

Block falls near the North Polar cap An example of Martian surface changes for iMars

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Ice distribution on Mars

During an ice age



Simulated view of Mars in an ice age NASA/JPL-Calthech

Today



Mars imaged by the *Hubble Space Telescope in 2003*





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Mars north polar ice cap



ESA/DLR/FU Berlin; NASA MGS MOLA Science Team











Accumulation and erosion













Active north polar scarp



NASA/JPL/University of Arizona













Digital Terrain Model



Stereo:

stereo angle: **10°-25°** time interval: max. **30 days**

Tools:

USGS Integrated Software for Imagers and Spectrometers (**ISIS**)

NASA open source software Ames Stereo Pipeline (**ASP**)

Image change detection:

same **season** resolution of **0.25 m same time** of the day









Co-registration



Ortho-rectified HiRISE image

To detect very small changes ↓ Sub-pixel accuracy needed ↓ Local co-registration (100m×100m)











Change detection

Input:

 two locally co-registered images at the same time of the year

Process:

- normalisation
- difference image
- Binary Large Object detection
- edge detection
- displaced block model:
 - bright object
 - shadow in the opposite direction of the sun



size restriction













Preliminary results



Density map of block fall events



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- Systematic procedure for
 - producing co-registered HiRISE images
 - detecting block falls
- Estimation of the **erosion rate** of the steep north polar scarps
- Estimation of the scarp retreat
- Contribution to the understanding of the scarp **evolution**



