RIDGE SYSTEMS RELATED TO MARTIAN IMPACT CRATERS. K. Kauhanen and J. Raitala, Department of Astronomy, University of Oulu, Oulu, Finland.

Ridge systems within and near impact craters exhibit tectonic patterns of basin-induced, regional and global stresses. Causes for these stresses include gravitational settling of the basin and local and/or global extension-compression (1). Ridges on the lunar maria are arcuate structures near the borders of a circular mare area, explained by the subsidence control of the basalt-loaded basin interior, or more complex linear patterns related to regional volcanic, tectonic or global stress systems.

Wrinkle ridges on Mars occur on all types of terrain including smooth plains and heavily cratered highland areas (2). Most of the Martian ridges appear to be controlled by regional compressional stresses due to volcanic loads or ancient impact basins (3). The absence of tensional features around some ridged plains indicates that basic cause of the compression was an areal contraction of Martian interiors rather than a mere surface load (4).

Basin-controlled ridge systems have been identified within and nearby over 30 impact basins on Mars (5,6). Most basins have multiple rings or arcs of knobby remnants of them around. The inter-ring area shows a more concentric pattern particularly in the shallower parts of a basin (4). More pronounced concentric or radial ridges are found outside the basin ring as far as one basin diameter from the center (5). In the case of multiple rings, ridges often concentrate on plains between adjacent rings. If local regional and basin-related ridges are omitted, a major residual ridge and scarp system emerges (5). While the global grid is not identifiable, this system may indicate effects of some unknown forces.

In order to investigate the role of basin-induced stresses in ridge formation we measured length and orientation of wrinkle ridges in the vicinity of some impact craters on Martian highland. Craters having ridges either inside or outside were selected for the study and subareas were chosen according to distinguished ridge orientation and/or geological unit.

Schiaparelli shows a well defined linear ridge patterns on the eastern half of the basin. Three main components are distinguishable: N45°W, N15°W and N10°E. The first one seems to be consistent with the orientation of stress trajectories from Tharsis (7). In places a 35 km spacing of main ridges is seen. Concentric pattern is weak and the lack of concentric ridges is explainable with thick mantling of the crater floor.

Areas just north of Schiaparelli show evidence (ridge rings) of thick mantling of former craters. The main ridge direction of N45°W is strongest close to Schiaparelli and it gradually disappears to the north the peak direction varying slightly. Another main direction N15°W is present also in the southern subareas and may indicate a broader pattern. The N10°E peak is present only in NNW and SW of Schiaparelli and north of Wislicenus and may represent a distinct but minor regional pattern. A faint set of ridges at N75°W can be seen in most areas around Schiaparelli. It can also be found in some areas around Flaugergues.

Two peaks arise from the data of **Flaugergues.** Inside the crater the ridges have a strong N30°W peak similar to regional system of scarps in the surrounding areas (7). Some of the ridges parallel the crater rim. The N-S ridge direction of the middle Flaugergues is also found in Schiaparelli, Wislicenus, Denning and in most of the intercrater areas. Ridges around Flaugergues does not show any especially high major peaks but there is a broad N-S peak. Ridges near Maggini are scattered and no dominating ridge direction can be discerned.

The floor of **Cassini** is rough and the crater rim is partially degraded. Remnants of inner ring structure can be found. Histogram of the ridges show several peaks (N15°W, N45°W, NNE), slightly inconsistent with the regional scarp system at N30°W. The NNE trend, clearly visible in the center of the crater, does not match with any regional pattern. The N15°W peak is also present in Tikhonravov and the Schiaparelli area and it can exhibit a broader-scale regional or global pattern.

Huygens contains a well developed concentric pattern of ridges approximately on the inner circular ring. Central parts of the crater show distinct linear patterns oriented N40°E, N55°W and N75°E. These are consistent with regional scarps and ridges (and grabens!) around the crater.

Phison Rupes is oriented N30°W and the adjoining **Antoniadi** and **Flammarion** areas have a peak at N20°W to N50°W allowing thus the regional stress pattern to be inferred. The N5°W peak can relate to the north-trending ridges of Syrtis Major Planum, Cassini and Schiaparelli.

Herschel shows rather indistinct WNW pattern of ridges on the northern half of the basin. There aree no concentric ridges either in or outside the basin but the most important directions are N10°E and N°30 W. A NNW-SSE direction is found in other Aeolis areas (Graff, Molesworth etc.)

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All measured basins express compressional tectonics on their lava-flooded floors. The intensity of compression or cumulative ridge length may roughly be functions of basin dimensions. The amount of basin-induced ridges may be explained with the lava fill thickness (7). Regional patterns obscure the basin-related patterns on deeply flooded crater floors (7). Within smaller craters, poorly defined ring structure cannot resist the effect of the global or regional stress systems, particularly if they are strong (7). All studied craters have different kinds of orientation histograms due to different regional and basin-induced tectonics. Areas with abundant ridges show more continuous histograms with Gaussian-like distribution. This may depend on arcuate ridges on the basin floor near the crater rim, where the lava thickness is shallow. Prominent peaks or sudden steps indicate intruding regional pattern.

The N45°W orientation is the strongest one near and inside Schiaparelli. Crater bottoms exhibit a more homogeneous distribution of ridge directions than the adjacent areas. Where the crater has a rounding effect on the ridge histograms the crater floor is probably not deeply filled. Often the ridge direction of crater floor continues also outside the crater. The most distinct crater ridge peak, however, disappears there and lower crater ridge histogram peaks arise from the data of intercrater area. Only one or two strongest compressions have been able to influence the crater interiors. Areas within one crater diameter usually show a pattern similar to the crater itself. Ridges outside small (<100 km) craters seem to behave like those around the larger ones.

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