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Possible framework for the study of Martian surface processes and landforms

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Mars, as Earth or every solid planet or satellite from the Solar System, is a complex evolution system which incorporates through time different internal and external influences [1].Both the differences and similarities between terrestrial geomorphology and extraterrestrial geomorphology are obvious and must be analyzed under a framework set:

1. The differences between the planets' geomorphic, geologic or cosmogenetic processes and resulted landscapes are greater than the similarities between them, and this must remain the principal concept upon which a planet evolution must be evaluated, the others principles being subordinated.

2. Three main forces act on the planetary interior and on its surface (endogenetic, cosmogenetic, and exogenetic), and their values, distributions, and/or associations during the planet's evolution can be established mainly by the temporal and spatial (area) distribution of planetary landforms.

3. Temporal and spatial (area) scales subordinate the distribution of materials and energy (hierarchy of landforms).

4. The cosmic, geologic, and geomorphic evolution may be expected to involve the development of complex landform assemblages.

5. A landform is a part of larger system which consists of the interaction between morphologic subsystem, and the cascade (mass and energy flows) throughout the landscape.

6. The distribution of mass and energy has to be analyzed with the reference to a local base level.

7. The available energy to perform work decrease through time, being associated with a positive feed-back in the initial stages of planetary geomorphic processes; the large-scale events (catastrophic), and those generated by thresholds, dominate the relaxation and equilibrium ones.

I appreciate that in geomorphologic approach on Mars there was a predominant catastrophic and threshold time dependant model applied for long periods of time; shorter periods of relaxation model could be applied for those processes which contributed to increasing entropy into system; equilibrium models could be applied only to those processes which acted on short recent periods of time and on relative small areas, the infrequent character of the most major processes on Mars contributing to this situation. Mars is a complex planetary system [2]. The morphologic subsystem has been created and modified during geologic time as a result of three categories of forces, and since the majority of them are less active during present times, it conserve the largest amounts of the energy and masses as a result of the cascade subsystem actions (the energy remained incorporated into landscape). The complexity of Martian environment resides in the mainly past character of the processes, the unknown rate of operation during the formation of the landscape, the response due by substratum physical, chemical and mechanical characteristics, which influence the “impact” of the inputs and the resulted outputs, the amount of energy necessary to build a landform, and the feed-back relationships. The morphology of a landform is the only characteristic we can evaluate in terms of morphometric indicators, and the relationships form-processes have to imply the cascade subsystem (the volume of mass and the amount of energy to create it)[3].References: [1] Tanaka, K. L. (1986)-The stratigraphy of Mars. J.G.R. Suppl. 91, E139–E158,[2] Craddock R.A., Howard A.D.(2003)-The case for rainfall on a warm, wet early Mars, JGR: Planets 107, no.11, p. 21-1 - 21-36, [3] C. E. Thorn (1988)An Introduction to Theoretical Geomorphology. Unwin Hyman, Boston. 247 pp.