Transient Bright “Halos” on the South Polar Residual Cap of Mars: Implications for Mass-Balance

- Bright halo-like albedo features appeared on pits and scarps of the South Polar Residual Cap of Mars during mid-summer of Mars Year (MY) 28 (2007).
- Features appeared and disappeared during the same year and have not been observed before or since
- MRO/HiRISE data suggests dependence on insolation and sublimation rates from walls of scarps and pits
- MRO/CRISM showed that the halos and their surroundings are primarily composed of CO_2 ice,
- HiRISE color ratios showed bluer ice in the halos, indicative of lower dust contents
- Hapke modeling showed that a self-consistent set of CO_2 ice grain sizes and dust contents can explain the albedo and band depth observations
- Analysis of settling rates of dust particles in the Martian atmosphere is consistent with settling dust particles being pushed away from halo zones by a sublimation-driven wind.

Conclusions

- The ephemeral occurrence of the halos implies a net positive mass balance on flat SPRC surfaces from the end of MY 29 through MY31
- This means that the enlarging pits seen over the past Mars decade do not require global warming (more CO_2 in the atmosphere)

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