

# Mars' Polar Topography Reveals Astronomical Forcing of Climate

**Analysis of the topography of exposures of the icy layers of Mars' North Polar Cap connects periodic changes in layer properties to the oscillation of Mars' orbit and rotation.**

- On Earth, climate variations recorded in ice cores result in part from orbital oscillations, but are also affected by changes in the oceans, and the activity of humans as well as other living organisms. Separating out the orbital effects is a complex problem, but Mars offers a natural laboratory where this is possible.
- Mars' climate oscillates as the planet's orbit and spin axis change with periods of 51,000 and 120,000 years, respectively. These had been expected to affect polar layered ice since it was discovered 45 years ago, but this link has never been demonstrated unambiguously.
- Images from the High Resolution Imaging Science Experiment (HiRISE) camera on the Mars Reconnaissance Orbiter (MRO) can image these layers (left) in stereo so their physical properties – measured by how far different layers protrude relative to others – can be read like ice cores on Earth. With this data (right) overlapping periodicities in the stratigraphy can be measured and, using climate models, two dominant signals can be matched to the orbital history of Mars.
- These new findings allow us to confidently connect martian polar ice layers with specific dates for the first time.

