# A look at past ice depositional environments of the Moon

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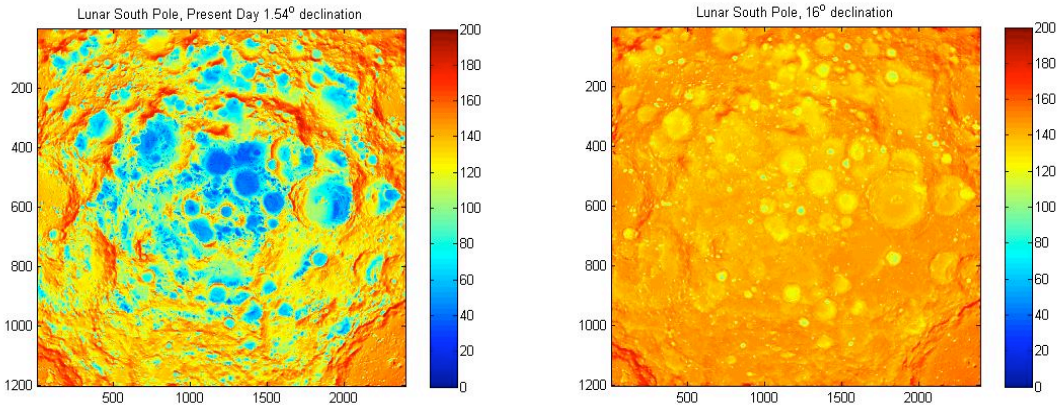
**Abstract**. There are currently regions on the Moon that remain cold enough that water ice will be stable from sublimation at the surface for billions of years. However, in the absence of other burial processes, most of these environments are currently too cold to thermally diffuse ice downward, and thus protect it from surface weathering. In this respect, the present near-surface thermal environment of the Moon may actually be quite a poor trap for water ice. This was not always the case. Long term orbital changes have dramatically altered the lunar polar thermal environment.

In response to past orbital changes, each current cold trap has undergone its own thermal evolution based on their latitude and local topography. Each of the current cold traps therefore went through a period when they were most efficient at thermally burying ice. Using topography based models developed in association with the Diviner Lunar Radiometer we examine the thermal and depositional history of a present lunar cold traps. These results are used to assess when and in what quantity ice may have been delivered to the Moon to explain the hydrogen distribution recorded by the Lunar Prospector Neutron Spectrometer.




**Modeled yearly average surface temperatures near the south pole of the Moon today and when the Moon was tilted at 16 degrees (roughly at 40 Earth Radii semimajor axis, or very roughly 2 billion years ago) . These thermal environments represented very different opportunities for ice deposition. (Maps from Paige et al 2010).**