3D multi-resolution mapping of Valles Marineris for better understanding of RSL formation

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Recurring Slope Lineae (RSLs) are metre- to decametre-wide dark streaks found on steep slopes, which lengthen downslope during the warmest times of the year, fading during the cooler periods and reappearing again in the next Martian year. This behaviour has been linked to the action of liquid water, but as liquid water is thermodynamically unstable under current martian conditions this interpretation is under vigorous debate. A better understanding of the formation process of RSLs is therefore fundamental to constraining Mars' water budget and habitability. One of the key components for studying the RSL process is accurate knowledge of the slopes and aspects.

The Valles Marineris (VM) area has the highest concentration of RSLs found on Mars as well as being a location where the triple point of water can be reached during the Martian summertime. This study focuses on multi-resolution 3D mapping of the whole VM area with all digital terrain models (DTMs) vertically referenced to the global standard Mars Orbiter Laser Altimeter (MOLA) surface. A multi-resolution DTM has been generated consisting of 82 Mars Express High Resolution Camera (HRSC) 50m DTMs and 1763 Mars Reconnaissance Orbiter (MRO) Context Camera (CTX) 18m DTMs which will be presented. For 3 selected study areas (Coprates Montes, Capri Mensa, Nectaris Montes), terrain corrected and co-registered MRO High Resolution Imaging Science Experiment (HiRISE; at 0.25m), Compact Reconnaissance Imaging Spectrometer for Mars (CRISM; at 20/50m) and ExoMars Trace Gas Orbiter (TGO) Colour and Stereo Surface Imaging System (CaSSIS; at 2.5m) colour images and associated DTMs will be discussed.

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