National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

Multisensor Platform Deployment Proposal for International Polar Year (IPY)

June 28, 2006

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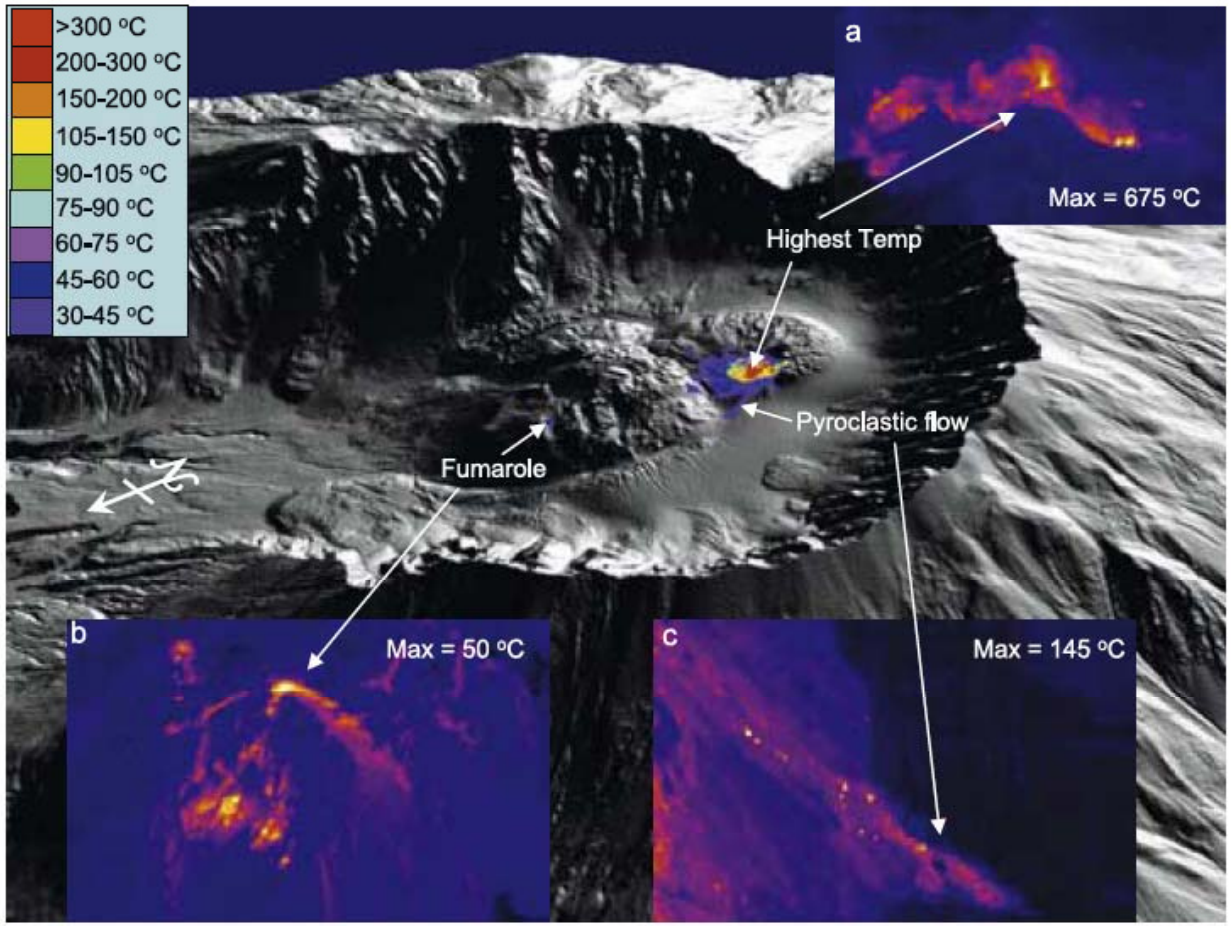
MASTER image overlain on concurrent lidar topography of Mt St. Helens in October 2004



Vaughan et al., 2005

Proposal Objectives

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- High resolution thermal survey's will be acquired to quantify the thermal balance of several active, changing volcanoes which are difficult to monitor for change. Maps of the heat flow on these volcanoes will help in understanding the internal processes changing their surfaces. Correlation of heat flow with volcano deformation and seismicity will help in the understanding of this active region. Remote sensing of composition and biology of warm, bare areas will allow a better understanding of these extreme ecosystems.

- The thermal survey's and ancillary compositional and biological mapping will be used to focus searches on Mars for similar environments. Mars is a polar desert, much like Antarctica, and one of the few places on Mars where life could exist is in a thermal anomaly like the bare, warm ground areas on the Antarctic volcanoes. We will study the factors making these areas habitable and hone the remote sensing techniques that may be used to detect these features on Mars. Warm areas on Mars (as on the Antarctic volcanoes) are especially hospitable to humans as well, making their discovery on Mars of primary importance for human occupation.

Map of Antarctica Showing Young Volcanoes

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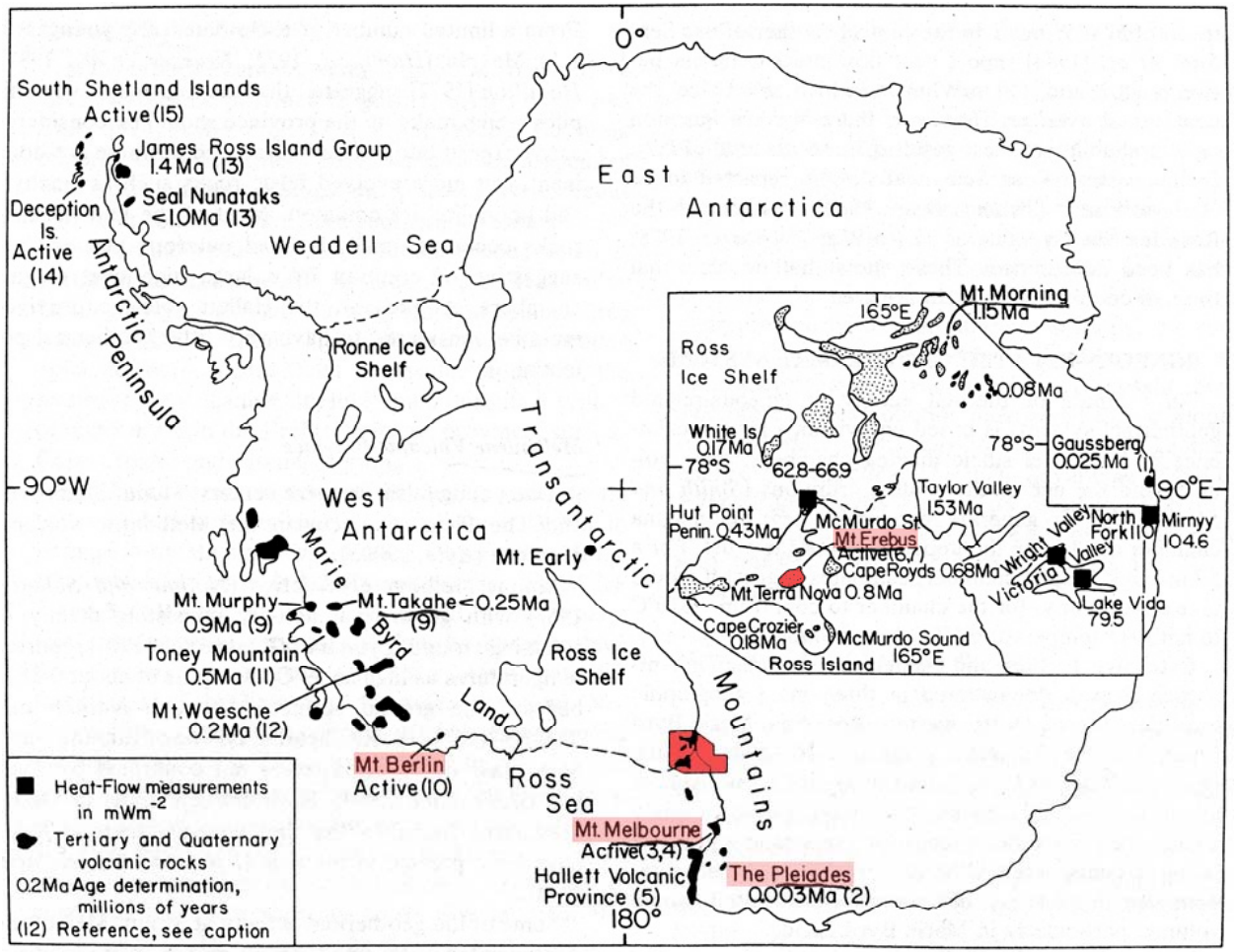

Kyle, 1990

Fumarolic Ice Towers on Mt Erebus

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Ice tower, venting water vapor and CO_2

Ice cave beneath a tower

Photographs from Mt Erebus Volcano Observatory web page

Fumarolic ice towers form when heated water vapor (steam) instatly condenses in the freezing (-30°C in summer, -60°C in winter) ambient air. The towers can reach over 20 meters high and have elevated CO_2 emissions (Wardell et al., 2003).

EO-1 Image of Thermally Active Pixels in the Crater of Mt Erebus

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Data acquired 7 May 2004

Davies et al., 2006

Lidar DEM of Mt Erebus

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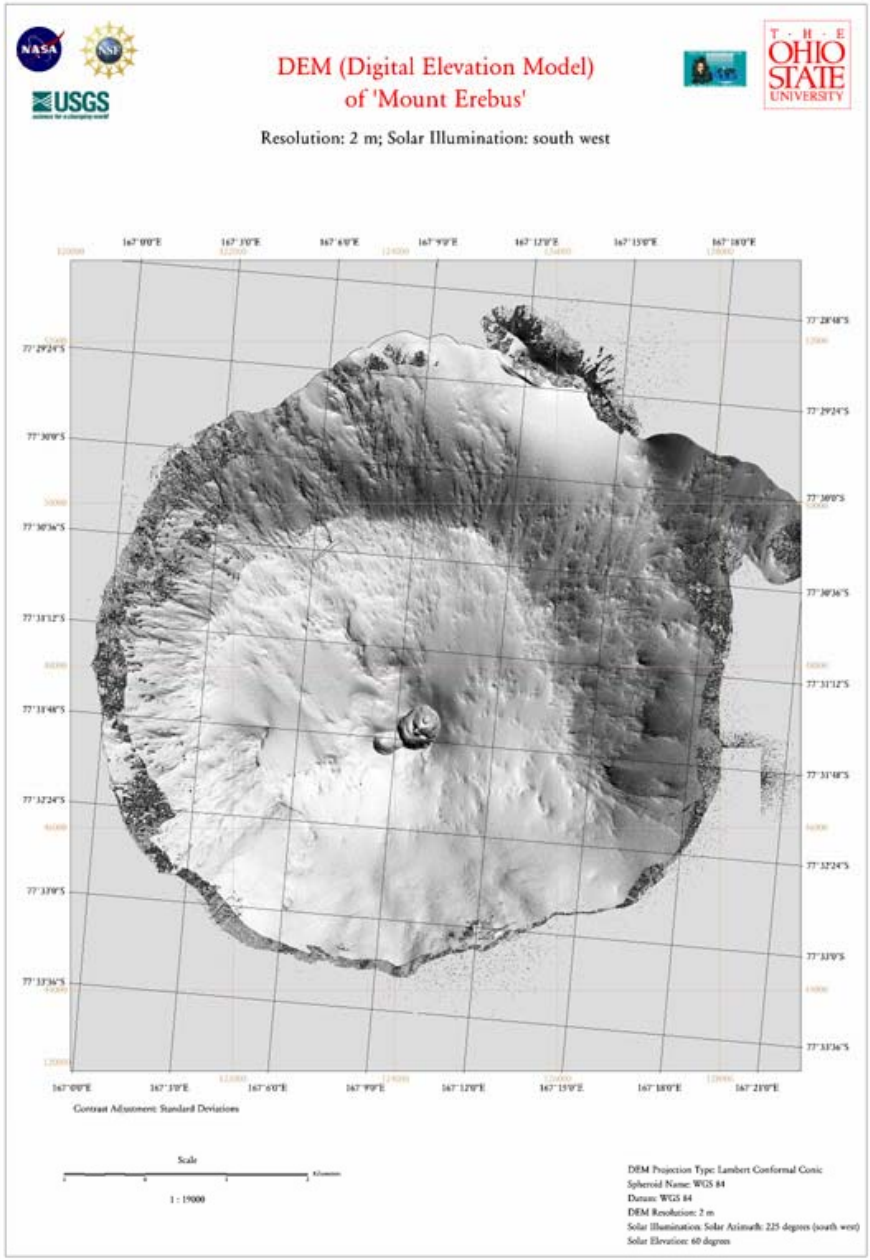

Data acquired in 2001 by GSFC Airborne Terrain Mapper (ATM)

http://usarc.usgs.gov/antarctic_atlas/

Characteristics of Remote Sensors Operating in the Visible-IR Wavelengths (upper) and Radars (lowers)

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Name	Wavelength Range (mm)	# Bands	Resolution (m)	Web site
MASTER	0.4-13	50	5-10	http://masterweb.jpl.nasa.gov/
AVIRIS	0.4-2.5	224	10	http://aviris.jpl.nasa.gov/
ASTER	0.5-11.5	14	15-90	http://asterweb.jpl.nasa.gov/

Name	Frequency (MHz)	Wavelength (m)	Resolution (m)	Web site
AirSAR	440, 1200, 5500	0.68, 0.25, 0.05	5	http://airsar.jpl.nasa.gov/
Radarsat	5300	0.05	8-100	http://radarsat.space.gc.ca/
PalSAR	1270	0.24	7-100	http://www.palsar.ersdac.or.jp/e/
GPR	100-400	3-0.75	<1	http://www.g-p-r.com/