30 second summary

Extensive erosion is being observed of the CO₂ ice cap on Mars by flat-floored pits. Why are we so lucky to see such a transient event?

- •The lifetime of the ice cap is limited by its increasing surface roughness. Ice-cap equilibrium is not possible.
- Deposition of mobile CO₂ ice crystals on the cap in some years can smooth surface roughness and regenerate the ice cap.
- Current erosion is just one stage in the ice-cap's life cycle - climate change unnecessary to explain current observations.
- Mobile CO₂ deposition may be linked to global dust storms.





- year (similar to Mariner 9 storm)
- Mesa-tops darkened (e.g. PSP_006270_0955)
 Deposition of dust?
- Thinning of top bright layer?
 Prediction that cap next year will be
- much brighter
- Increased precipitation this winter





Infrequent Smoothing Cm=2.0, right balance between frequency and degree of smoothing give regenerating cap





Conclusions

- 'Swiss-cheese' erosion almost inevitable even during net accumulation.
- Maximum size attained by residual cap CO₂ reservoir controlled by competition between surface-roughness and albedo.
- No equilibrium situation is possible
- Residual CO₂ cap may be in steady state (of a kind)
- Interannual variability actually a condition for polar cap survival.
- No climate change necessary to explain what we see
- Multi-generational cap may explain polygonal grooving
- Cap-reincarnation may be linked to global dust storms
- ~100 Martian years of climatic history in thickest CO₂ mesas
- Great record to characterize variability of current climate
- Current cap has overlapping generations
- Albedo vs. depth profile can possibly yield accumulation rate over time
- Carbon date the ice cap in the future? look for ~3% drop in ¹⁴C....