The crater chains of Vesta — the global view

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The NASA Dawn spacecraft obtained in the Low Mapping Orbit (LAMO) more than 10,000 images of the surface of Vesta, with an average resolution of 20 m per pixel. The solar illumination conditions during LAMO kept the north pole (above 50°N) in darkness. We searched this data set and recognized 760 crater or pit chains, 2/3 of them are in the somewhat smaller illuminated northern hemisphere. We measured for each crater chain: the position (longitude, latitude), length, and the tilt angle of the chain relative to the East–West direction (Fig.). There is a clear asymmetry between the northern and southern hemispheres, in the total number of chains, in the spatial distribution, and in the relative numbers of chains in each one of the sub-groups (tilt angle).

The Northern Hemisphere: Most of the chains are located in the northern hemisphere, from the equator, through mid latitudes up to 50°N, where our data set ends. Most of the chains are with relatively low tilt angles between -10° and 10°, and a large group of them concentrate just north of Divalia Fossae. Their tilt agrees well with the orientation of the troughs. There are a few "holes" in the global distribution (coverage), e.g., around lat.=15°N long.= 190° — the Marcia area — marked in Fig. with M. We suggest that young craters with extended ejecta blankets hide the "older" crater chains.

The Southern Hemisphere: There are significantly fewer crater chains in the southern hemisphere. There is a deficiency of chains in mid latitudes (20°S to 50°S), and an enhancement south of 50°S. There are many more chains with high absolute tilt angles. We will have to inspect each one of them separately, but we suspect that they have different characteristics from those with low tilt angles. The spatial distribution in the northern hemisphere suggests a relationship with the equatorial troughs of Divalia Fossae. The chains are much smaller than the troughs but might have similar formation mechanism.

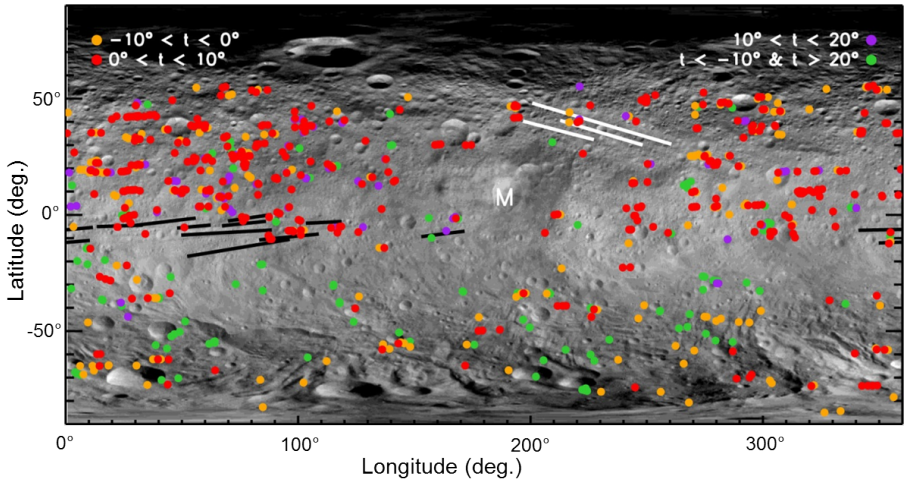

Figure: A Global View - The positions of the crater (pit) chains are superimposed on an image mosaic of Vesta. The crater chains are color-coded according to their tilt angles relative to the East–West direction (see text). The black lines are the troughs associated with Rheasilvia and the white lines are the troughs associated with Veneneia.