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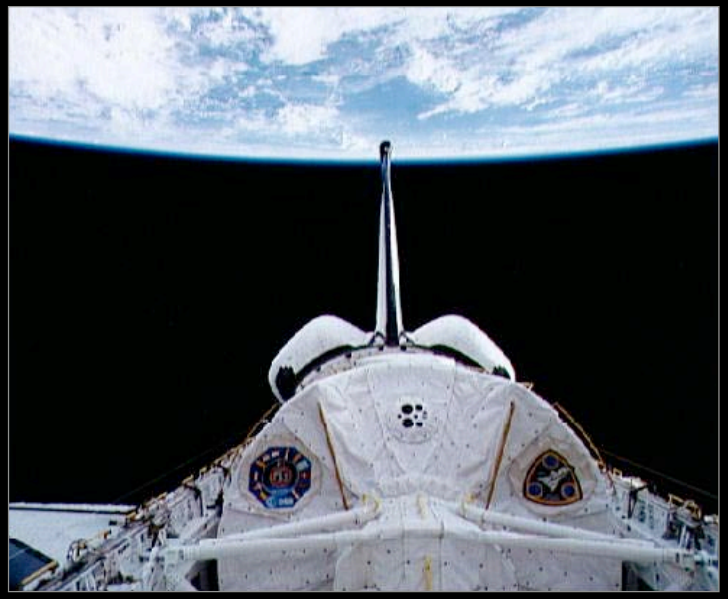
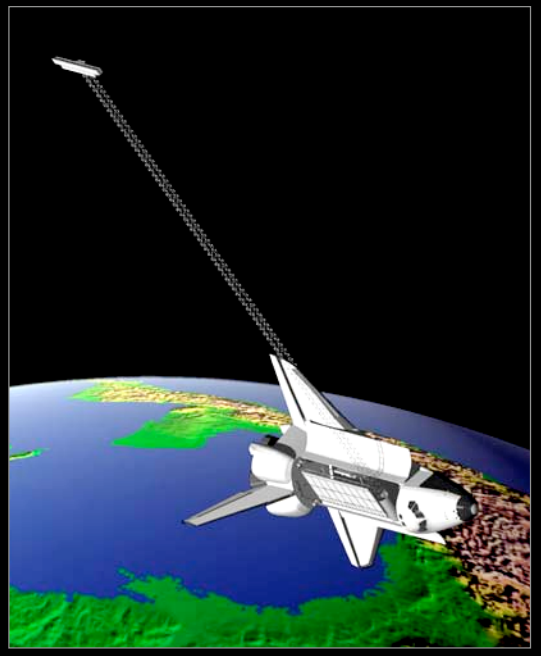
Spacelab, Science, and Human Space Flight – *Retrospective Observations*





M. Sander
May 13, 2009

(With thanks to Tony Freeman / Scott Hensley)

Spacelab Scenario – 1970's to 1980's

- Nixon administration approved Shuttle, but…
- ESA agreed to participate – two agendas (sales and experience)
- Early expectations for :
  - flight rate vs. later realities
  - utilization practices vs. later realities
  - flight program start vs. later realities
- Learning how to use Spacelab
  - Too much, too early?
  - Finding the balance between force fitting and exploiting
- Finding the balance between protecting the infrastructure and flying experiments
  - Helping the PI be successful vs. protecting the "system" from the PI
- Funding the infrastructure vs funding the "payoff"

Spacelab in the Smithsonian

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Shuttle Radar Laboratory

- Spaceborne Imaging Radar – A (SIR-A) on STS-2 Nov, 1981
- SIR-B on STS-41G Oct, 1984
- SIR-C / X-SAR on STS-59 and STS-68 April/Oct, 1994
- Shuttle Topography Radar Mission (SRTM) on STS-99 Feb, 2000

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Coupled Airborne and Spaceborne Radar Programs

Rocket Radar mounted on NASA CV-990. (L-band only)

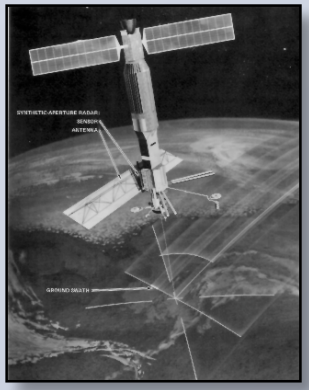
SIR-A

SIR-B

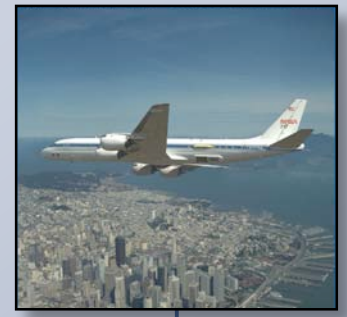
SIRC/XSAR

IFSARE/*3I

SeaSAT



AIRSAR re-built on DC-8



SRTM

Rocket Radar

GeoSAR

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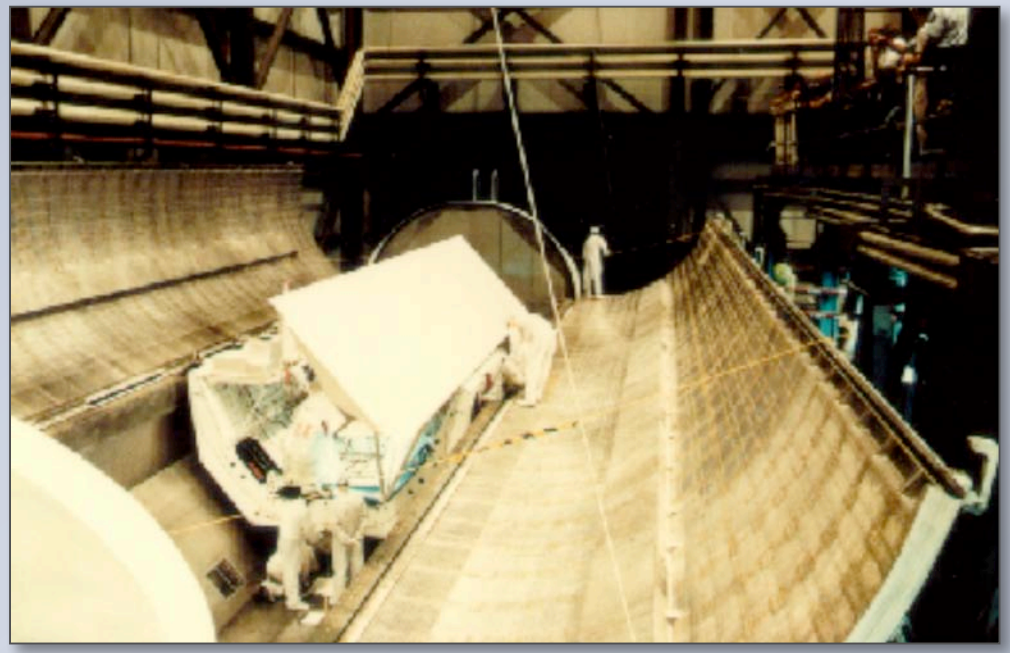
Shuttle Imaging Radar-A (SIR-A), 1981



SIR-A image of Sudanese desert superimposed on visual image showing buried river channels

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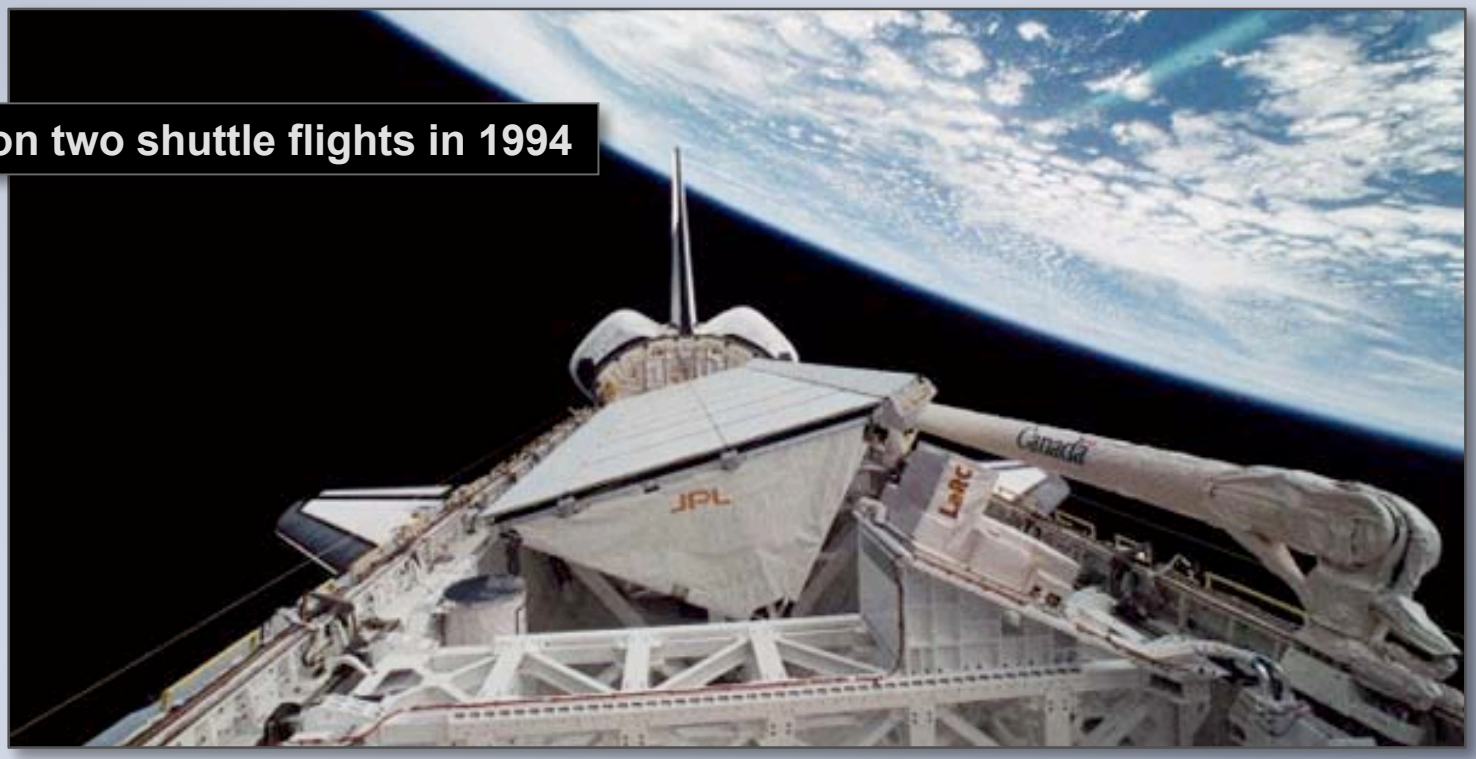
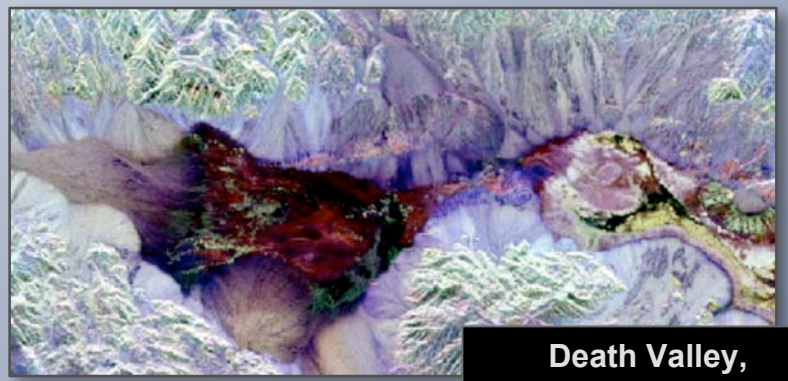
Shuttle Imaging Radar-C / X-band Synthetic Aperture Radar (SIR-C/X-SAR)

Flew on two shuttle flights in 1994



Forest cover and geology of Lozere Department, France with Gorges du Tarn. Composite of two X-band images from different seasons.



Death Valley, California

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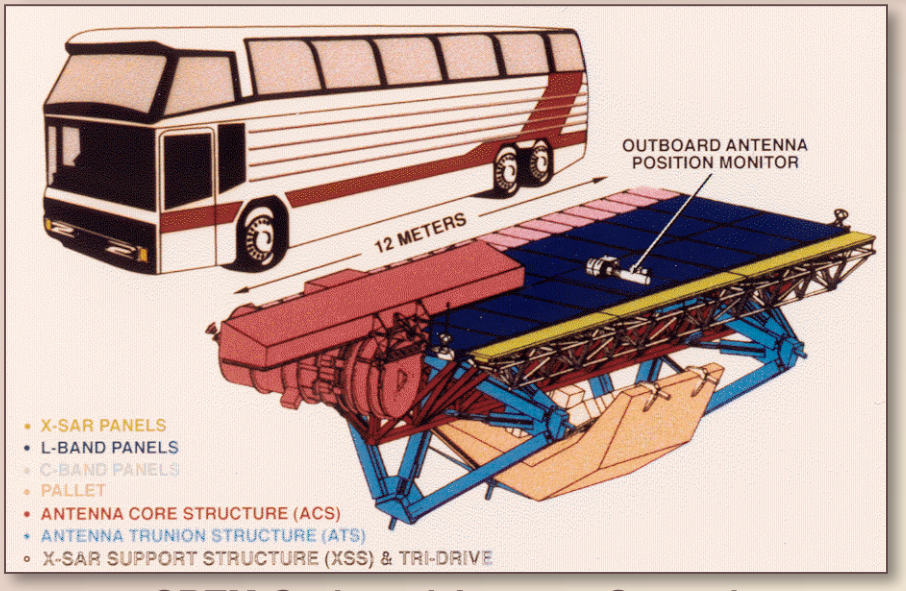
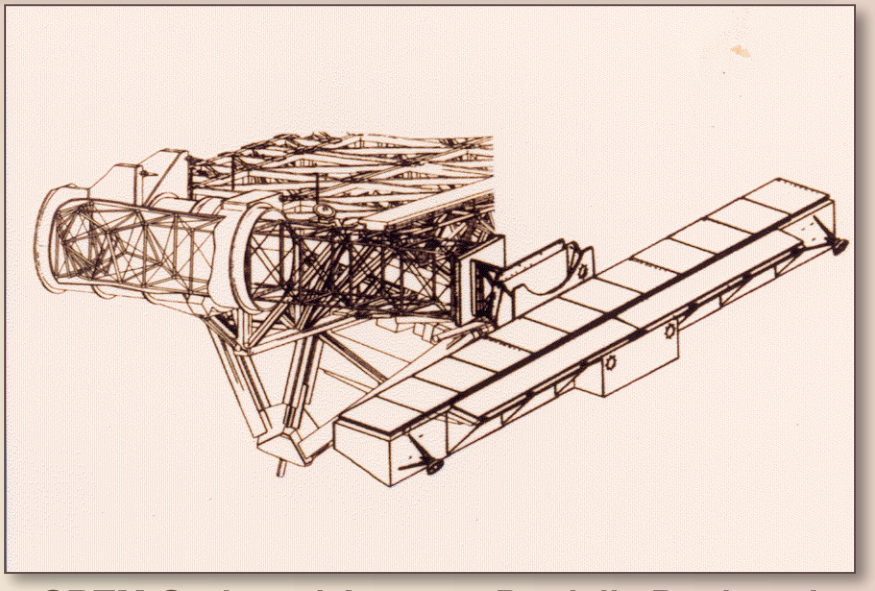
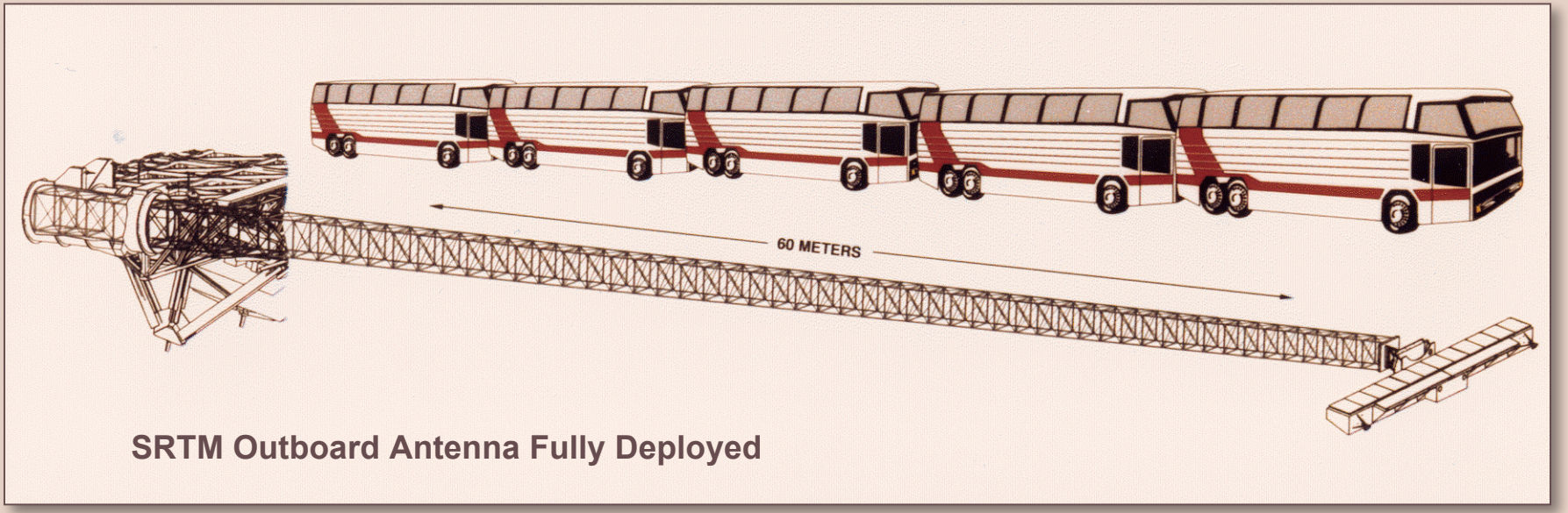
SRTM Hardware



SRTM Outboard Antenna Stowed



SRTM Outboard Antenna Partially Deployed



SRTM Outboard Antenna Fully Deployed

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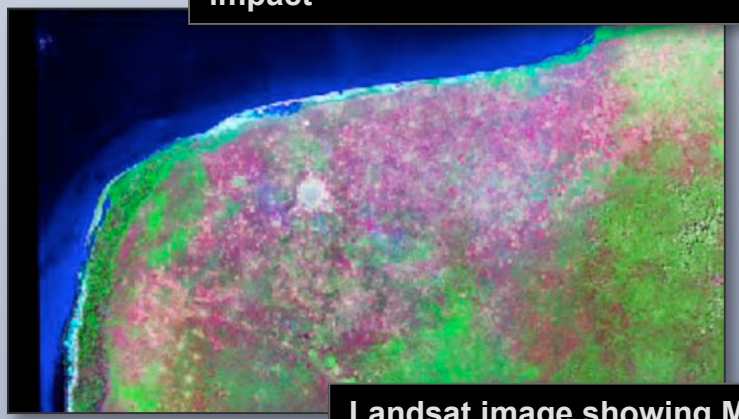
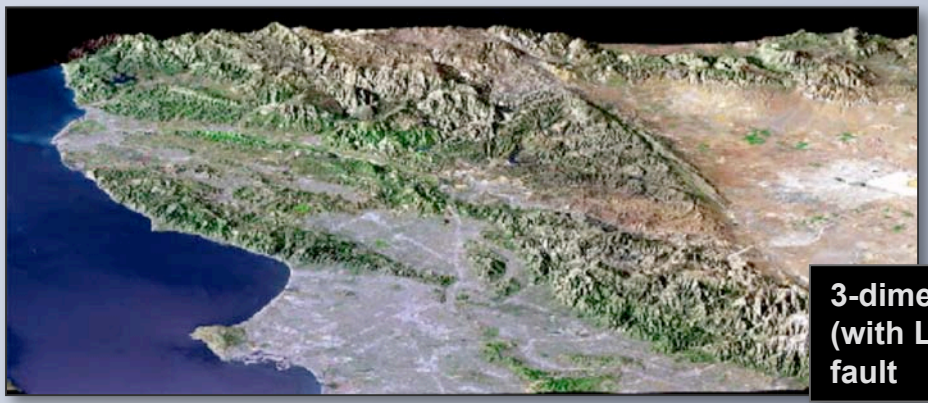
Shuttle Radar Topography Mission (SRTM)

- Mapped 80% of Earth
- 30 m horizontal data points
- 10 m vertical accuracy

SRTM image of Yucatan showing Chicxulub Crater, site of K-T extinction impact



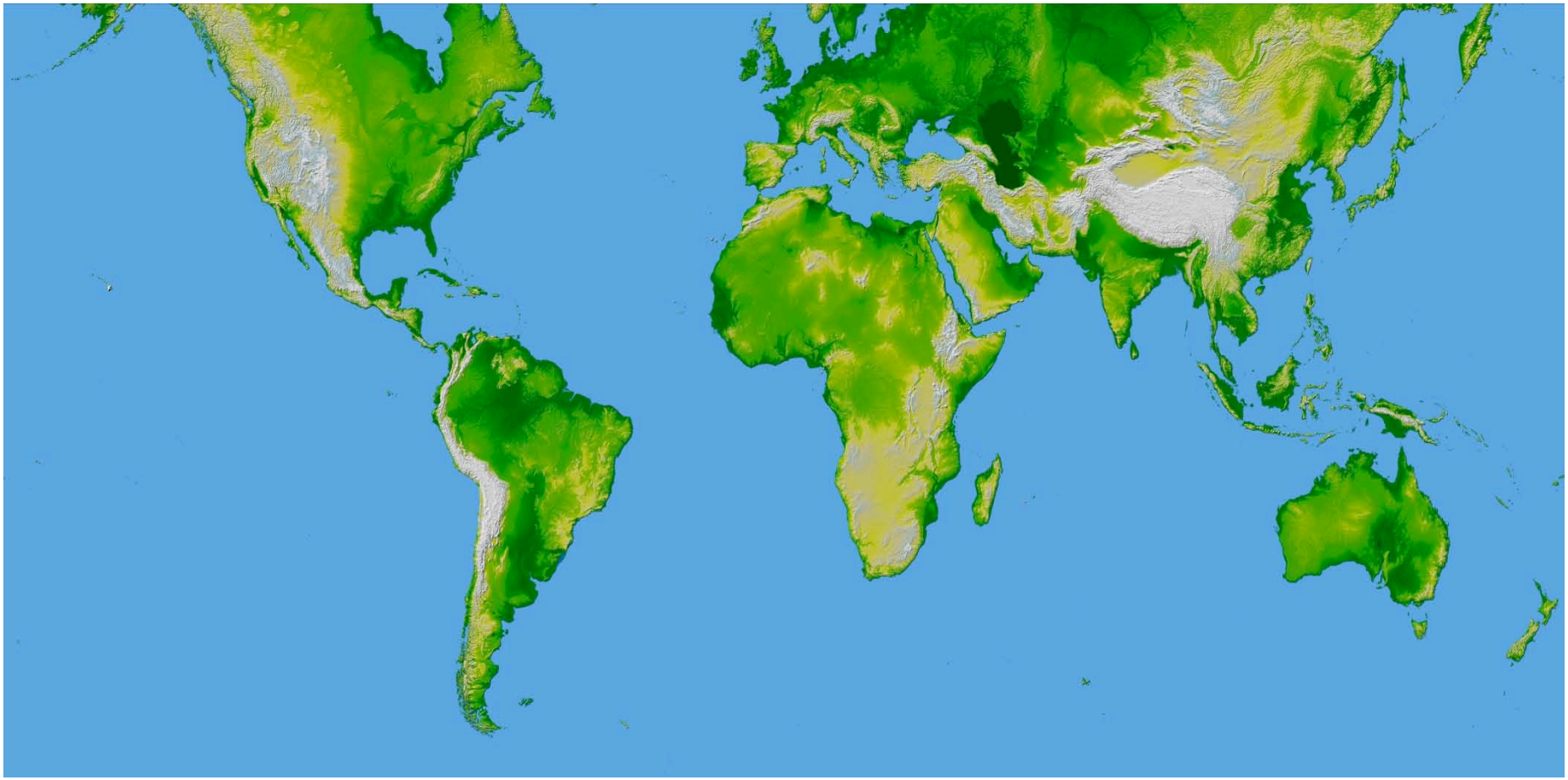
Landsat image showing Merida



3-dimensional SRTM view of Los Angeles (with Landsat data) showing San Andreas fault

SRTM Outboard Antenna in the Smithsonian

SRTM Global Production



• Map showing topographic data generated by the SRTM mission.

1.5 tera points of topographic reference elements

So What Do We Learn From This?

- Early expectations can be misleading
- Those who are successful using the elements of Human Space Flight Systems:
  - Understand the systems technically and socially
  - Develop systems that:
    - Are maximally self-reliant
    - Leverage and respect the presence of humans
    - Leverage the capabilities of the HSF transportation Infrastructure
- Exploiting the HSF capabilities requires timing, tenacity and agility
  - Let the systems mature before dipping in too deeply
  - Most elements are highly schedule and functionally interdependent
- Potential for payoff is huge