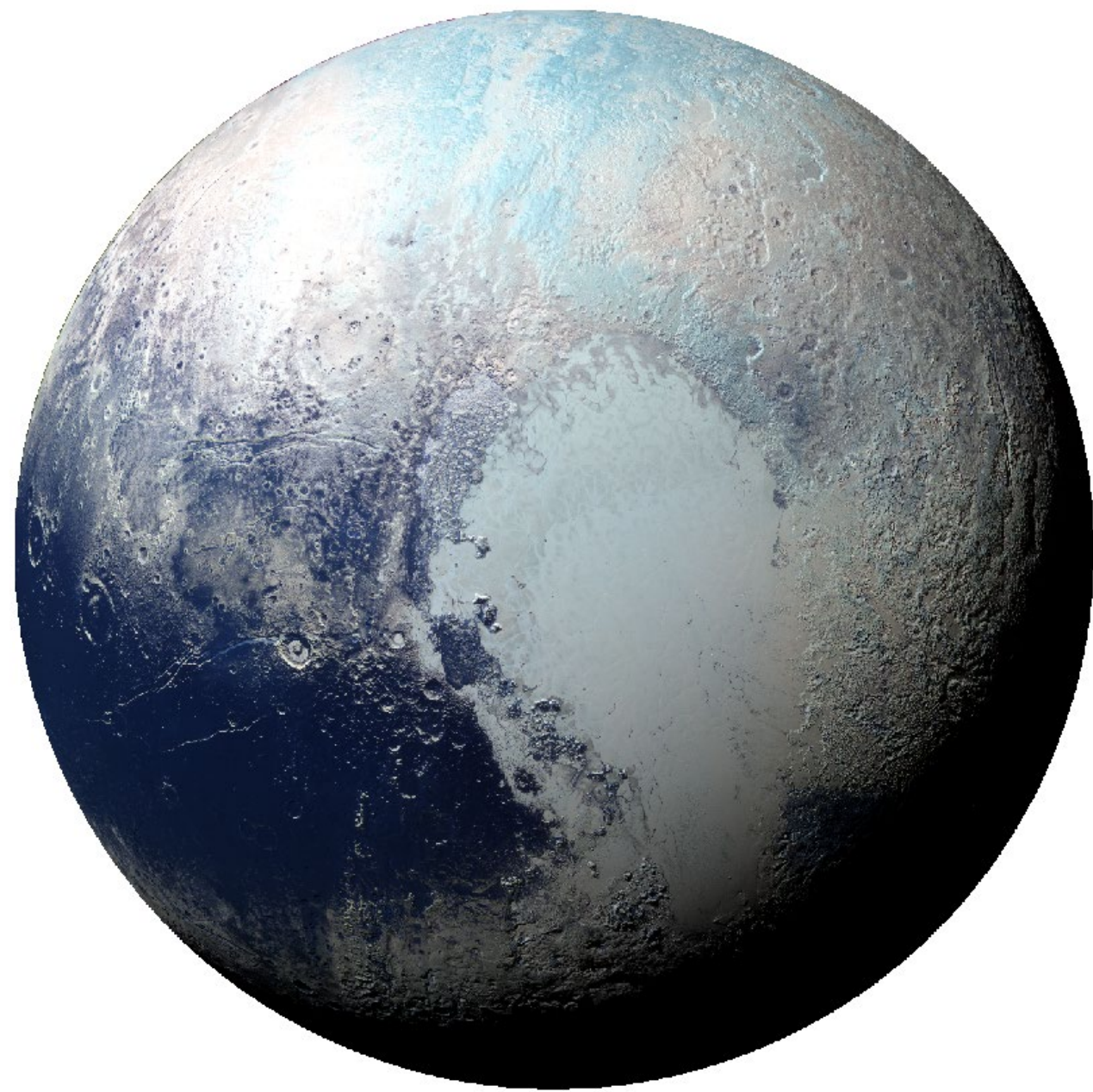




A NEW METHANE SPECTRAL INDEX FROM NASA'S NEW HORIZONS RALPH/MVIC INSTRUMENT



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INTRODUCTION:

NASA's New Horizons probe onboard Ralph/Multispectral Visible Imaging Camera (MVIC) instrument has revealed spatial distribution of volatile methane (CH₄) ice on the surfaces of Pluto. We propose a new methane spectral index (MSI) from MVIC instrument data using only two bands (red and the narrow methane absorption channels) to produce a global methane distribution map of the dwarf planet.

OBSERVATIONS AND METHODS:

❑ MVIC 4-color image cube

▪ 0299178092_0x536

❑ MVIC global color mosaic

▪ 0298652198 and 0299178098 [MET]

✓ New Methane Spectral Index:

$$MSI(CH_4) = \frac{\lambda_{\text{red}} - \lambda_{\text{CH}_4}}{\lambda_{\text{red}} + \lambda_{\text{CH}_4}}$$

where λ_{red} and λ_{CH_4} are the I/F of MVIC red and the narrow CH₄ absorption channels, respectively.

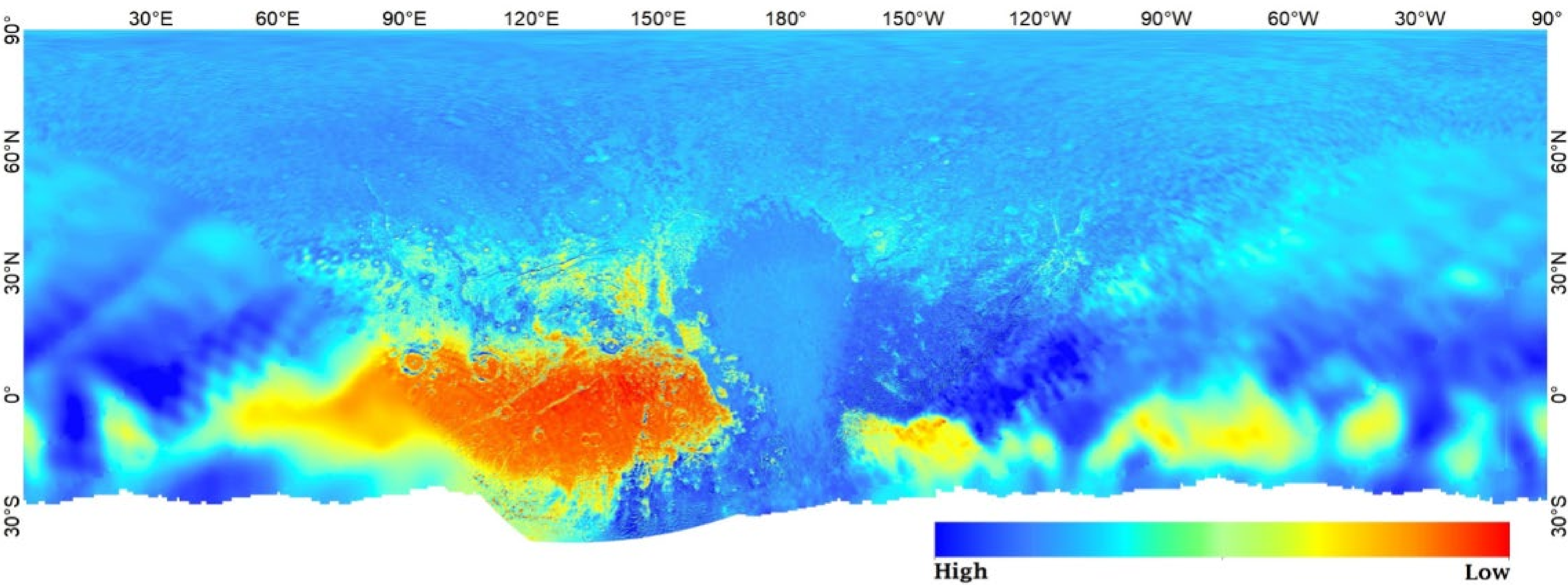


Fig 1: Global-scale methane ice distribution. Warmer colors indicate the redder/ non-volatile deposits.

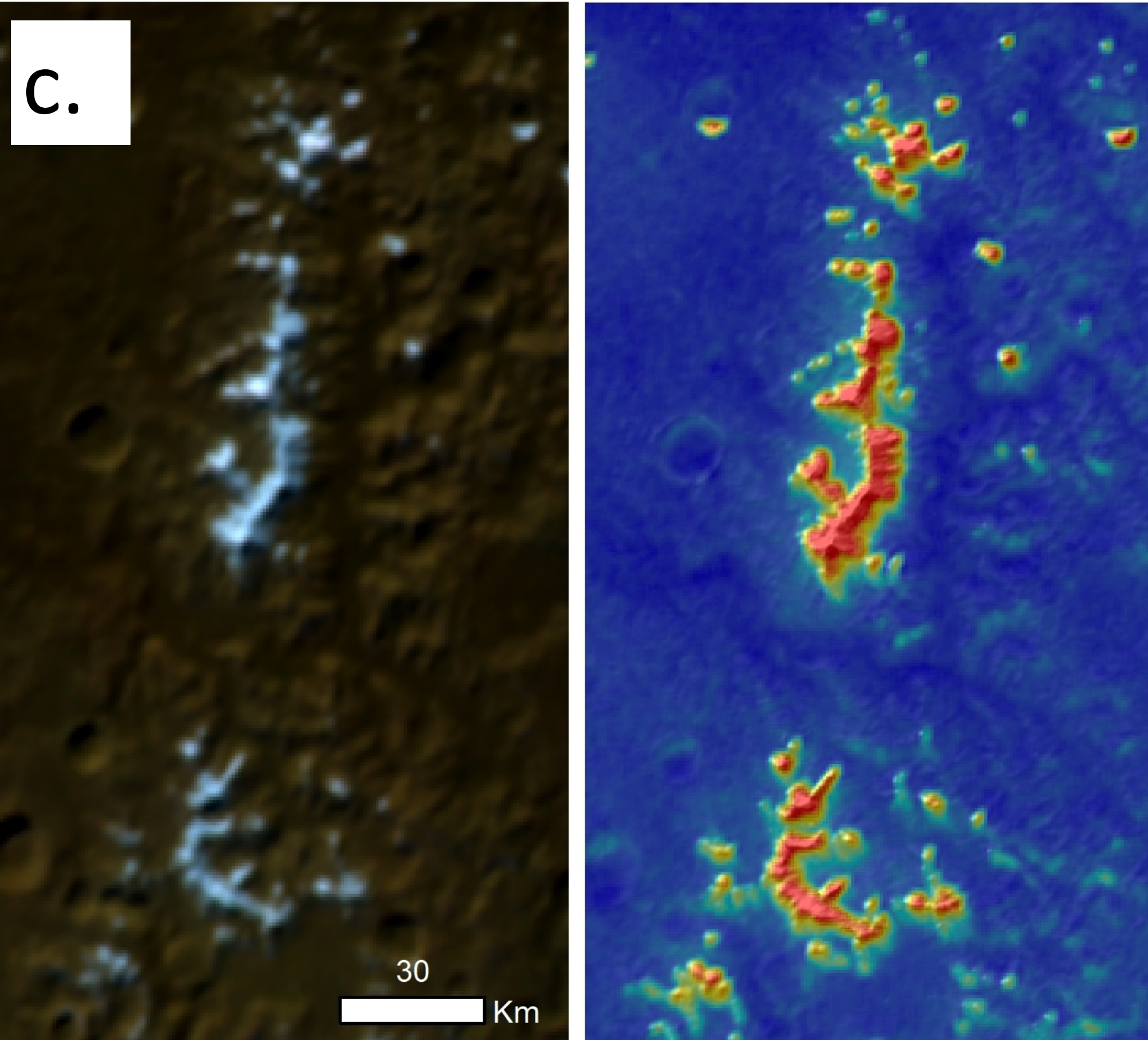
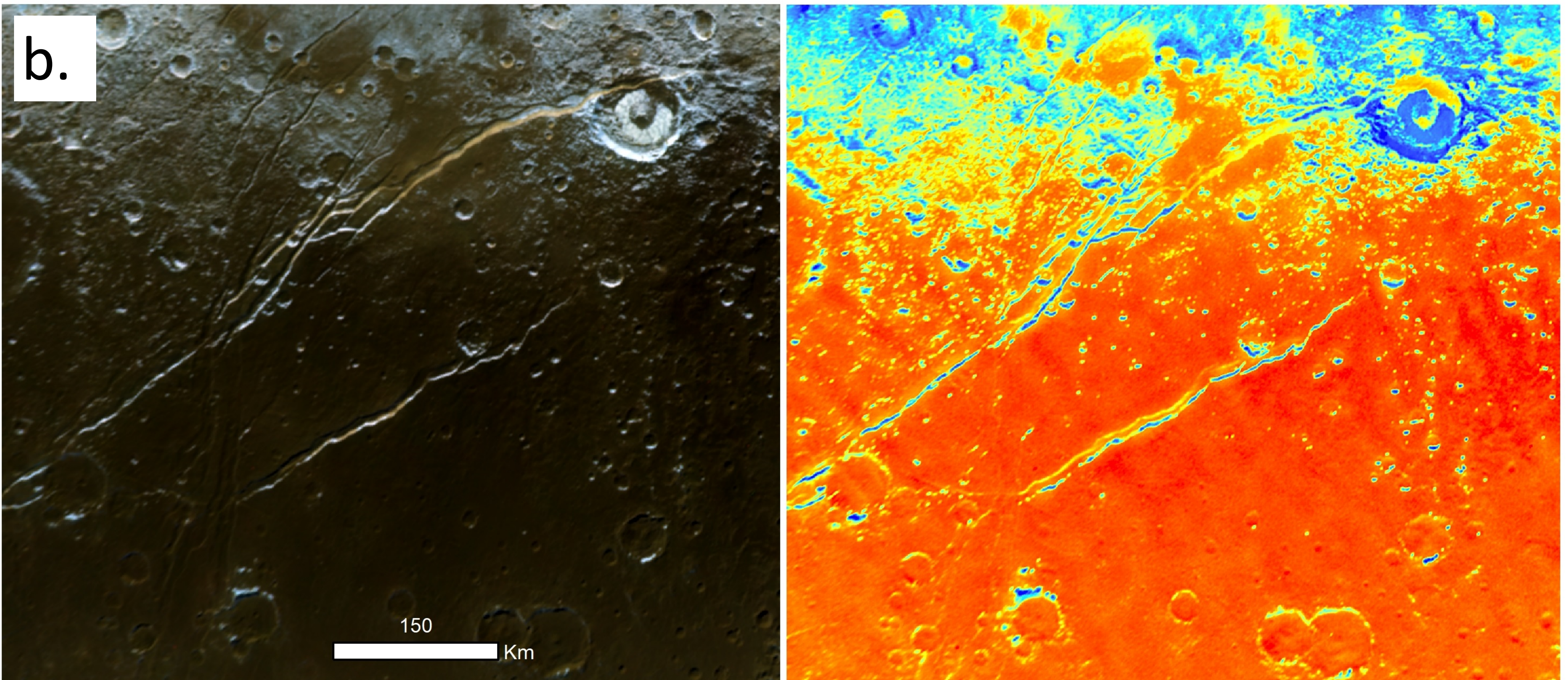
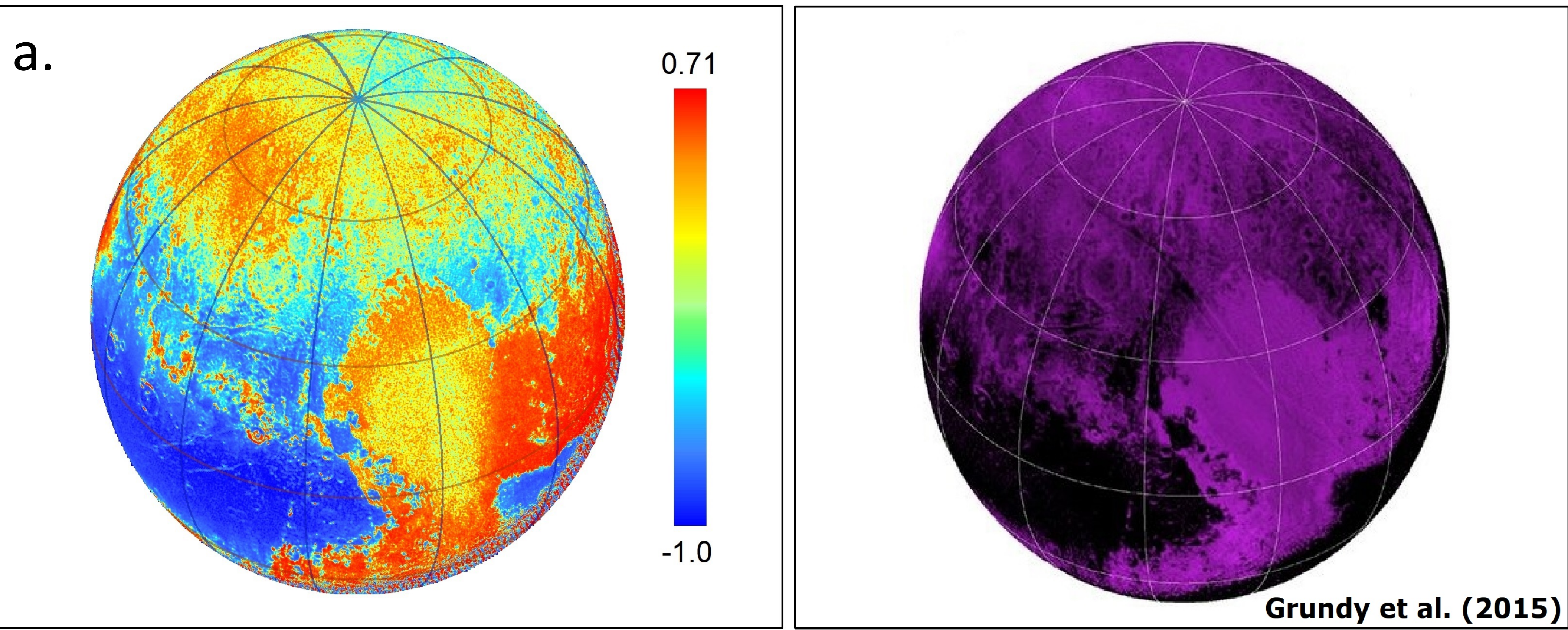


Fig 2: **a)** CH₄ distribution map (left panel). Absorption of CH₄ ice as mapped by LEISA instrument (right panel). **b)** Redder materials at Cthulhu around the equator, Elliot crater, Virgil Fossa, and Beatrice Fossa. **c)** CH₄ snow-capped chain of mountains.

Results:

- ❑ Cthulhu (at the equator) shows dominance of the redder materials or tholins deposits (Fig. 1).
- ❑ Visually consistent/comparable with methane distribution map by Ralph/ LEISA instrument (Fig. 2a).
- ❑ Eastern Sputnik Planitia (SP) at Tartarus Dorsa show presence of pure and coarse-grain-sized CH₄ ice.
- ❑ Advantages of the new methane spectral index:
 - ❖ quick method (using only two bands instead of using three bands)
 - ❖ provides a (qualitative) impression of pure (coarse grain) CH₄ distribution.

Conclusion and Future work: We plan to expand this project to see if our proposed index result is consistent with the local scale geology and associated methane ice abundance on the dwarf planet as mapped by the previous studies.