A Fresh Look at Older Mars Odyssey Neutron Spectrometer Data Yields a Surprise at the Equator

Image-reconstruction has improved the spatial resolution of Mars Odyssey Neutron Spectrometer (MONS) data, which show where H exists near the surface, by a factor of 2 (left-hand figure).

This improvement revealed H enhancements, potentially in the form of water, that were previously too small to be seen. The Medusae Fossae Formation (MFF), where radar-sounding has suggested the presence of low-density volcanic deposits or water ice, was found to be the most H-rich equatorial region. If the detected H were in the form of water then it would constitute over 35% of the mass of parts of the deposit (Water Equivalent Hydrogen, WEH, right-hand figure), consistent with the presence of excess, pore-filling ice. However, at the equator ice is not stable at any depth. Thus the deposit’s continued presence, perhaps as hydrated minerals, is surprising.

An improved-resolution map of the MONS epithermal neutron data was created and reveals substantial, unexpected H deposits near the equator.