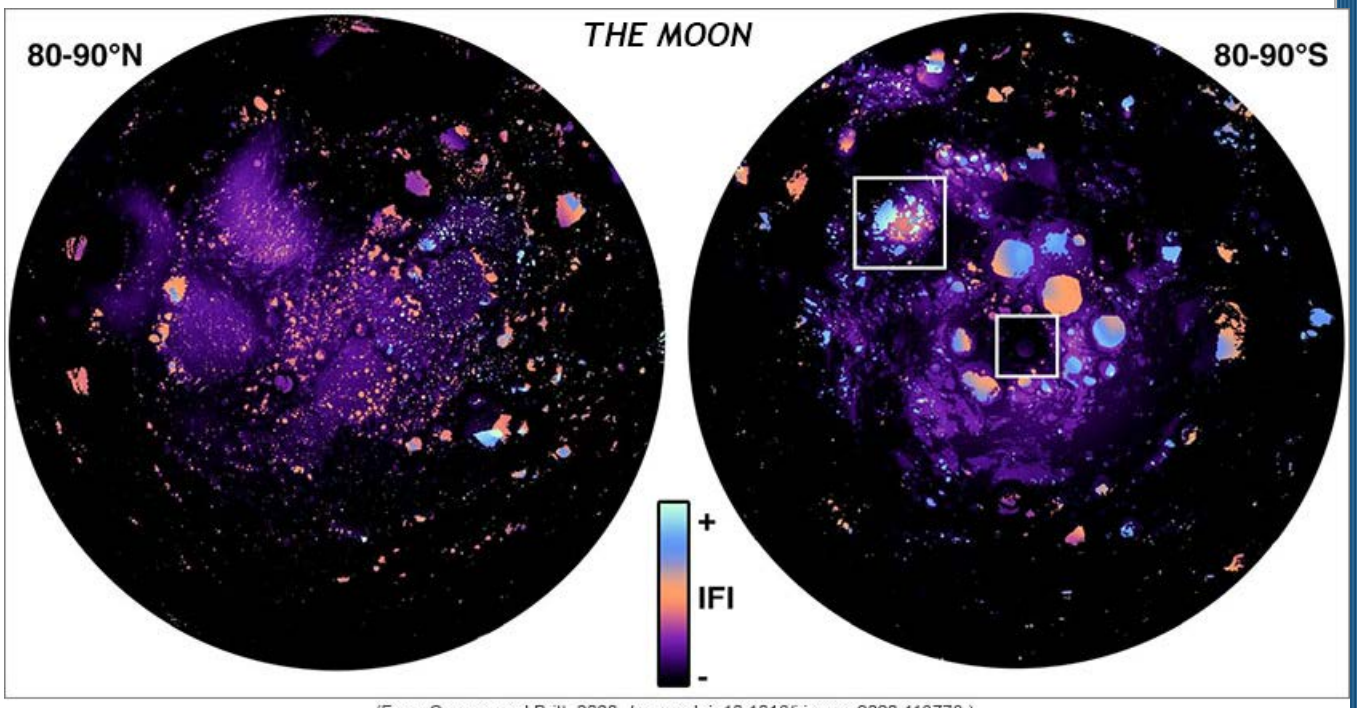
PLANETARY SCIENCE RESEARCH DISCOVERIES
CosmoSparks

Quick Views of Big Advances

Geology of Ice Deposits at the Lunar Poles

Remote sensing data have shown that there is considerable ice associated with permanently shadowed regions near the lunar poles. This has garnered considerable interest as a source of rocket propellant to fuel a robust human presence throughout the Solar System (see PSRD report: ***Refueling Space Exploration***). In short, polar ice deposits are potentially of significant commercial value. However, evaluating potential ore deposits requires knowing a lot about the concentration and distribution (vertically and horizontally) of the potential resource (in this case H_2O ice) and its accessibility. Obtaining this geologic knowledge requires data, of course, but also an understanding of the geologic processes and geologic history of the region of interest.

Kevin Cannon and Dan Britt (University of Central Florida) have developed a geologic model of polar deposits, from the source of the H_2O, its deposition, and its retention in the frigid polar ***regolith***. They found, for example, that places with high, mineable concentrations of ice are distributed randomly, in contrast to typical terrestrial ore deposits, which are sequestered into relatively small ore bodies.



(From Cannon and Britt, 2020, *Icarus*, doi: 10.1016/j.icarus.2020.113778.)

Maps of the Ice Favorability Index (IFI) in the northern (left) and southern (right) polar regions of the Moon. The IFI is based on modeling a source term (where the H_2O comes from), a capture term (the nature of polar cold traps), and a retention term (how H_2O is preserved in polar regolith). The white squares on the south polar map indicate the locations of Cabeus crater (left) and Shackleton crater (lower right), which Cannon and Britt discuss in detail.

See Reference:

· Cannon, Kevin M. and Britt, Daniel T. (2020) A Geologic Model for Lunar Ice Deposits at Mining Scales, *Icarus,* v. 347, 113778, doi: 10.1016/j.icarus.2020.113778. [***article***]

See also:

· Martel, L. M. V. (November 2019) Refueling Space Exploration, *PSRD,* ***www.psrd.hawaii.edu/CosmoSparks/Nov19/lunar-propellant-production.html***.

· Martel, L. M. V. (October 2010) An Icy Treat—Water ice Confirmed on the Moon, *PSRD,* ***www.psrd.hawaii.edu/CosmoSparks/Oct10/Moon-surfacewater.html***.

· Spudis, P. D. (December 1996) Ice on the Bone Dry Moon, *PSRD,* ***www.psrd.hawaii.edu/Dec96/IceonMoon.html***.

· Taylor, G. J. and Martel, L. M. V. (April 2018) New Age for Lunar Exploration, *PSRD,* ***www.psrd.hawaii.edu/April18/lunar-exploration.html***.

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