



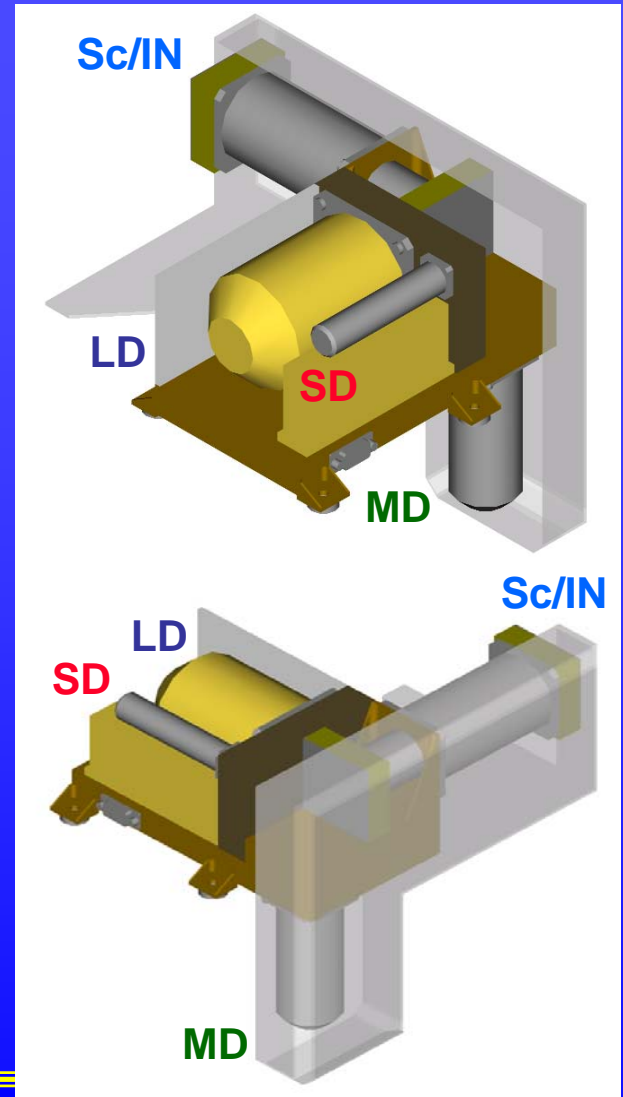
Studies of Polar Caps by HEND



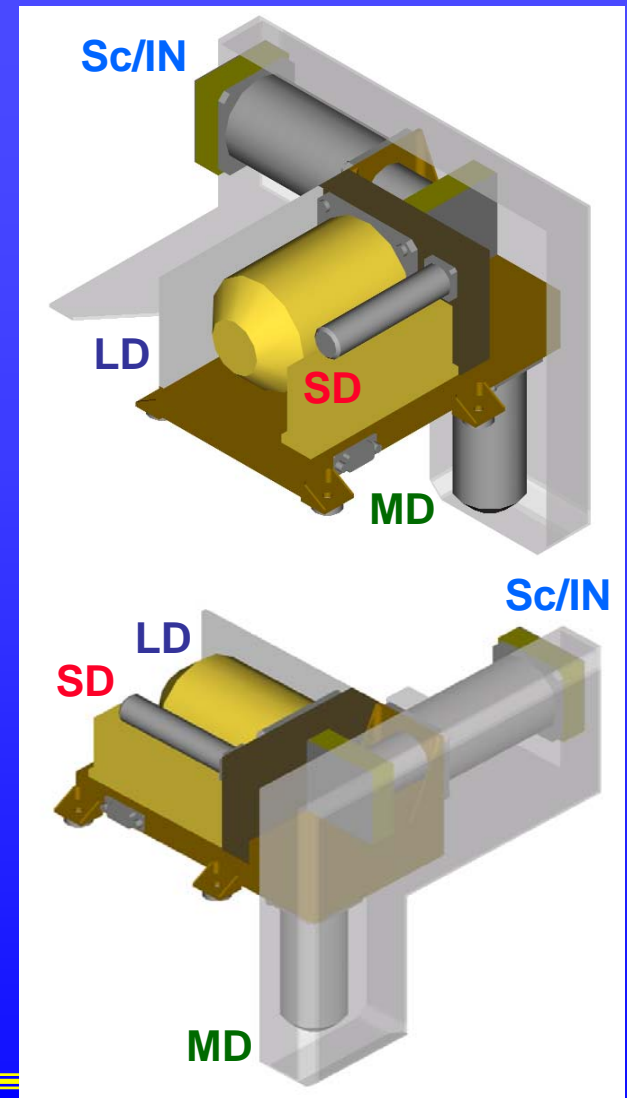
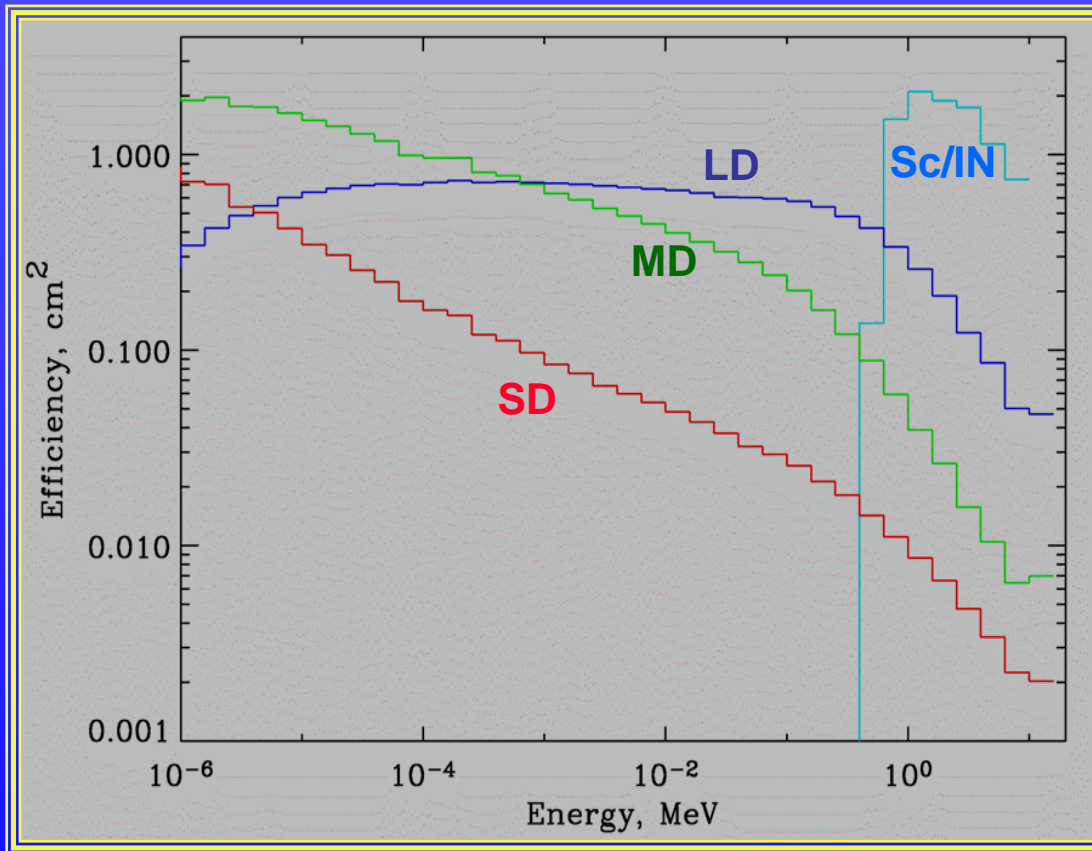
I.Mitrofanov, M.Litvak, A.Kozyrev, A. Sanin and V.Tret'yakov
Institute for Space Research, Moscow, Russia

W.Boynton, D.Hamara and C.Shinohara
University of Arizona, Tucson, USA

HEND (High Energy Neutron Detector) was developed by Russian Space Research Institute for NASA Mars Odyssey mission

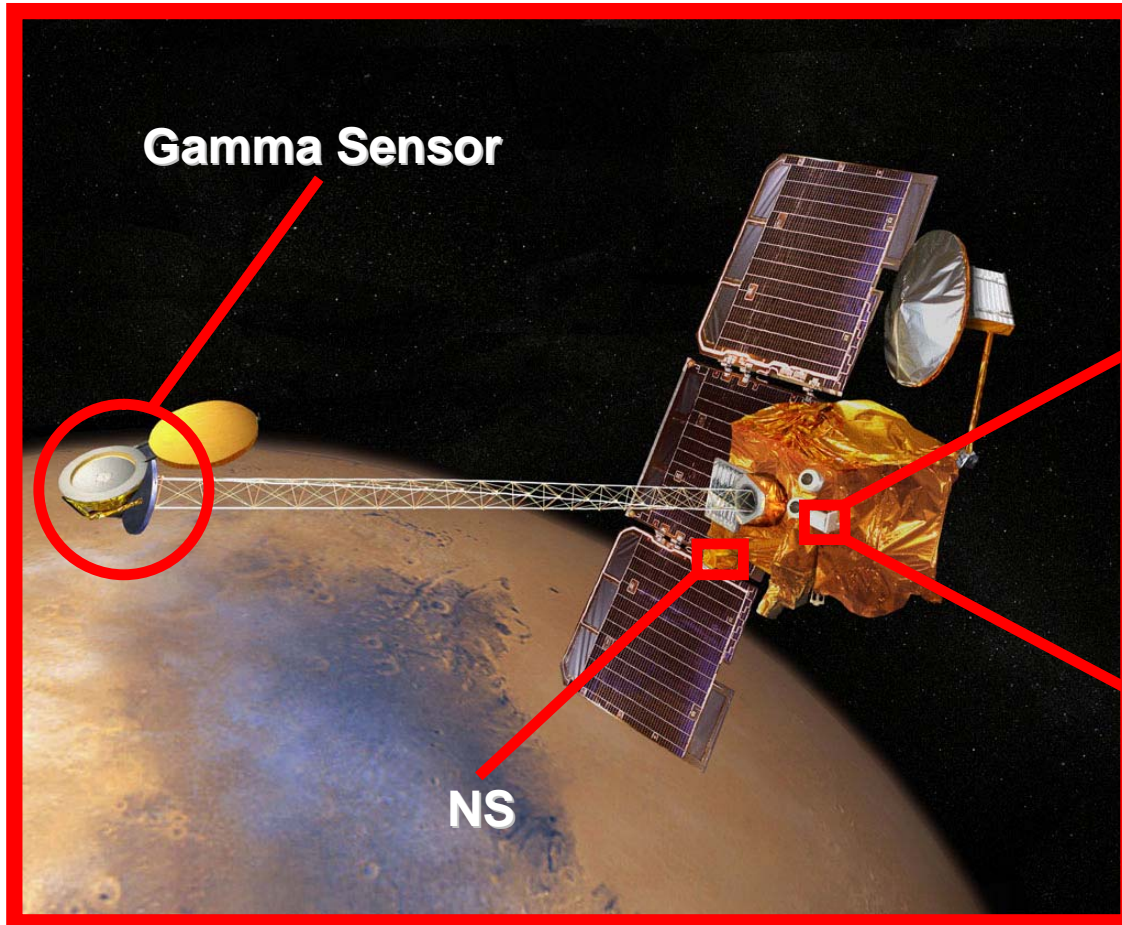
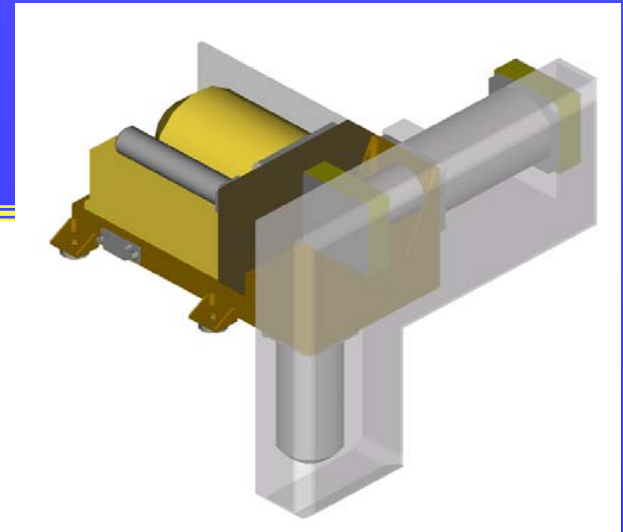


HEND (High Energy Neutron Detector) was developed by Russian Space Research Institute for NASA Mars Odyssey mission

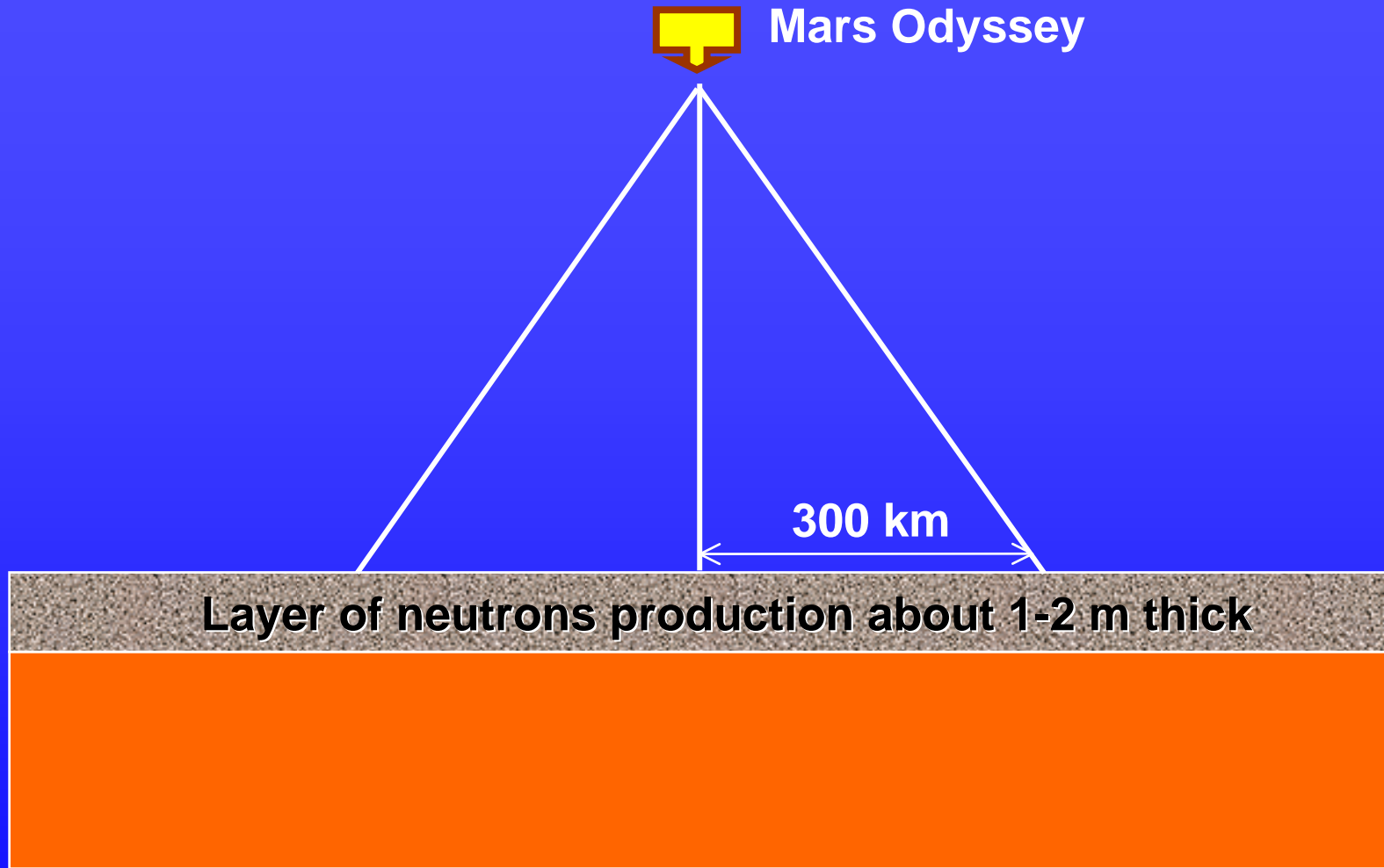


First Mars Express Science Conference, ESTEC, 21-25 February, 2005

HEND (High Energy Neutron Detector) was developed by Russian Space Research Institute for NASA Mars Odyssey mission



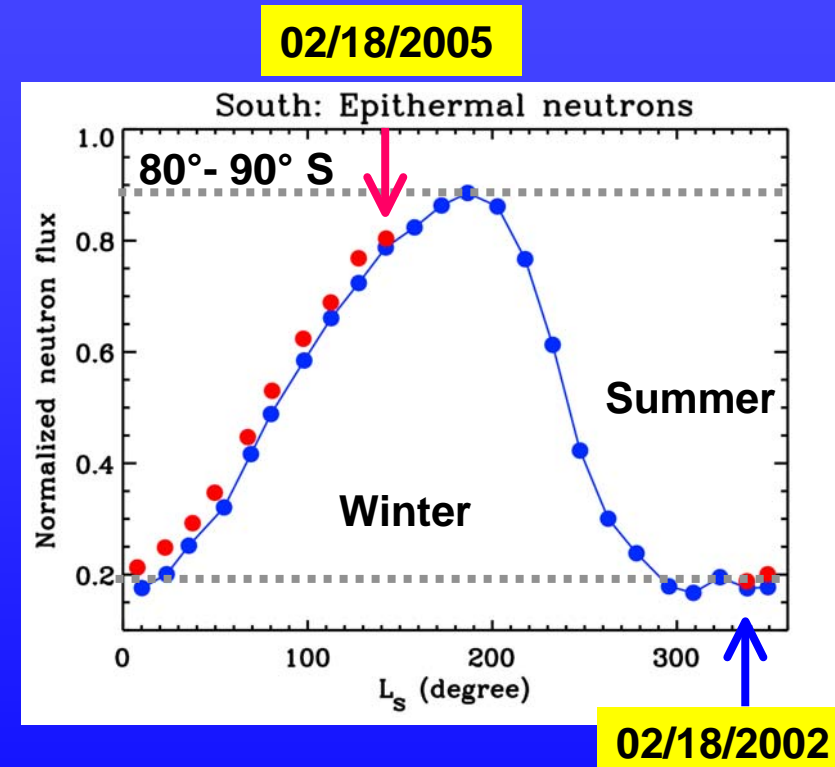
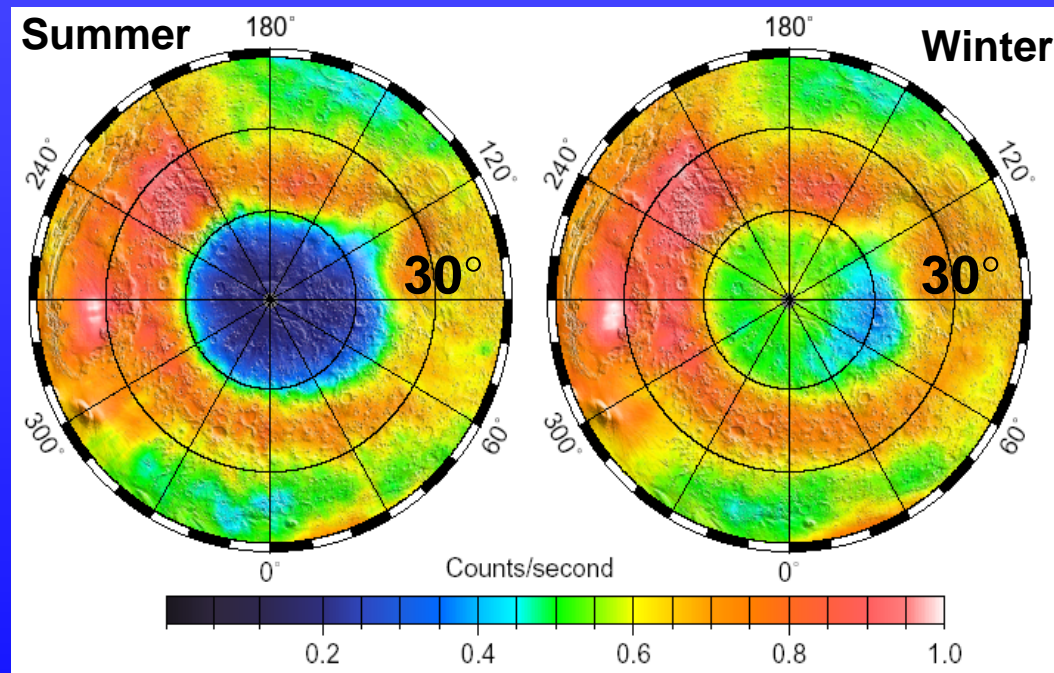
**Might HEND see the Residual
Polar Caps at North and at
South during summer time?**

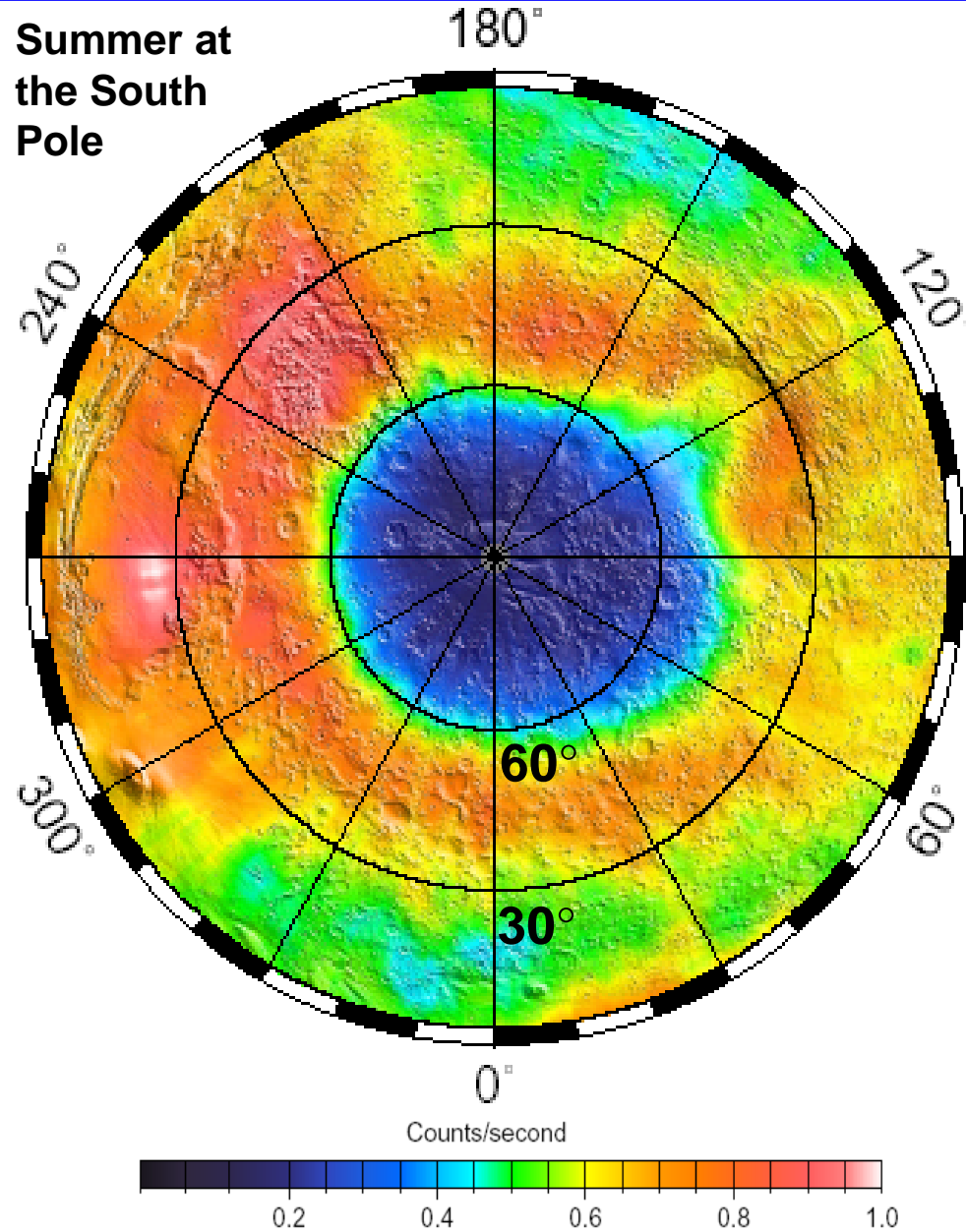


Now HEND is at the middle of the second Martian year of orbital mapping of South pole:

● - 1st year

● - 2nd year

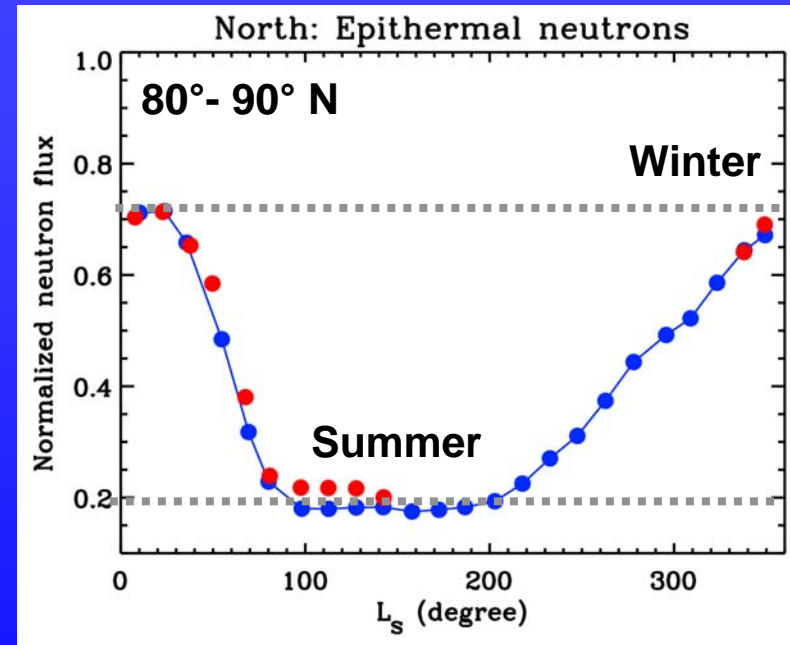
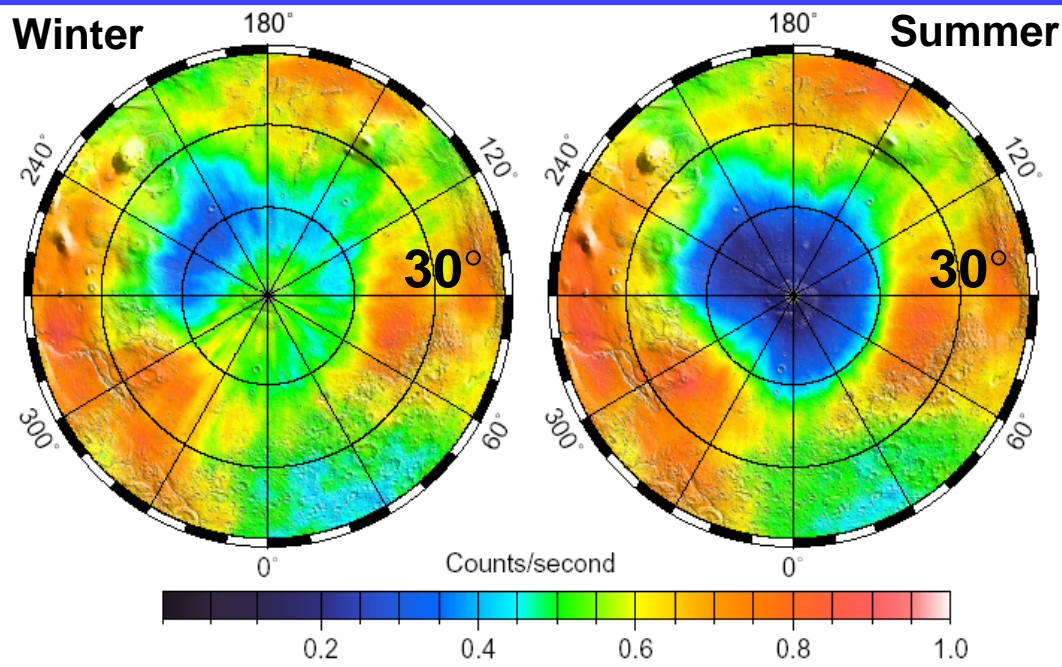


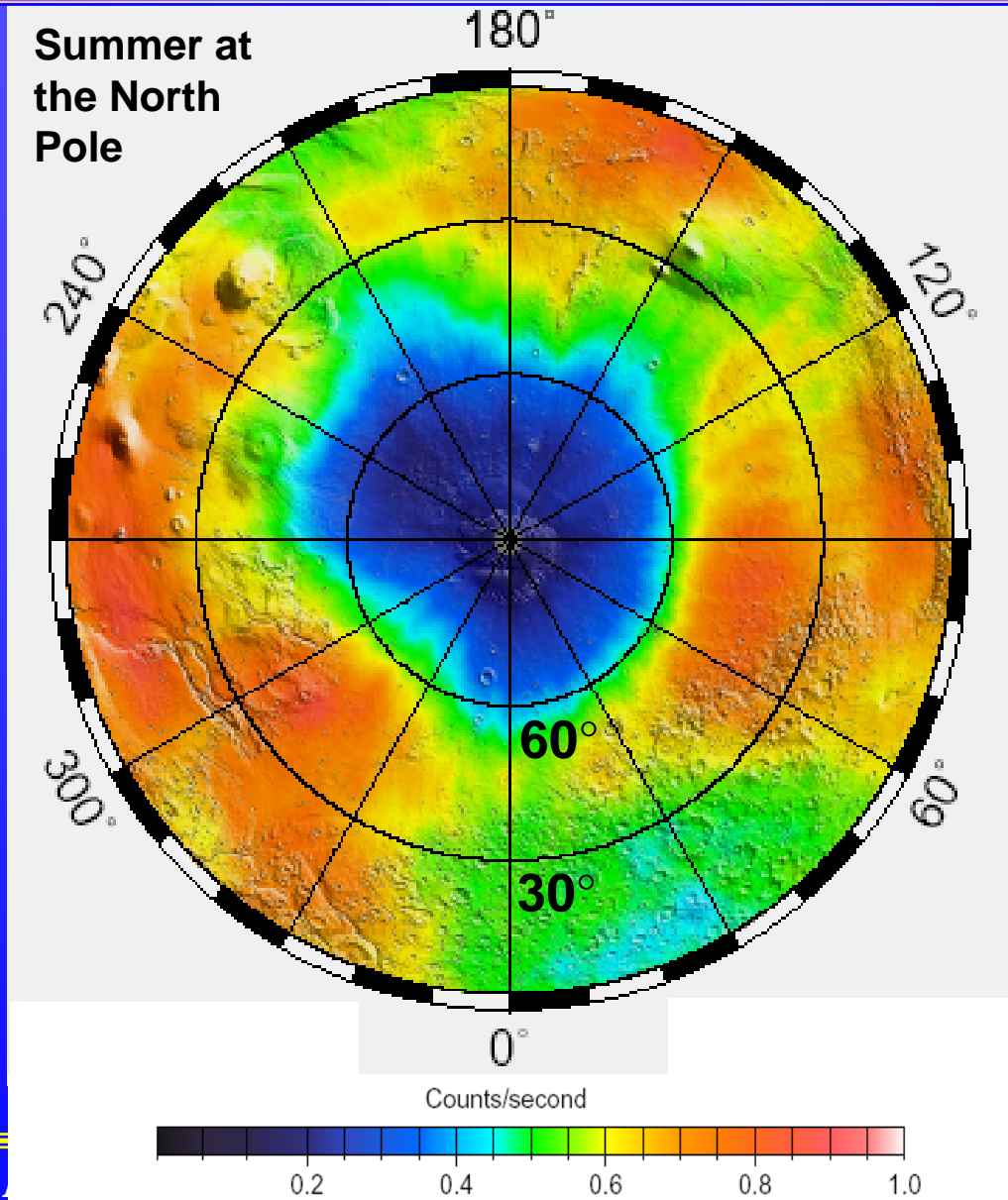


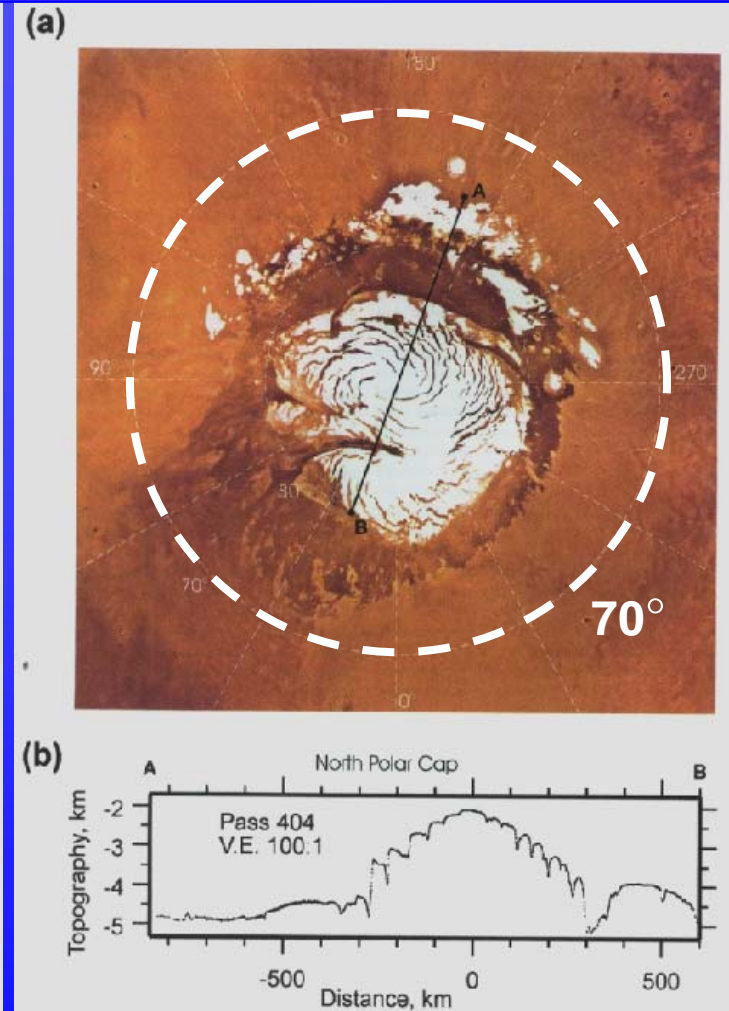
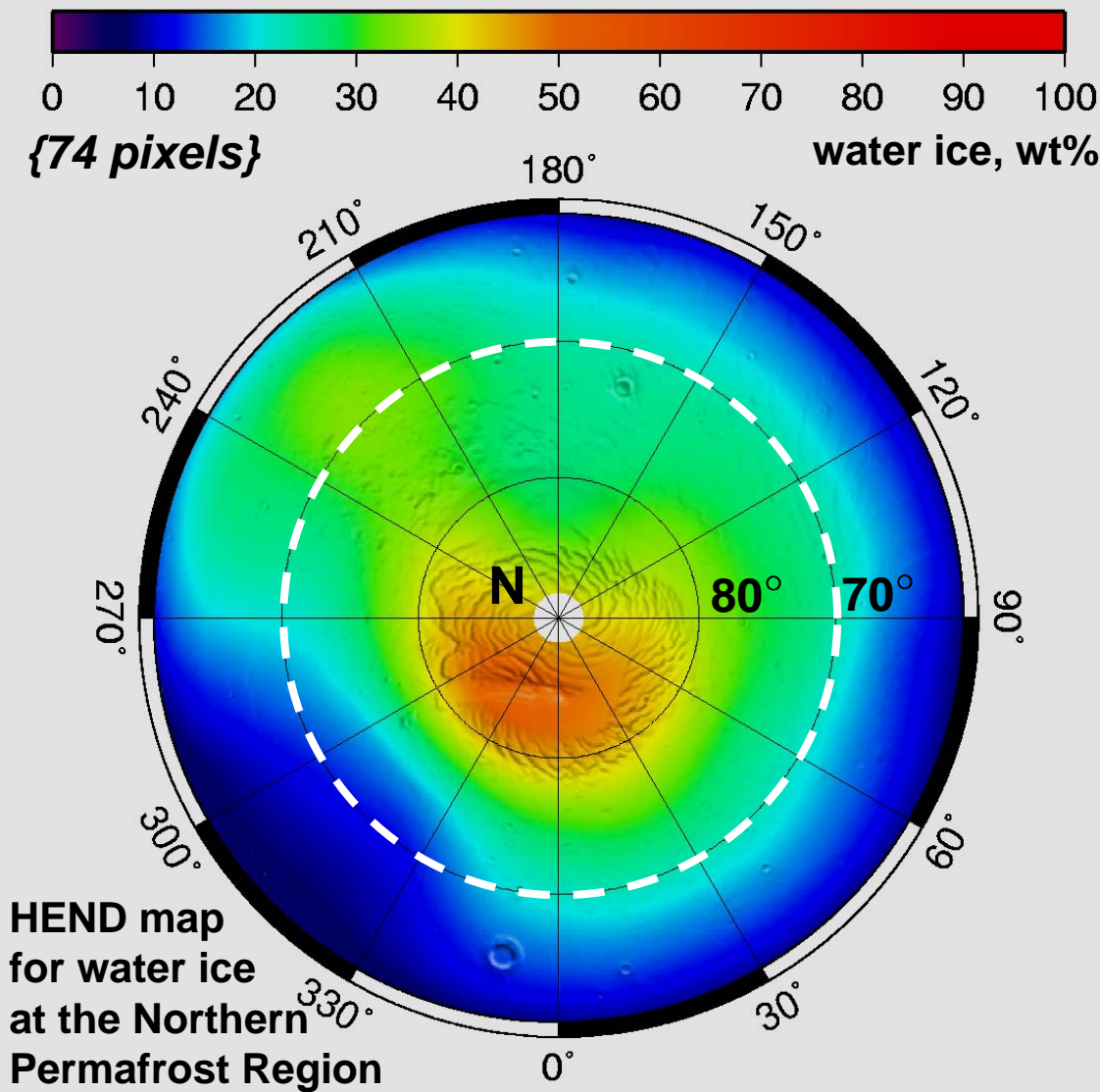
Now HEND is at the middle of the second Martian year of orbital mapping of North pole:

● - 1st year

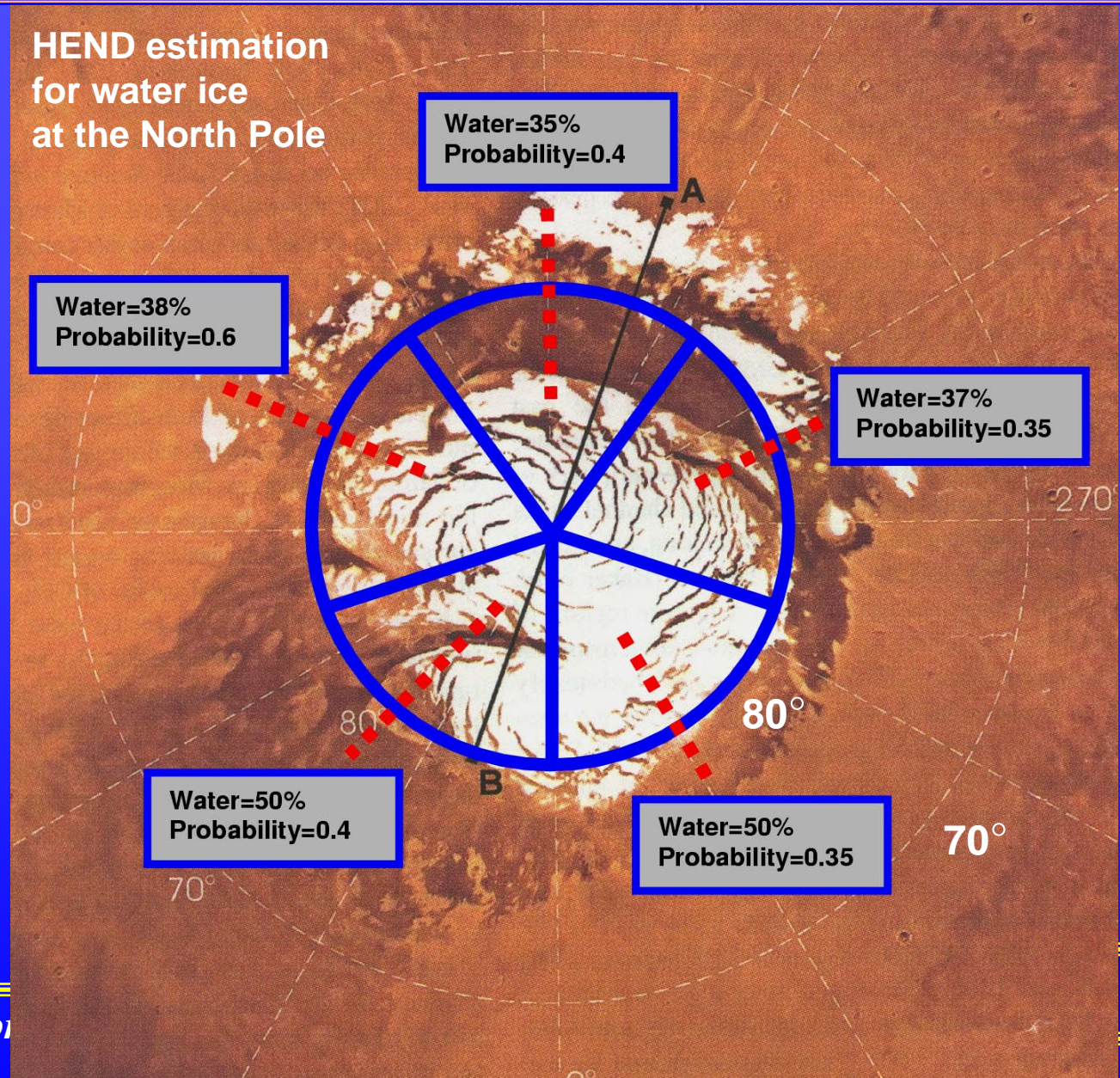
● - 2nd year

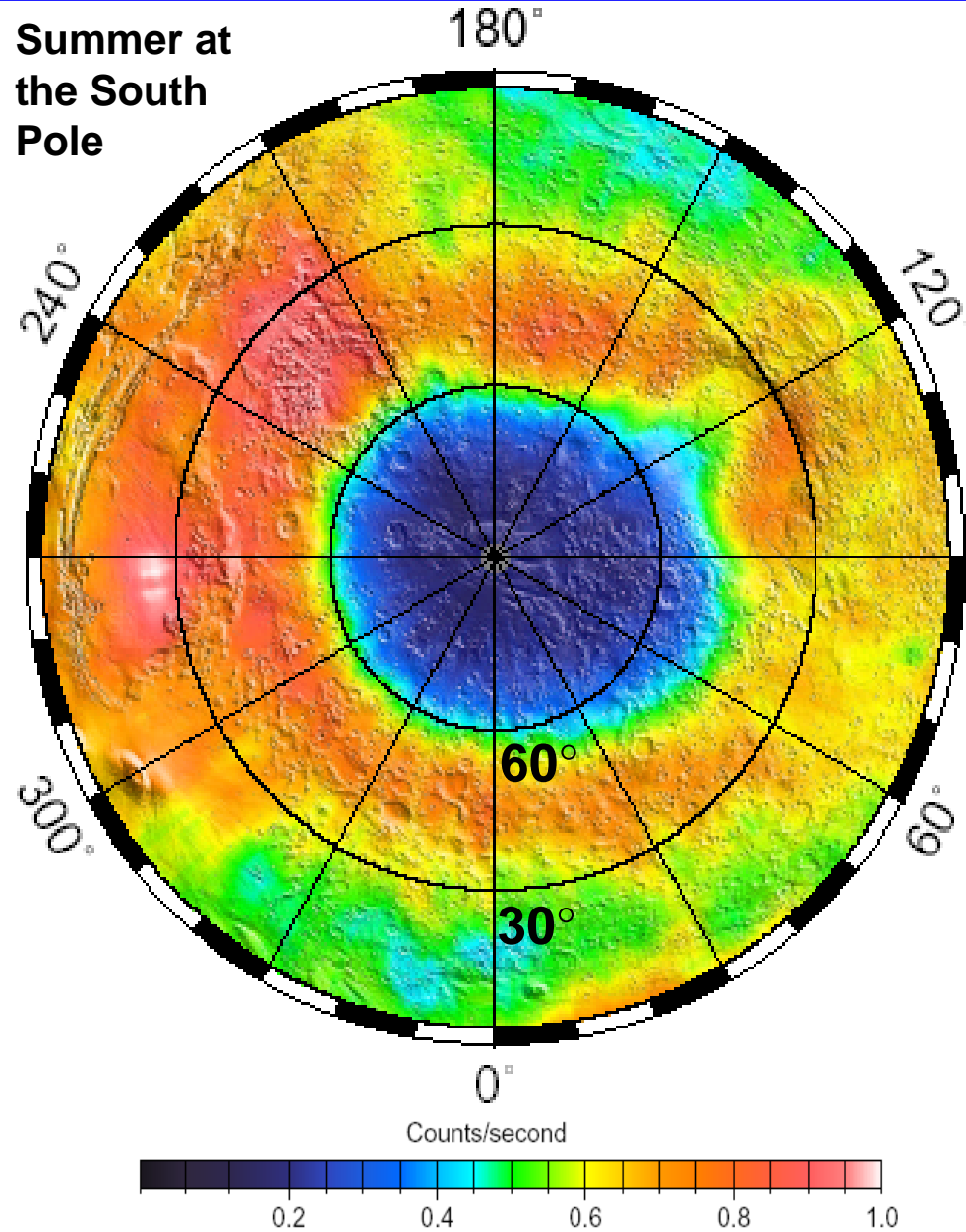


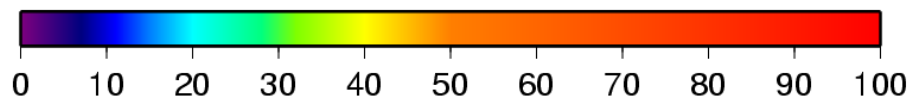




**HEND estimation
for water ice
at the North Pole**

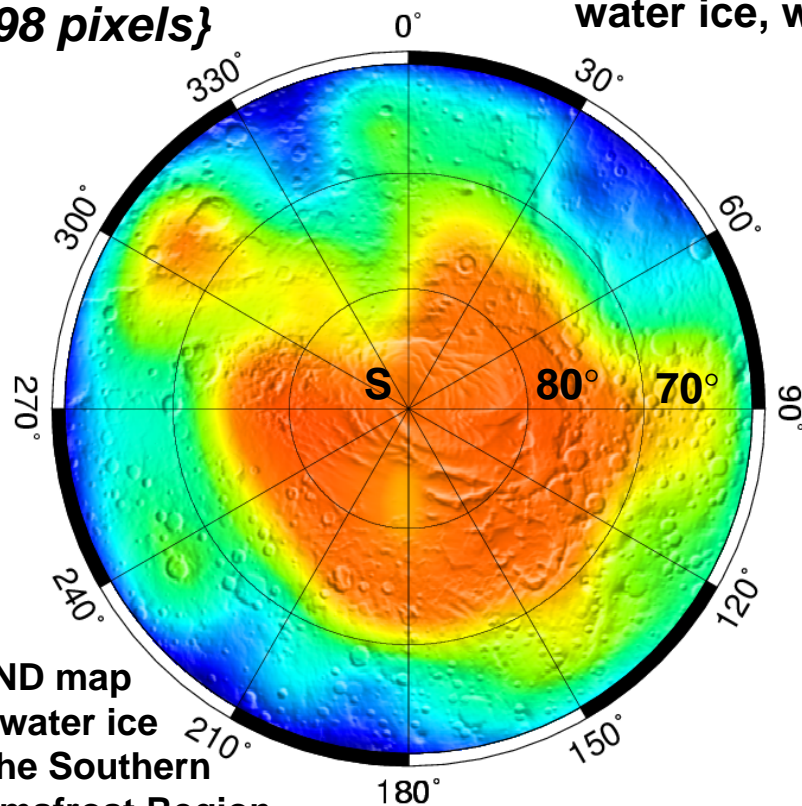






{98 pixels}

water ice, wt%

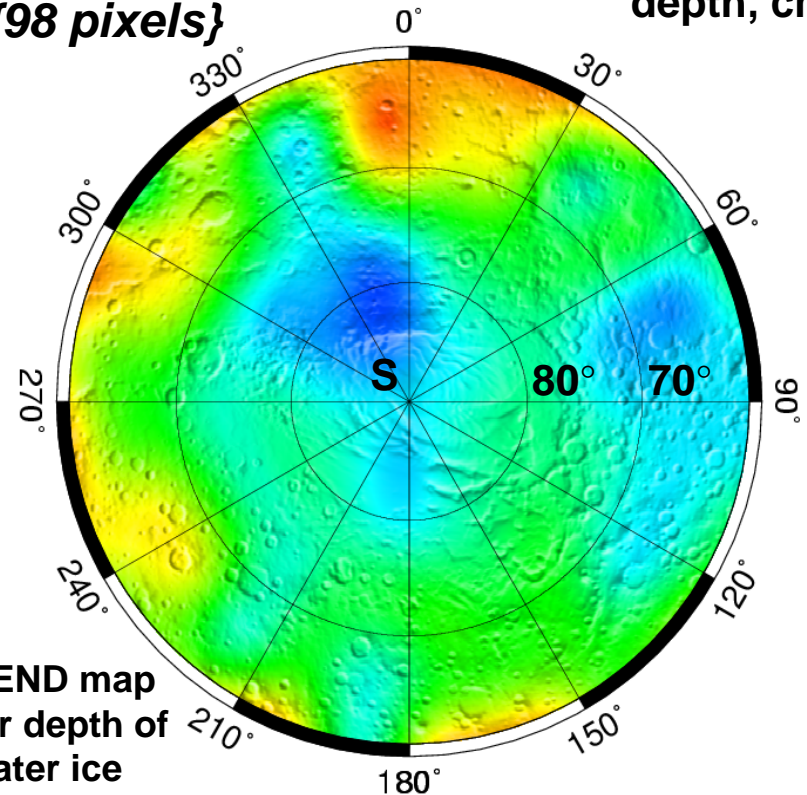


**HEND map
for water ice
at the Southern
Permafrost Region**

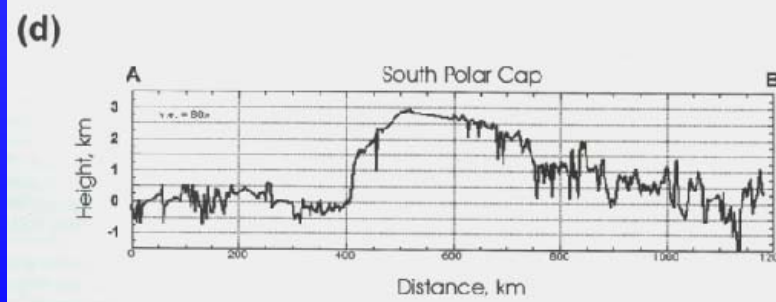
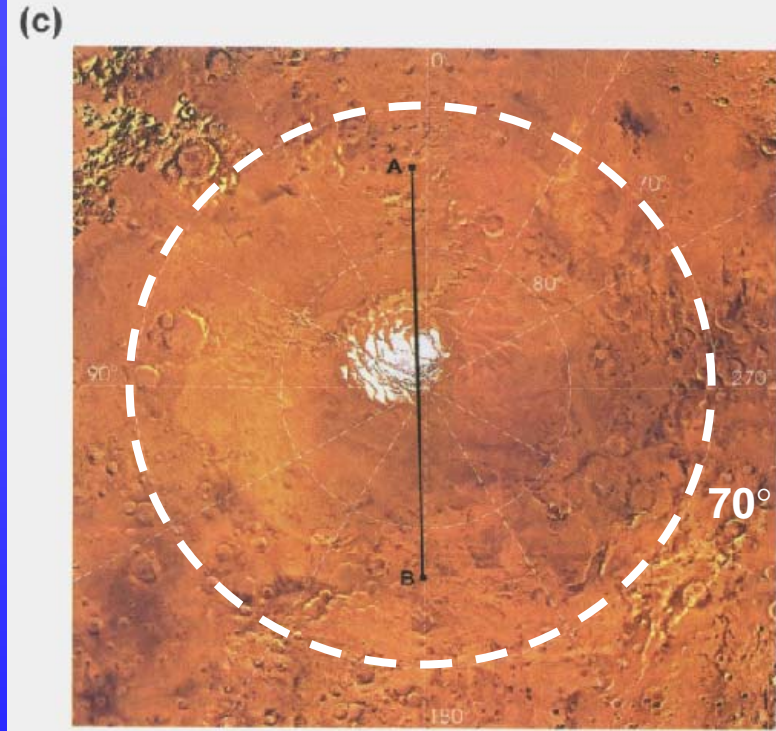
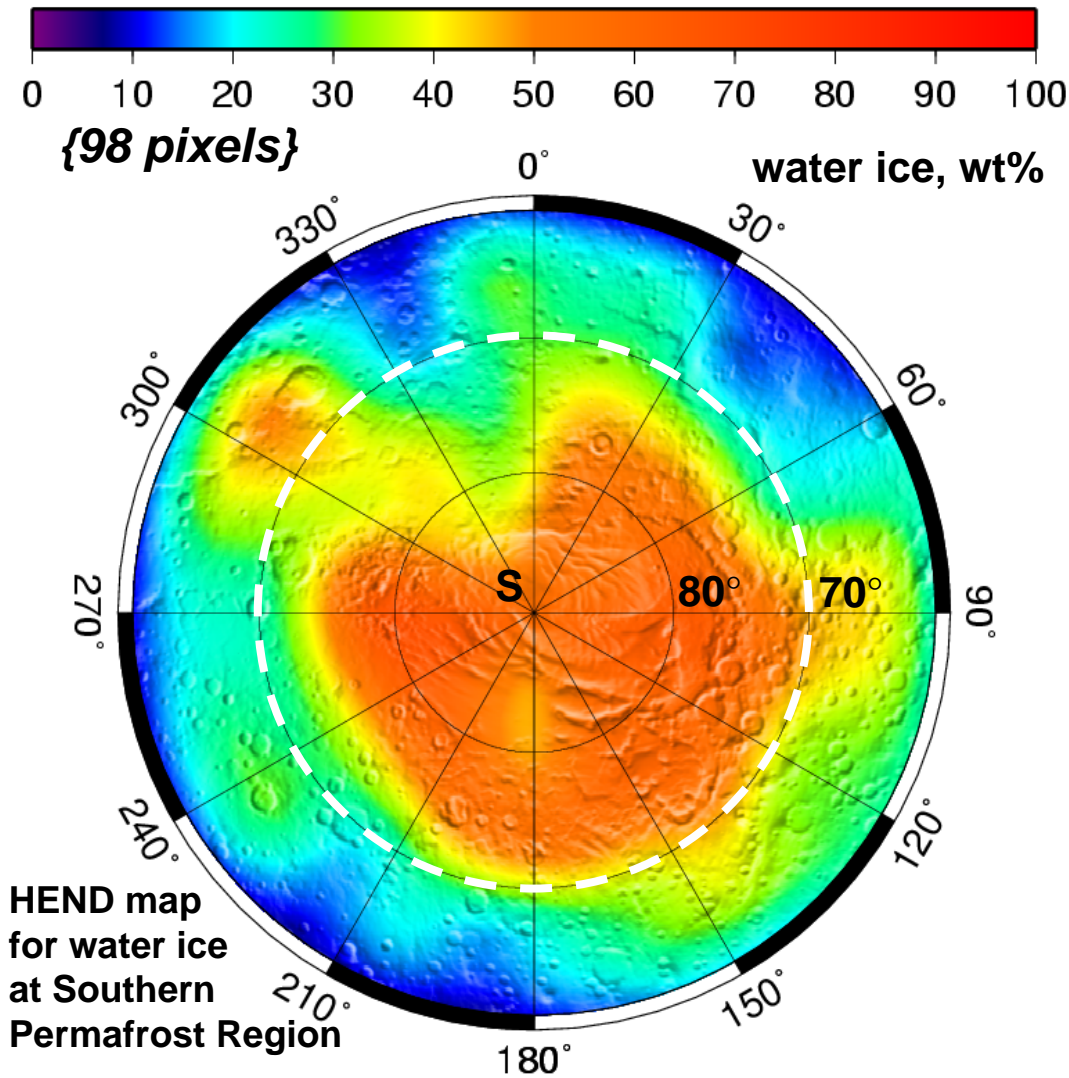


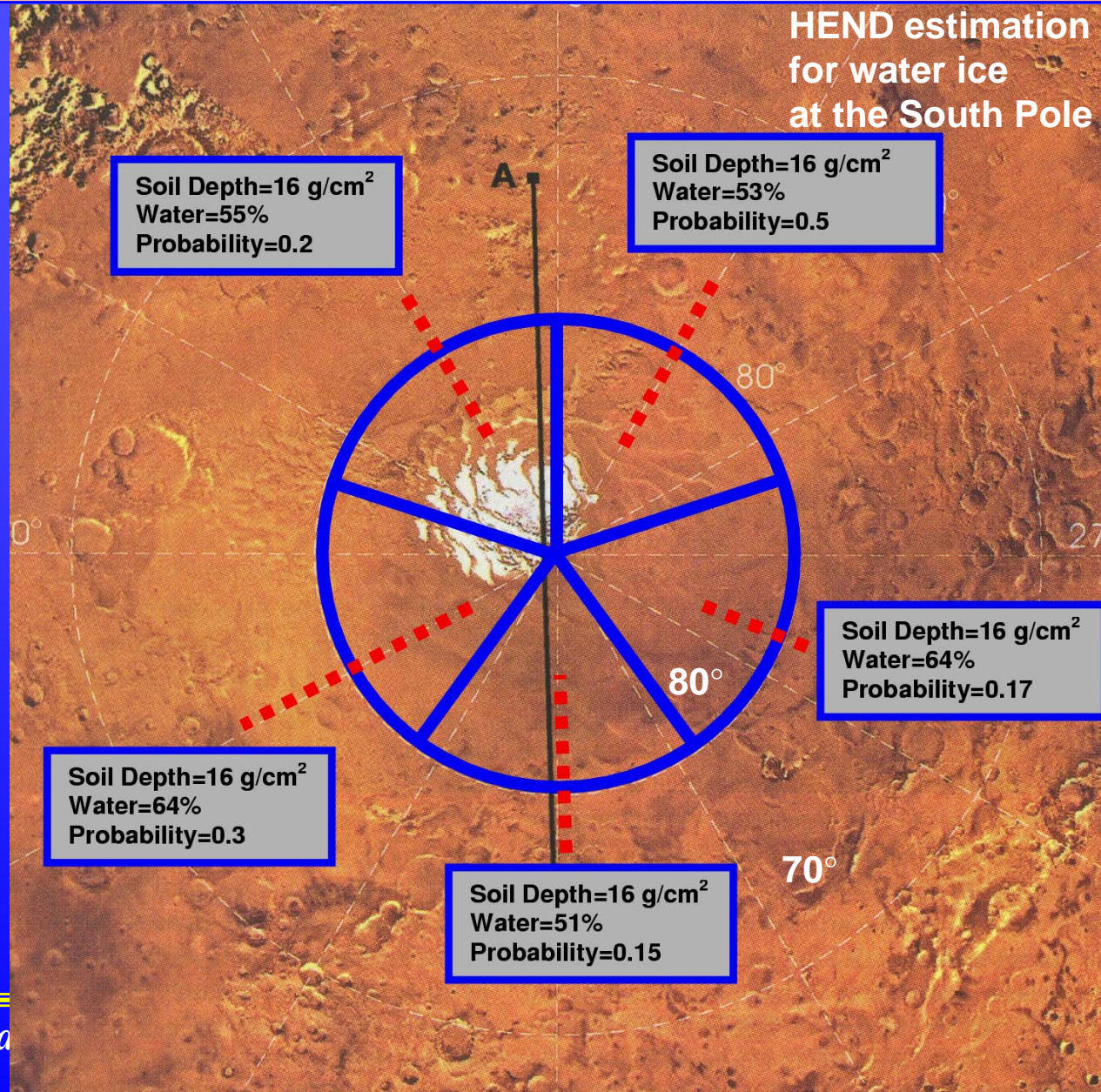
{98 pixels}

depth, cm

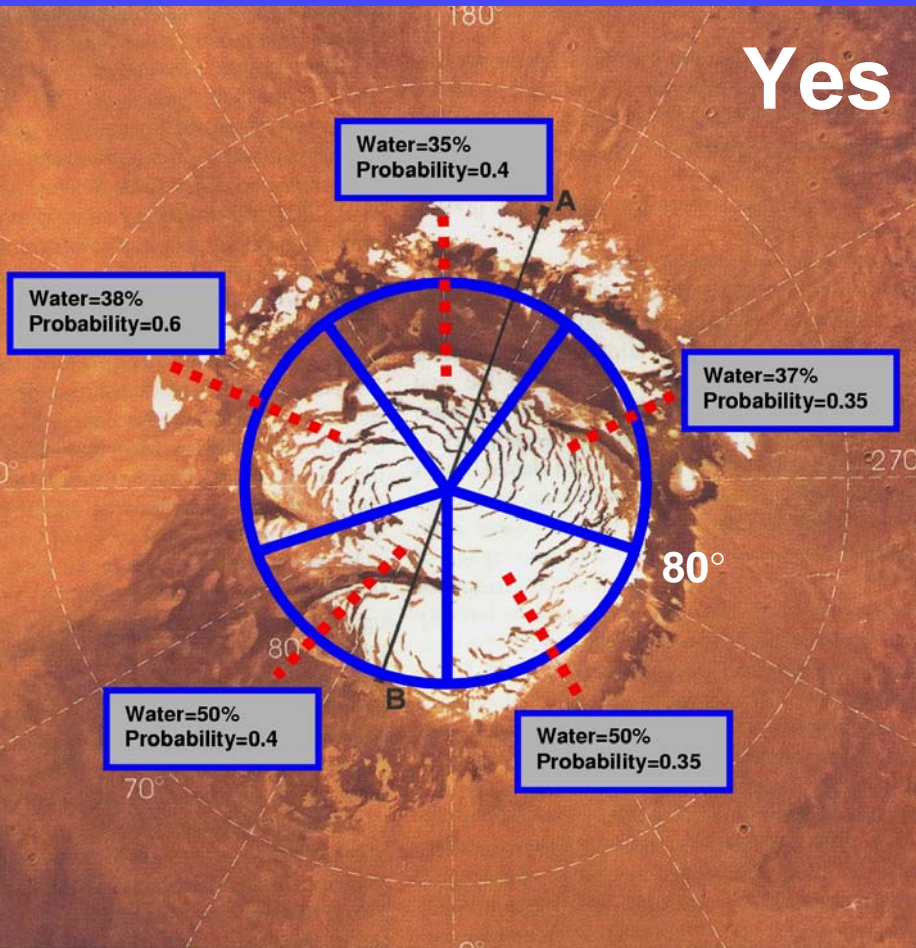


**HEND map
for depth of
water ice
at the Southern
Permafrost Region**

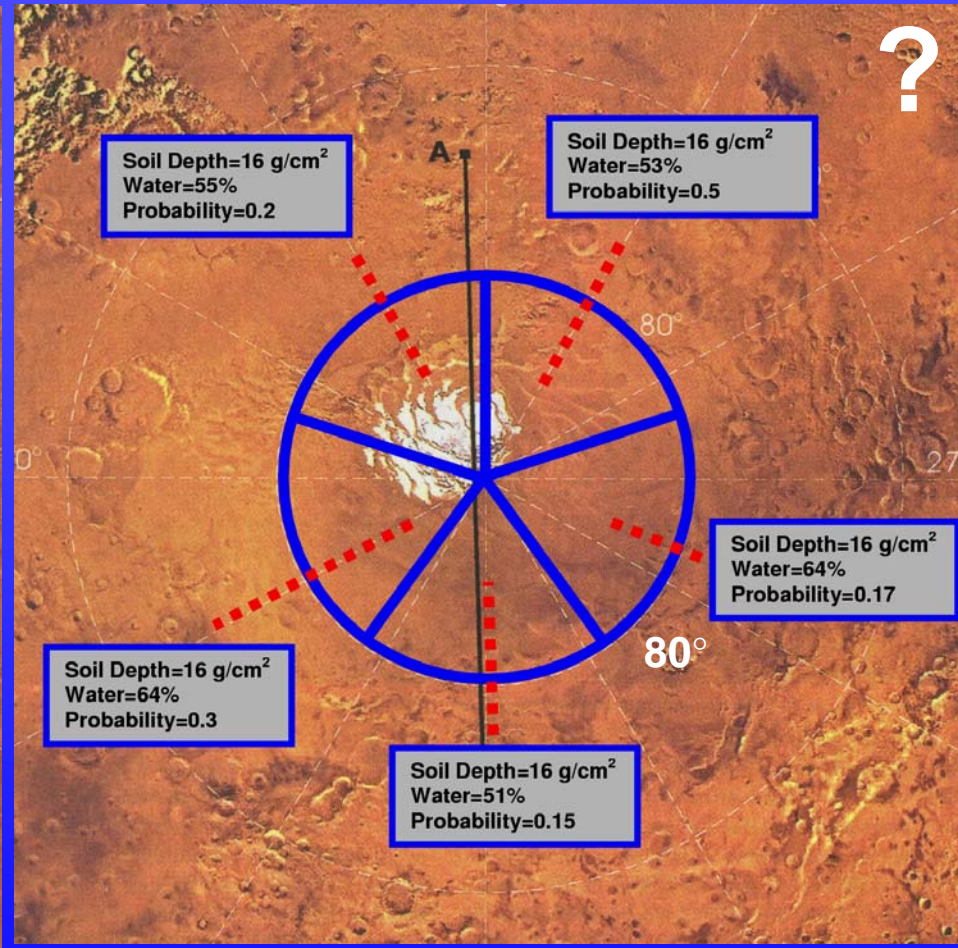




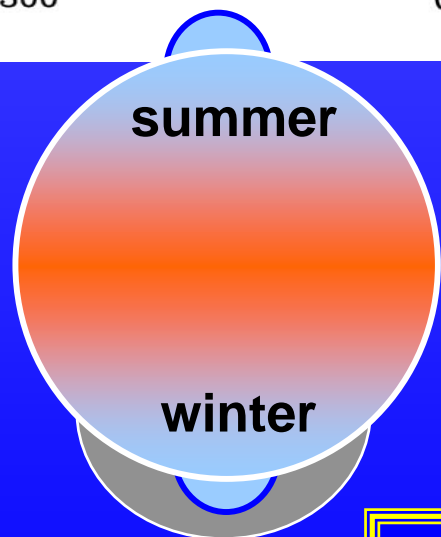
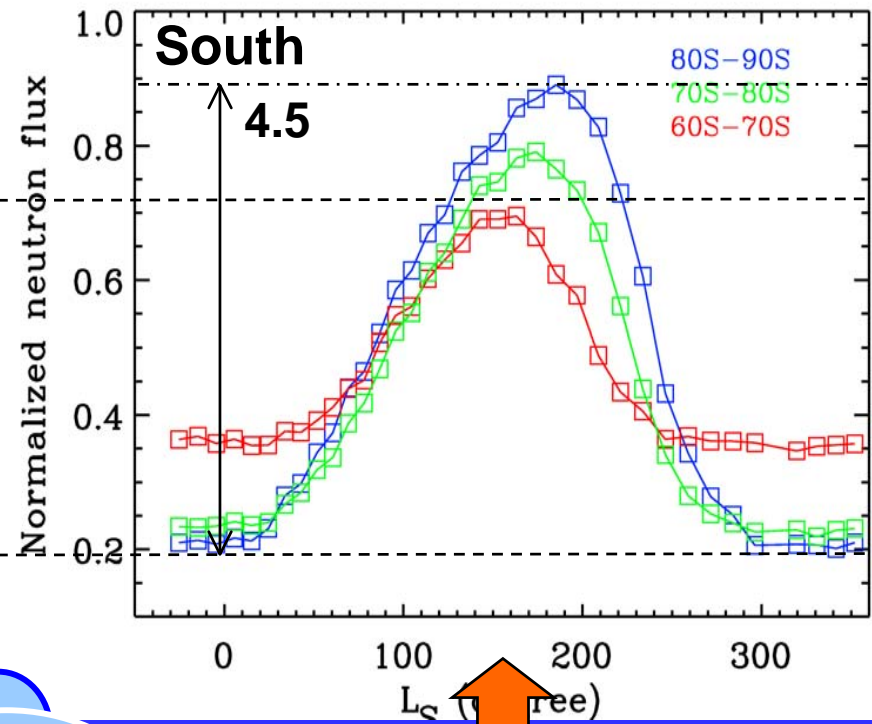
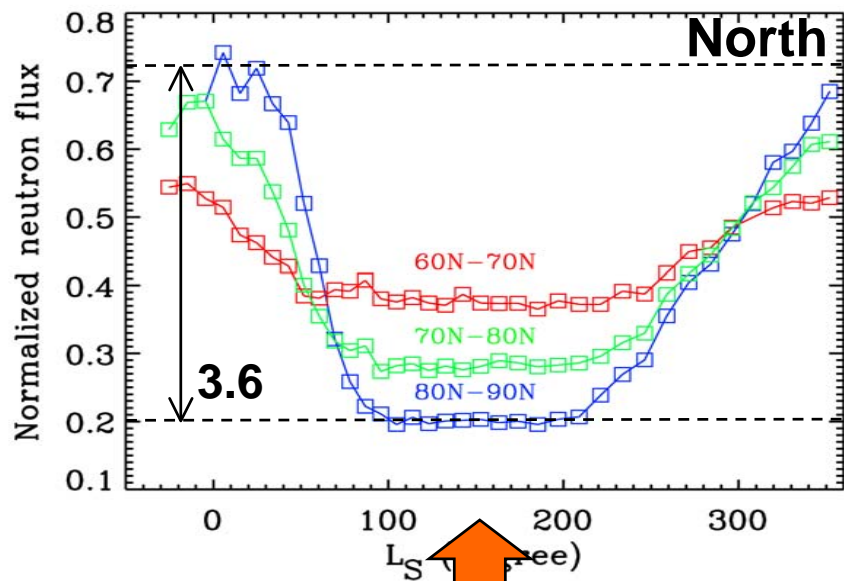
Yes

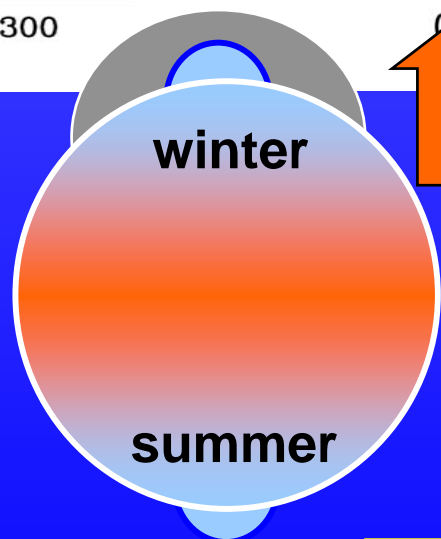
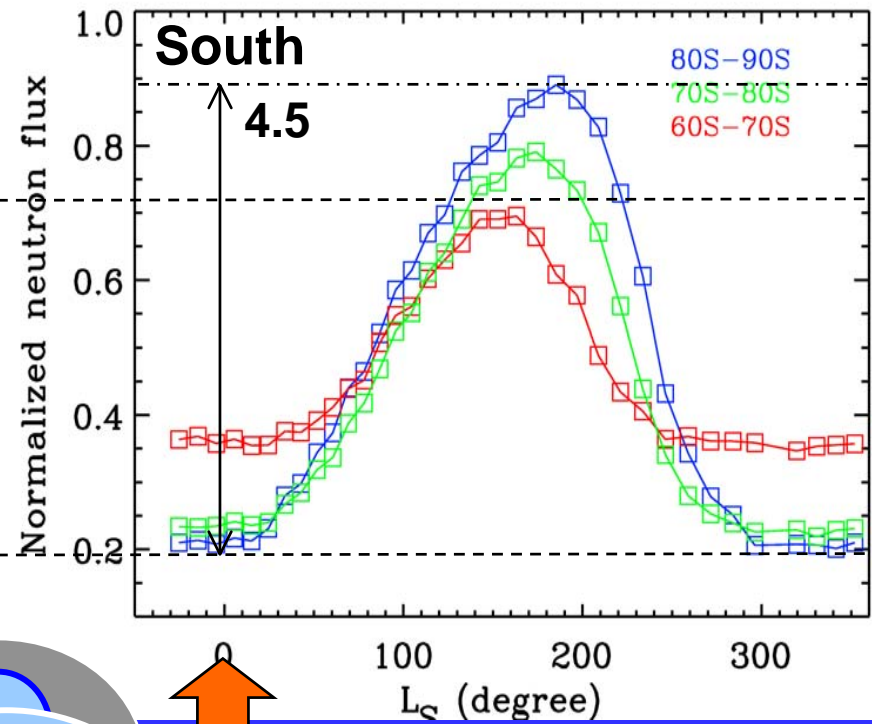
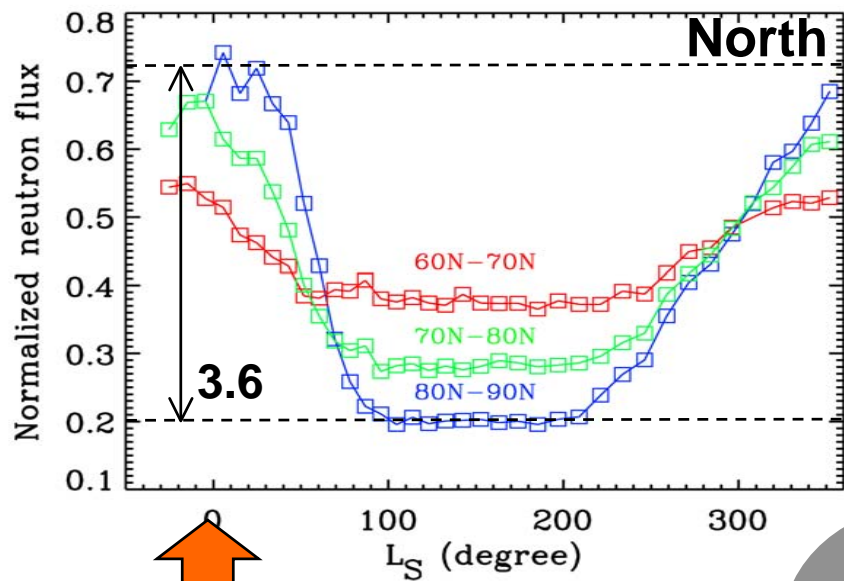


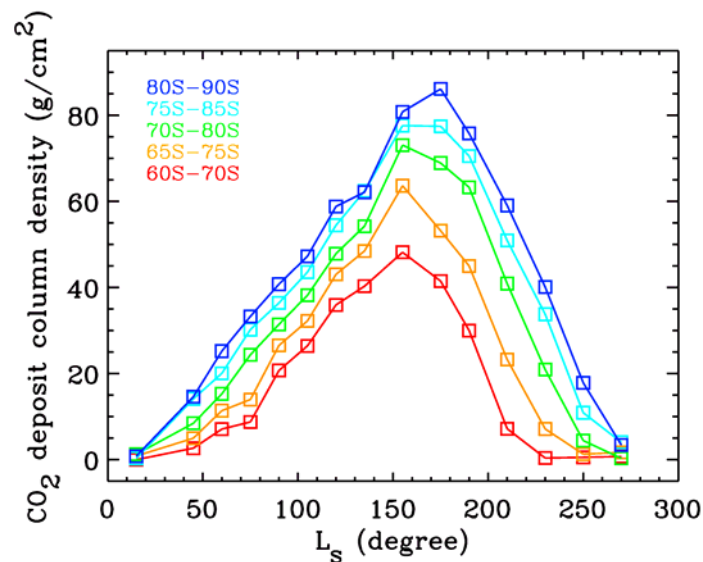
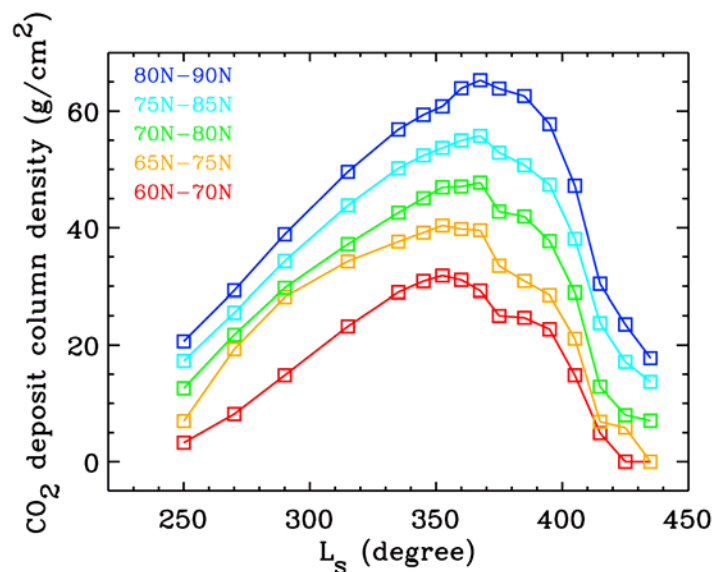
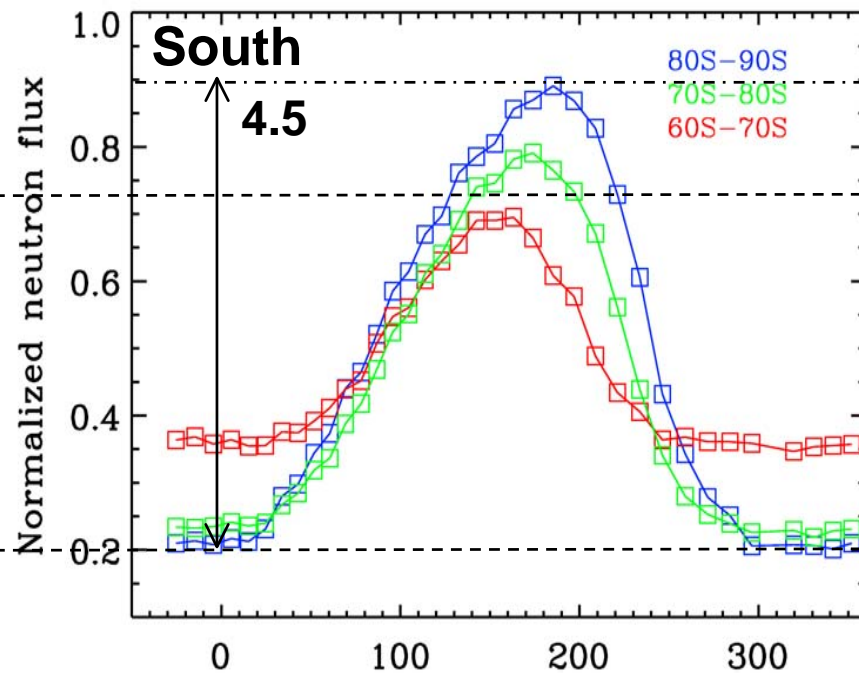
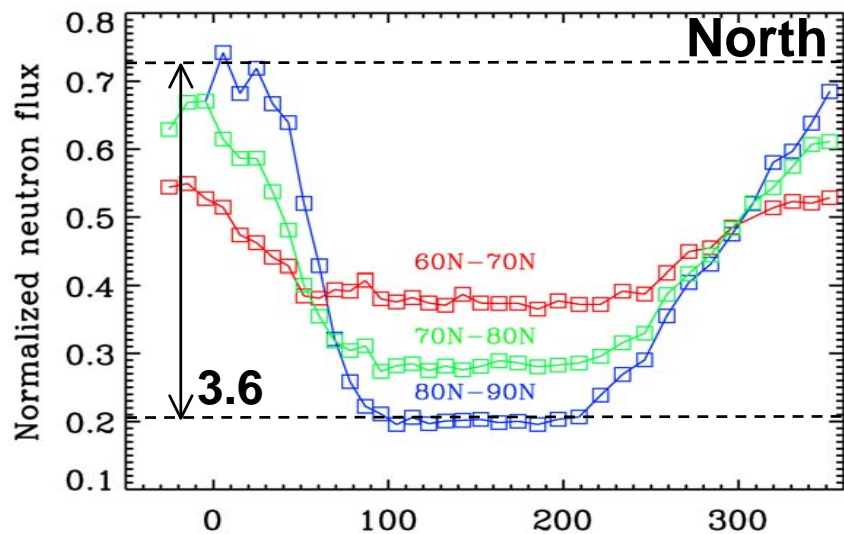
?



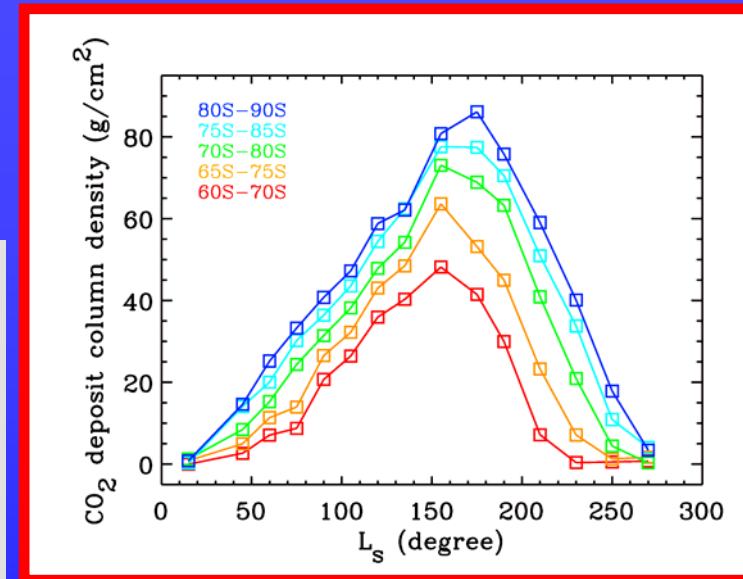
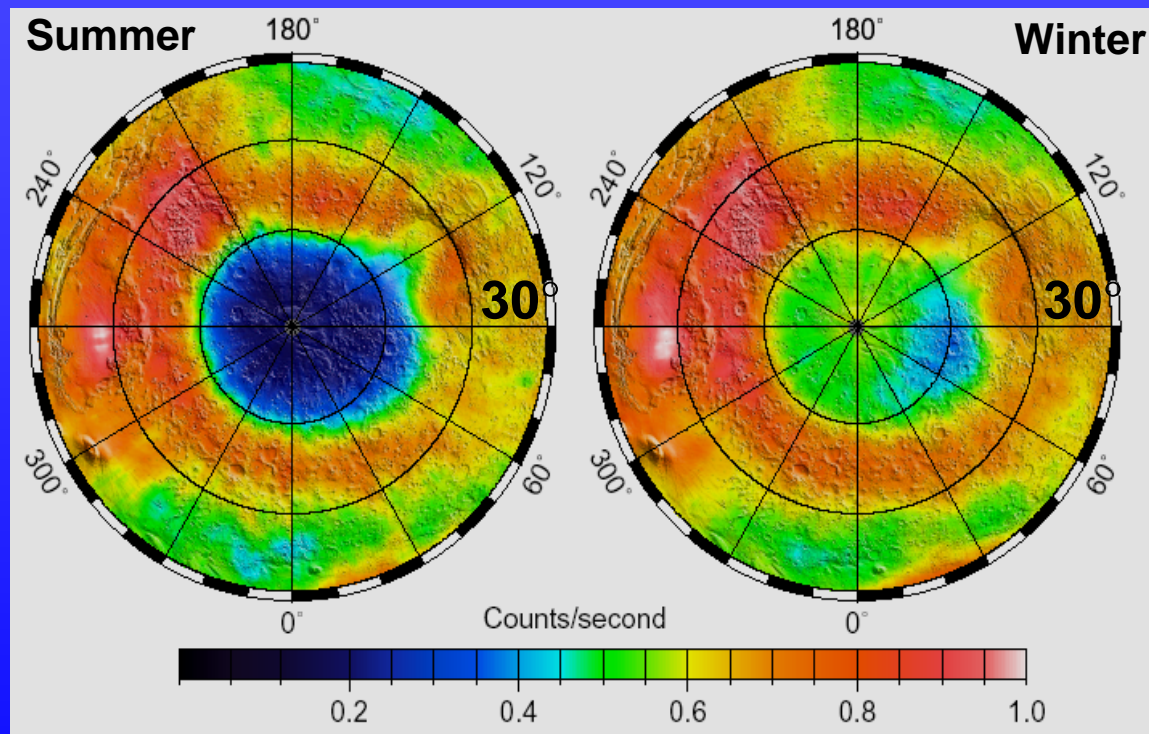
Where is the Southern Residual Polar Cap with CO₂ ?



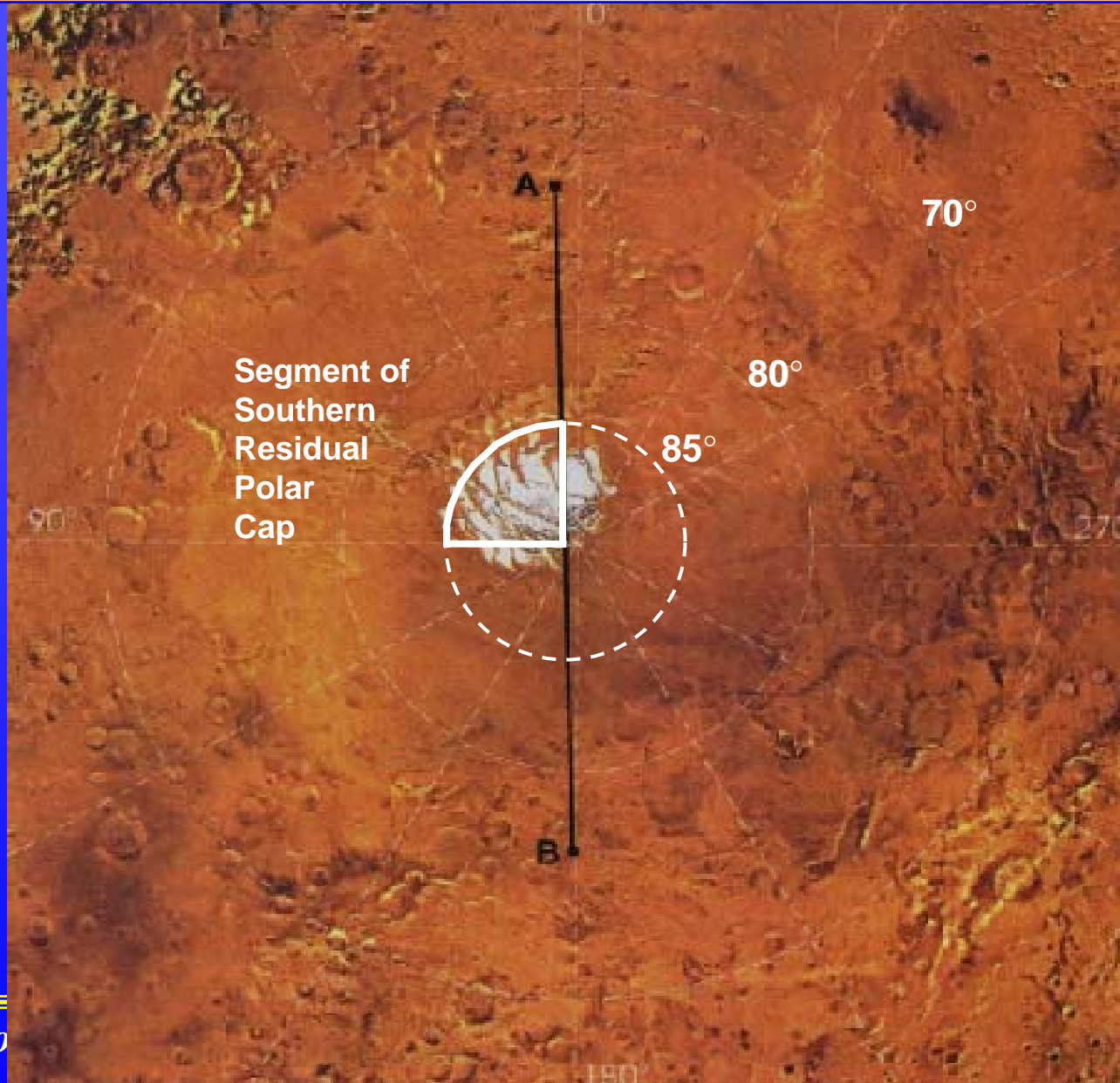




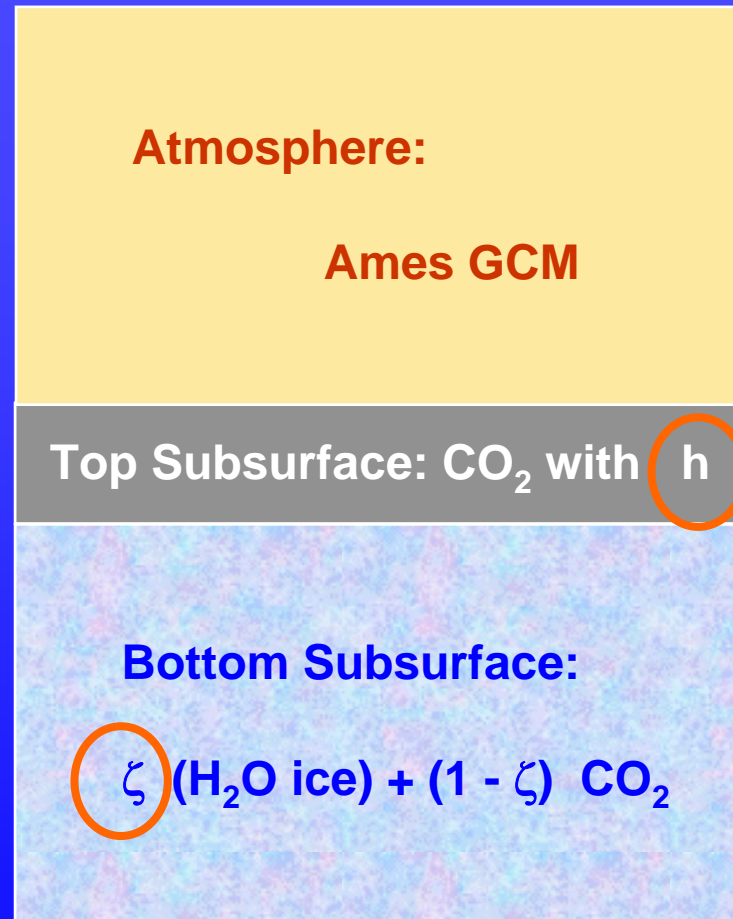
Seasonal cycle at the South Pole

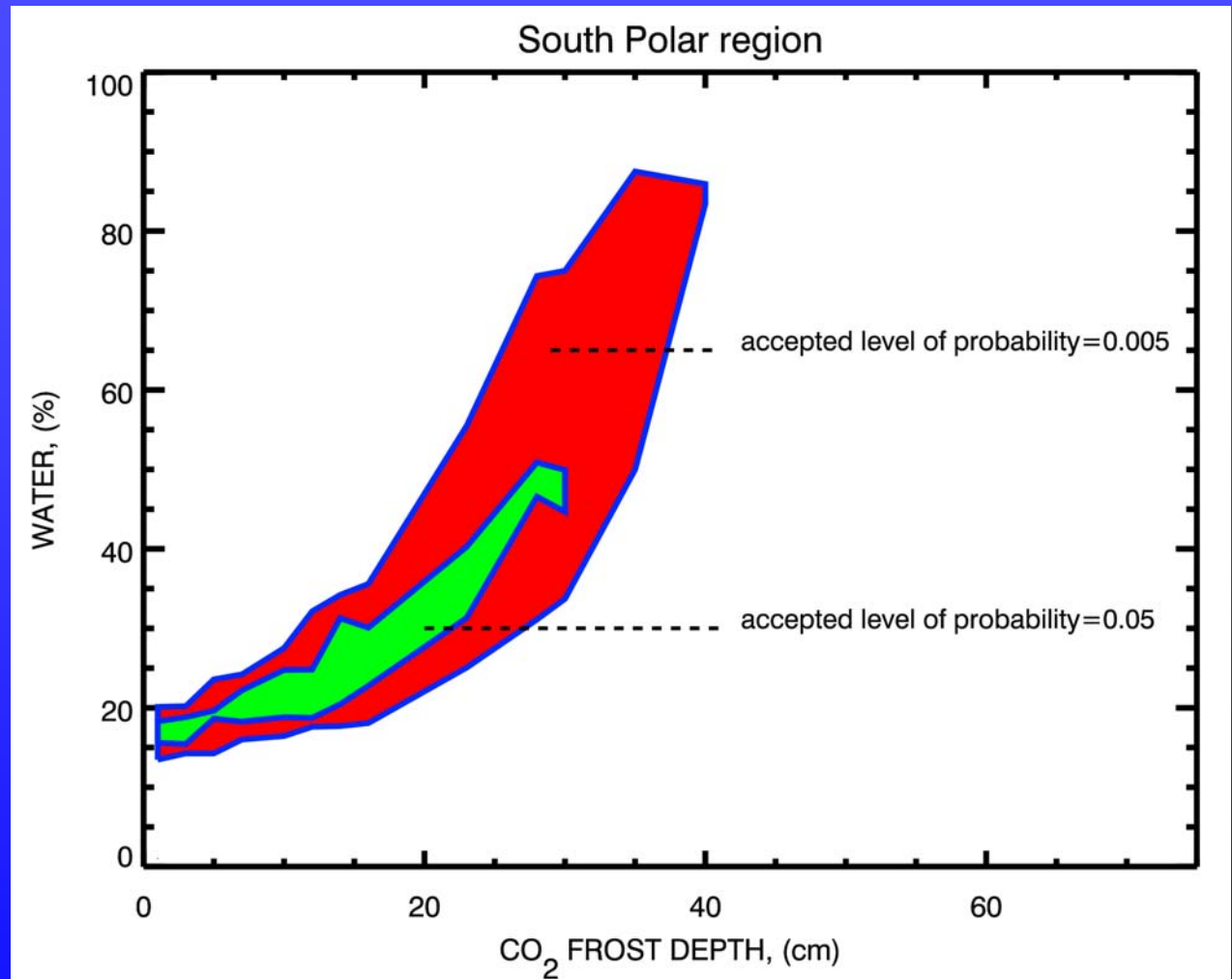


**Which mixture of water ice and
CO₂ does HEND data supports
for
Southern Residual Polar Cap ?**



Model for Segment of South Residual Polar Cap

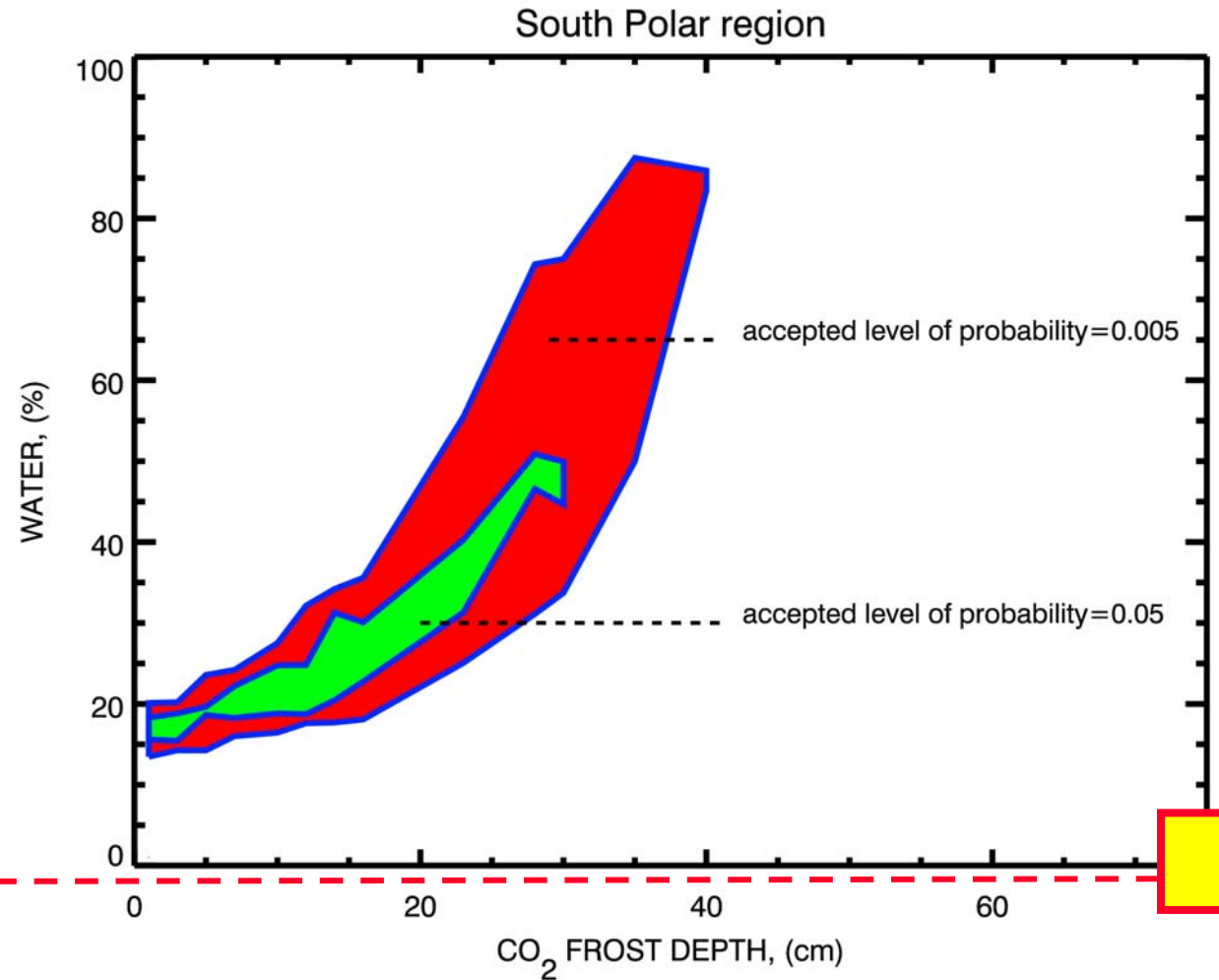


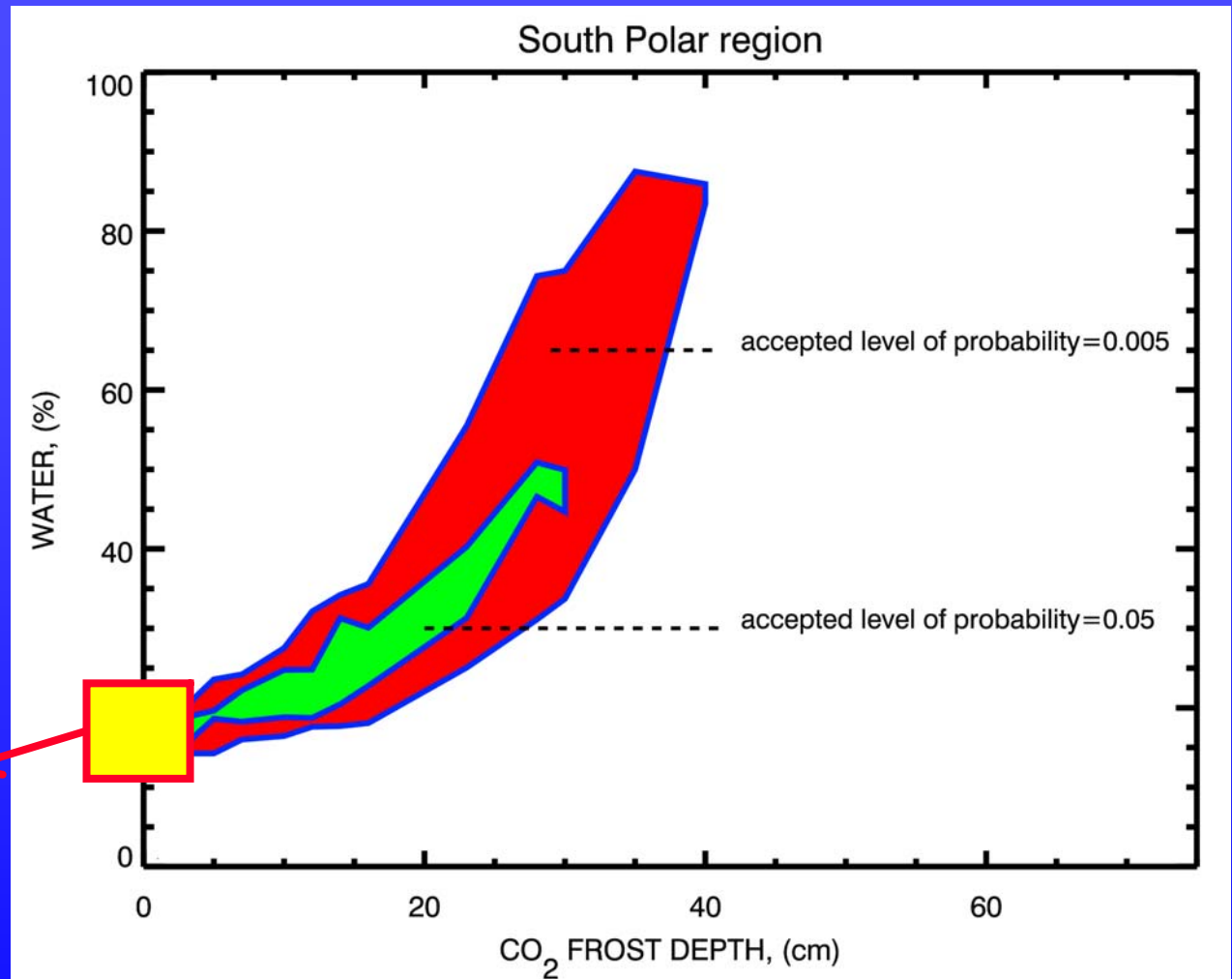
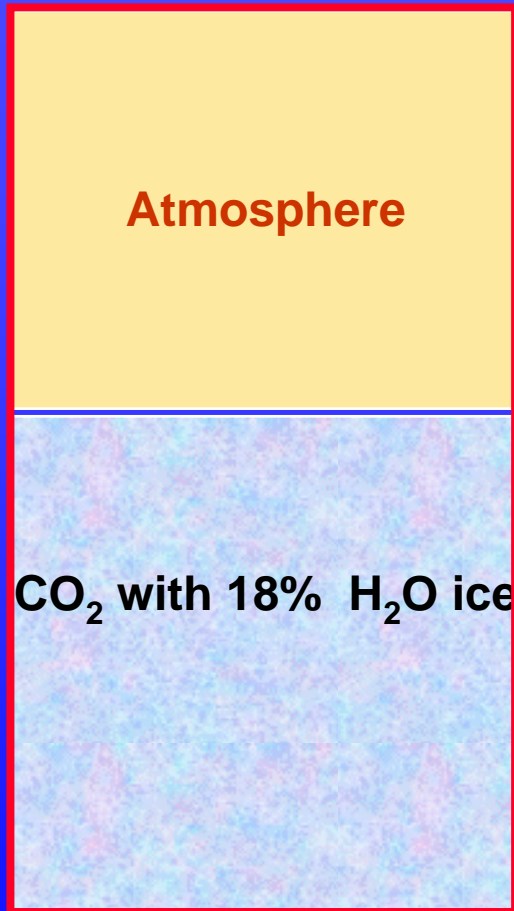


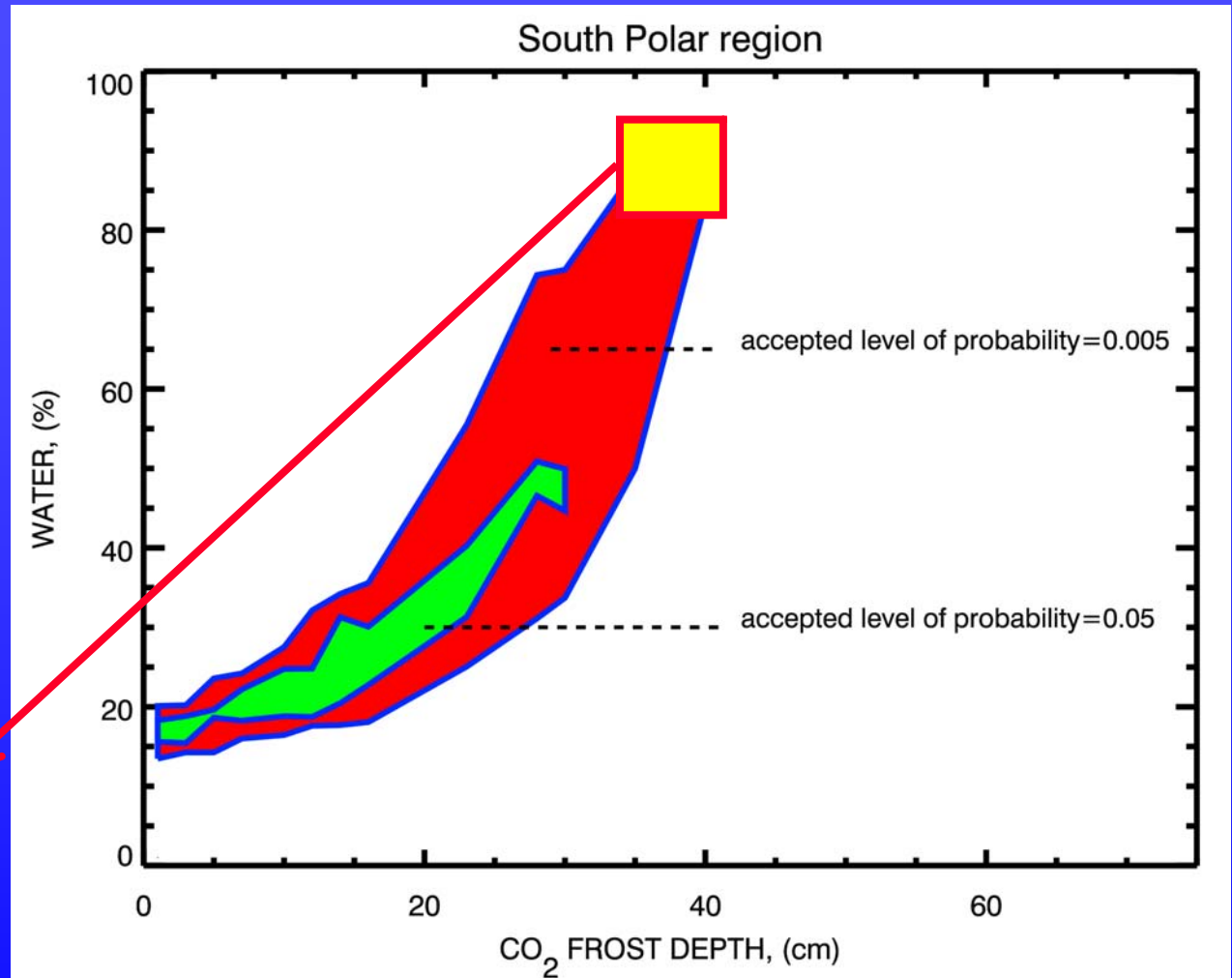
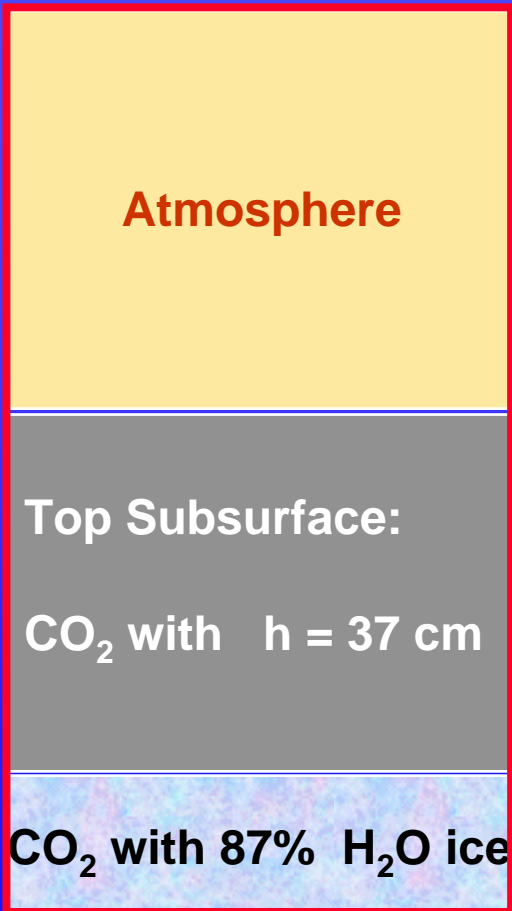
Atmosphere

Top Subsurface:

CO₂ with $h = \infty$ cm







Conclusions:

- 1) HEND/Odyssey well sees water ice for Northern Residual Polar Cap
- 2) HEND/Odyssey does not see carbon dioxide for Southern Residual Polar Cap
- 3) HEND/Odyssey sees quite similar seasonal changes around both North and South Poles
- 4) HEND/Odyssey data supports water ice (>20 wt%) under the top layer of “dry ice” of CO₂ (< 40 cm) for region of the Southern Residual Polar Cap

