Visualization, analysis and understanding of MOC and THEMIS Datasets

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Outline

- Avaialble datasets for Mars
  - current spacecraft and archived data
- Technologies
- Data fusion
- Understanding
- Conclusion

Available datasets for Mars

- Currently operational at Mars
  - Mars Global Surveyor
    - Mars Orbiter Camera, Thermal Emission Spectrometer, Mars Orbiter Laser Altimeter
  - Mars Odyssey
    - Thermal Emission Imaging System, GRS suite
- Archived datasets from past missions
  - Viking Orbiters, Mariner 9, Phobos-2
    - images, spectra

Technologies

- Understanding and fusion of data requires application of same algorithms as in the Earth sciences.
- We currently use
  - SPICE (for getting information about S/C position and orientation).
  - VICAR (image projection, mosaicking, interface to SPICE, geared towards gas giants exploration)
  - USGS ISIS (same as VICAR, more geared

Data fusion

- Project data into the same reference frame
  - level0 data - raw data
  - level1 - calibration
    - Camera (geometrical/radiometrical) proprietary software
  - level2 data - map products
    - ISIS/ArcView/GMT for projection data
  - Scientific analysis
  - ArcView/IDL
- Search and location of datasets is important.
  - PDS datasets - started work in bringing all datasets into "one point search"
  - backend systems - MySQL databases that store data itselef (laser altimeter data), or metadata (image coordinates).

Understanding

- Need to validate a hypothesis or answer a question.
- Example : prove that south polar ice cap on Mars is mostly water ice as opposed to CO2 ice
  - first dataset : Mariner 9/Viking mosaic
    - uncertain topography, composition
  - 20 years later - MOLA profiles suggest that north/south are the same.
  - now THEMIS evidence + physical models.
    - IR temperatures prove existence (yet inconclusively) of water ice in the surface layer.

Conclusion

- Numerous steps have to be completed for data to be retrieved and analyzed together.
- Rely on proven technologies (MySQL, ArcView).
- Develop new ones (e.g. large database access, cross-mission data retrieval)
- A combination of tool developed for Earth science is used (GMT, ENVI, ArcView) and specific tools for planetary science (SPICE, VICAR, ISIS)
- The most important part is the question you would like to answer or a hypothesis you would like test. Often times answers lead to new questions.