

# TIMINGS OF MARTIAN WRINKLE RIDES, A GLOBAL INVESTIGATION

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Wrinkle ridges are common compressional structure found on the surface of Mars. These structures are observed on the surface with volcanic floors that have suffered crustal shortening with an indefinite depth of extent of the associated low angle thrust fault and have the potential to comment on the thermal evolution of the planet. However, wrinkle ridges are also frequent on the large crater floors and the region surrounding the volcanic patera. Here, in this research work, we updated the existing global map of Martian wrinkle ridge structures (Knapmeyer et al., 2006; 2008) and thereafter, used the Buffer Crater Counting (BCC) technique to extract the age of the wrinkle ridges. We have categorized and divided the wrinkle ridges into several groups, depending on their morphological and orientational pattern. We restricted our observation on 70° on each hemisphere. We carried our mapping and crater counting (in ArcGIS) using high-resolution Context (CTX) camera images (6 m/pixel; Malin et al., 2007), Thermal Emission Imaging System (THEMIS) (Christensen et al., 2004) global mosaic and High-Resolution Stereo Camera (HRSC)-MOLA blended Digital Elevation Models (DEM) (200 m/pixel; Fergason et al., 2018).

Our result suggests that most of the Martian wrinkle ridges are formed around the mid-phase of early Hesperian i.e., ~3.50 to ~3.60 Ga old. It includes Tempe Terra (~3.59 Ga), Lunae planum (~3.58), Solis Planum (~3.52), Thaumasia Planum (~3.59 Ga) as a part of Tharsis region. However, we have found that the age of the Tharsis surrounding wrinkle ridges are older than those of their counterparts in the Tharsis bulge (Chryse Planitia ~3.63 Ga; the eastern part of the Coprates rise ~3.65 Ga). Their orientation nature of the Tharsis-circumferential implies the influence of the origin of the compressional stress from the Tharsis volcano-tectonic province. The ages of the wrinkle ridges within Tharsis bulge also corresponds to the ages of the Noachis Terra/Terra Sabaea region of the southern highlands (~3.60 Ga), wrinkle ridges on the eastern part of the Hellas basin (~3.50 and ~3.52 Ga), wrinkle ridges associated with the southern part of the Circum Hellas Volcanic Province (i.e., ~3.48 to ~3.64 Ga), wrinkle ridges on the Hesperia Planum (trending ENE ~3.54 Ga and trending ~3.46 Ga), and wrinkle ridges on the west of Arcadia Planitia (~3.56 Ga). However, wrinkle ridges on the Syrtis Major Planum (radial ~3.40 Ga and concentric ~3.39 Ga). There are two sets of wrinkle ridges on the Amenthes Planum region. Dichotomy parallel wrinkle ridges are ~3.49 Ga old. However, dichotomy perpendicular ridges are younger and in this preliminary investigation, we are getting age of ~2.68 Ga. This age indicates a much younger age than the surroundings and possibly needs fresh reinvestigation.

Keywords: MARS, TECTONICS, WRINKLE RIDGE, Buffer Crater Count