First results from the Terra Multi-angle Imaging SpectroRadiometer (MISR)

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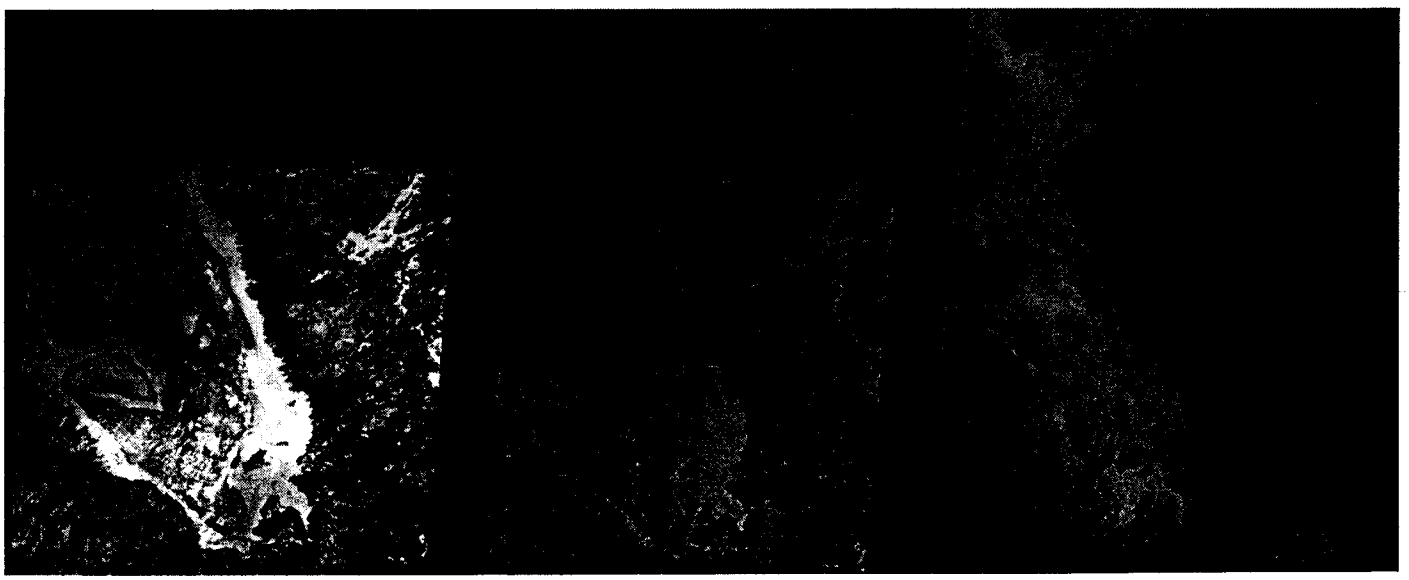
Abstract -- The Multi-angle Imaging SpectroRadiometer (MISR) is one of five instruments aboard the EOS Terra platform. MISR acquires pushbroom images of the Earth at 9 viewing angles ranging from 70.5° forward to 70.5° aftward of nadir, in 4 visible/near-IR spectral bands. Data are acquired over a swath width of approximately 400 km, with selectable footprints in each channel ranging from 275 m to 1.1 km.

DESCRIPTION

The MISR instrument [1] was launched into polar Earth orbit aboard the Terra spacecraft on December 18, 1999. Terra is in a 16-day repeat 705-km sun-synchronous orbit, and has approximately a 10:45 am equator crossing time on the descending node.

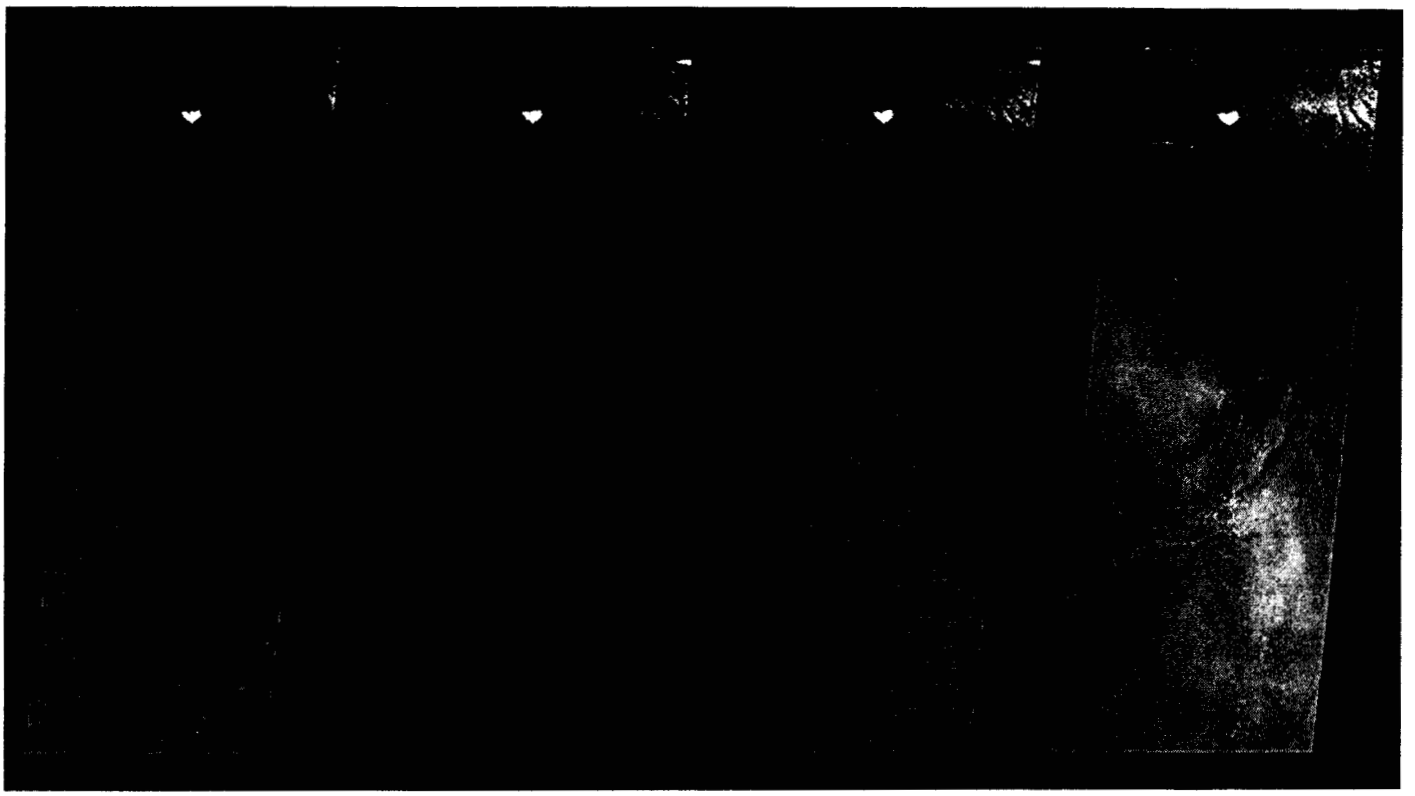
MISR provides multiple-angle, continuous imagery of the Earth in reflected sunlight. It uses nine separate charge coupled device (CCD)-based pushbroom cameras to observe the Earth's surface, atmosphere, and clouds at nine discrete angles: one at nadir, plus eight other symmetrically placed cameras that provide fore-aft observations with view angles, at the Earth's surface, of 26.1°, 45.6°, 60.0°, and 70.5° relative to the local vertical. Each camera contains four detector line arrays spectrally filtered to 446, 558, 672, and 866 nm.

This paper highlights results obtained since cover opening on February 24, 2000. Example images are shown in Figs. 1 and 2. The data are presented in a Space Oblique Mercator map projection to facilitate angle-to-angle and band-to-band co-registration.



70.5° forward **nadir** **70.5° aftward**

Figure 1. "First light" imagery obtained on February 24, 2000 over the ice-covered James Bay in the Ontario-Quebec region of Canada. The abrupt transition from dark to light in the left image marks the opening of MISR's cover as the forward camera was viewing this scene. The image acquired by the nadir camera was obtained about 3.5 minutes later, and the aftward image was acquired about 7 minutes after the forward view. Changes in brightness and contrast with angle distinguish different environmental conditions, notably the fast (smooth) ice, pack (rough) ice, and clouds. North is toward the top.



nadir **45.6° forward** **60.0° forward** **70.5° forward**

Figure 2. Multi-angle imagery obtained on March 6, 2000 over the eastern United States, stretching from Lake Ontario to Georgia. As the slant angle increases, the line-of-sight through the atmosphere grows longer and a pall of haze over the Appalachian Mountains becomes progressively more apparent. The images have been reproduced using the same radiometric scale. North is toward the top.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the efforts of the entire MISR team.

This work is being carried out by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the National Aeronautics and Space Administration.

For further information: *http://www-misr.jpl.nasa.gov*.

REFERENCES

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