsia Mons Fan-shaped deposits

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Arsia Mons is characterized by an unusual fan deposit at its base extending approximately 500 km towards the west. The fan is considered to consist of essentially three facies: a ridge facies, the knobby terrain and the smooth facies. Hypotheses regarding the development of the Arsia Mons fan-shaped deposit (FSD) range from rock glaciers, pyroclastic deposits or piedmont-like debris-covered, and cold-based glaciers. Most recent research focusses on the formation of the fan-shaped deposits through multiple stages, i.e., advances and retreats of cold-based glacial systems. They state that the ridged facies is a series of drop moraines where each of these represents a period of standstill of a glacier followed by a phase of retreat. They compared the morphology of the Antarctic Dry Valley debris-covered glaciers with the knobby facies and interpreted it as a sublimation till possibly developed from a sublimated debris covered glacier. In the context of ongoing geologic and geomorphologic mapping work conducted on high-resolution data, we are currently focussing on mapping of sites of scientific interest. In order to characterize specific units of the Arsia Mons fan-shaped deposits more precisely and within their regional context and due to the fact that past mapping efforts are based on low resolution Viking VIS data we perform our mapping with a focus the lithology and stratigraphic relationships, i.e., assess the geological context and also on formation process and landscape evolution as derived from High-Resolution Stereo Camera (HRSC) orthoimage data, and Mars Reconnaissance Orbiter Context Camera (CTX) image data, and by means of terrain-model data and morphometry. The time-stratigraphic relationships are derived from geological mapping and analysis of crater-size frequency distributions in order to be able to differentiate not only between the three main facies mentioned above but also to be able to introduce/subdivide additional subsets of units. The investigation area is located in the western part of the Arsia Mons plains between -12° to -0° S and 229° to 238° E covering an area of 370,000 km^2. The mapping scheme is based on the map-scale definition of 1:200,000 as suggested for HRSC data and is furthermore refined at several places for closer inspection to make use of the high-resolution CTX data allowing to map at scales of 1:50,000. Mapping is conducted on 9 HRSC image observations at a scale of 12.5 m/px, and derived topography data from quadrangle-based bundle-block adjustments as well as 88 CTX image scenes with a scale of 5 m/px which form a gapless image mosaic covering the Arsia Mons FSD. Mapping work conducted thus far includes the differentiation of the main fan-shaped deposit units on the basis of HRSC and CTX data and preliminary stratigraphic work.