**Uncovering the origin of the banded terrain and its implications for water on Mars**

The banded terrain is a unique feature of the Hellas basin on Mars, characterized by smooth curvilinear bands that appear to have undergone viscous deformation. Several hypotheses for its formation imply a significant role for liquid water or water ice. The quantity and phases of water present on a planet over time are crucial to understanding its geological history but remain controversial on Mars. The banded terrain could provide insight, but its origin remains a subject of debate, with competing hypotheses having wildly different implications. A leading theory is that banded terrain may have formed by sediment deformation beneath an ice sheet. We propose to test this theory for the origin of the banded terrain using numerical modeling, along with data from the HiRISE and Context Camera (CTX) instruments on the Mars Reconnaissance Orbiter. We will use finite element modeling of ice and sediment flow to perform two tests of this subglacial formation hypothesis, on the regional scale of the Hellas basin and on the scale of the banded terrain. The latter model results will be compared to topography measured using HiRISE and CTX data. The high resolution of HiRISE means it is the only instrument that can vertically resolve banded terrain, while CTX provides sufficient horizontal resolution over the full extent of individual bands. This work will provide insight into the extent of past glaciation on Mars, an important unknown in constraining its water inventory and climate history. Understanding these aspects of Mars’ geological history is a critical step towards understanding how water cycles may evolve on terrestrial planets more generally.