Large scale assessment of landscape changes and recovery in forest structure of mangrove wetlands subject to human activities, freshwater diversion, and natural disturbances (severe storms, climate and sea level change) using enhanced Shuttle Radar Topography Mission data.

(IDS/NRA-03-OES-03)

Marc Simard, **Jet Propulsion Laboratory/Caltech, E-mail:** marc.simard@jpl.nasa.gov

Victor H. Rivera-Monroy and Robert R. Twilley (Louisiana State University)
Michael Ross and Keqi ZhanG (Florida International University)
Norman Duke (The University of Queensland, Australia)
Catherine Ticehurst (CSIRO Land and Water, Australia)
Ernesto Rodriguez (JPL)

JPL, May 2005

Objectives

- *to use SRTM elevation data to estimate vegetation height in mangrove wetlands;*
- *to estimate productivity within the complex mangrove mosaic and extend production models to regional scales.*

Relevance to NASA

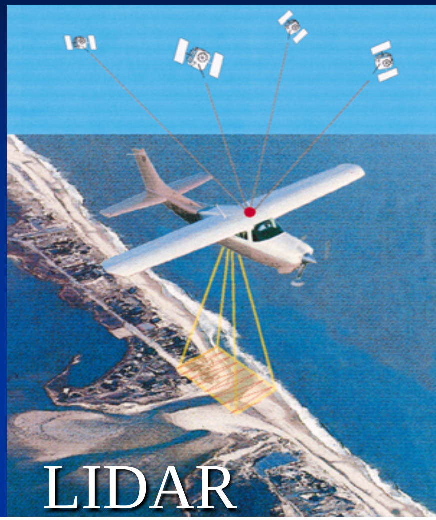
- *NASA Carbon cycle and Ecosystem Roadmap*
    - *(T)Vegetation 3D structure (Biomass & Disturbance)*
        - *3D (height) repeatedly emphasized by LCLUC science team (1/11/05).*
        - *"… critical in this focus area." (Bill Emanuel, 1/11/05).*
    - *Coastal carbon*
- *Research associated to LTER (Long term Ecological Research) site network.*

Jet Propulsion Laboratory
California Institute of Technology

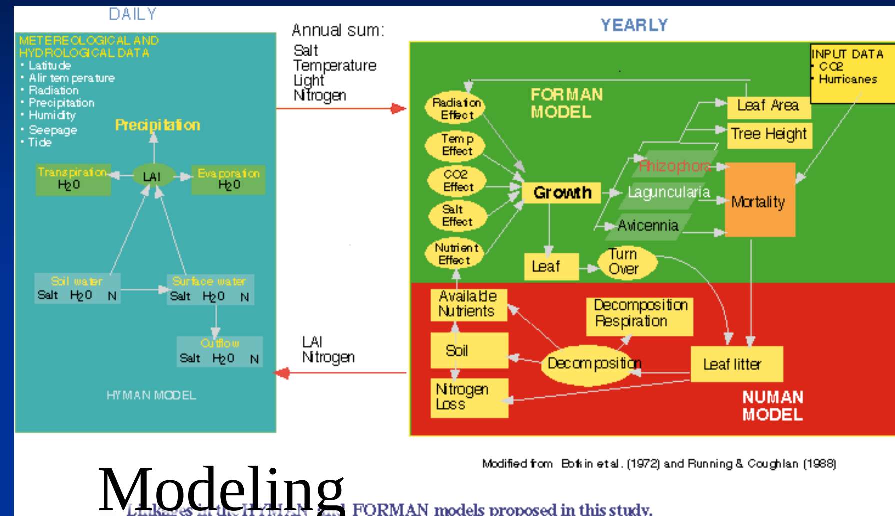
Why mangroves?

- Biodiversity
  - Habitats of 1300 species of animals of which 628 mammals, birds, reptiles, fish and amphibians
- Among the most productive ecosystems on earth (Jennerjahn & Ittekkot, 2002)
  - Global coverage of 100k-230k km^2 with mean 2.5g C m^{-2} per day
    - 25% accumulates in mangrove sediments
    - 25% is recycled
    - 50% is exported to the coastal zone
  - Annual input into ocean $46X10^{12}$ g C
    - Thus contributes 11% of global total export to ocean
  - Annual accumulation of carbon in modern sediments $23X10^{12}$g C yr^{-1}
    - Makes up for 15% of the C_{org} accumulation in modern sediments
- Endangered by urbanization, exploitation and sea level rise
- Between 33% to 50% coverage loss over the last 50 years
- Single band radar interferometry allows relative height measurement because of flat topography.

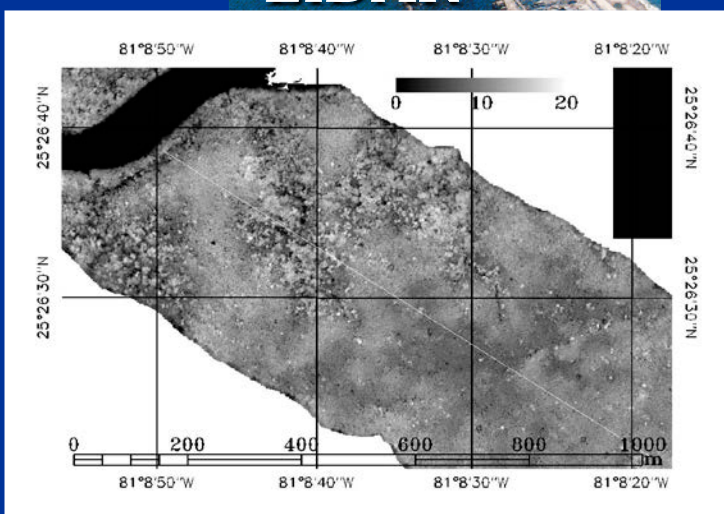
Calibration Approach



LIDAR



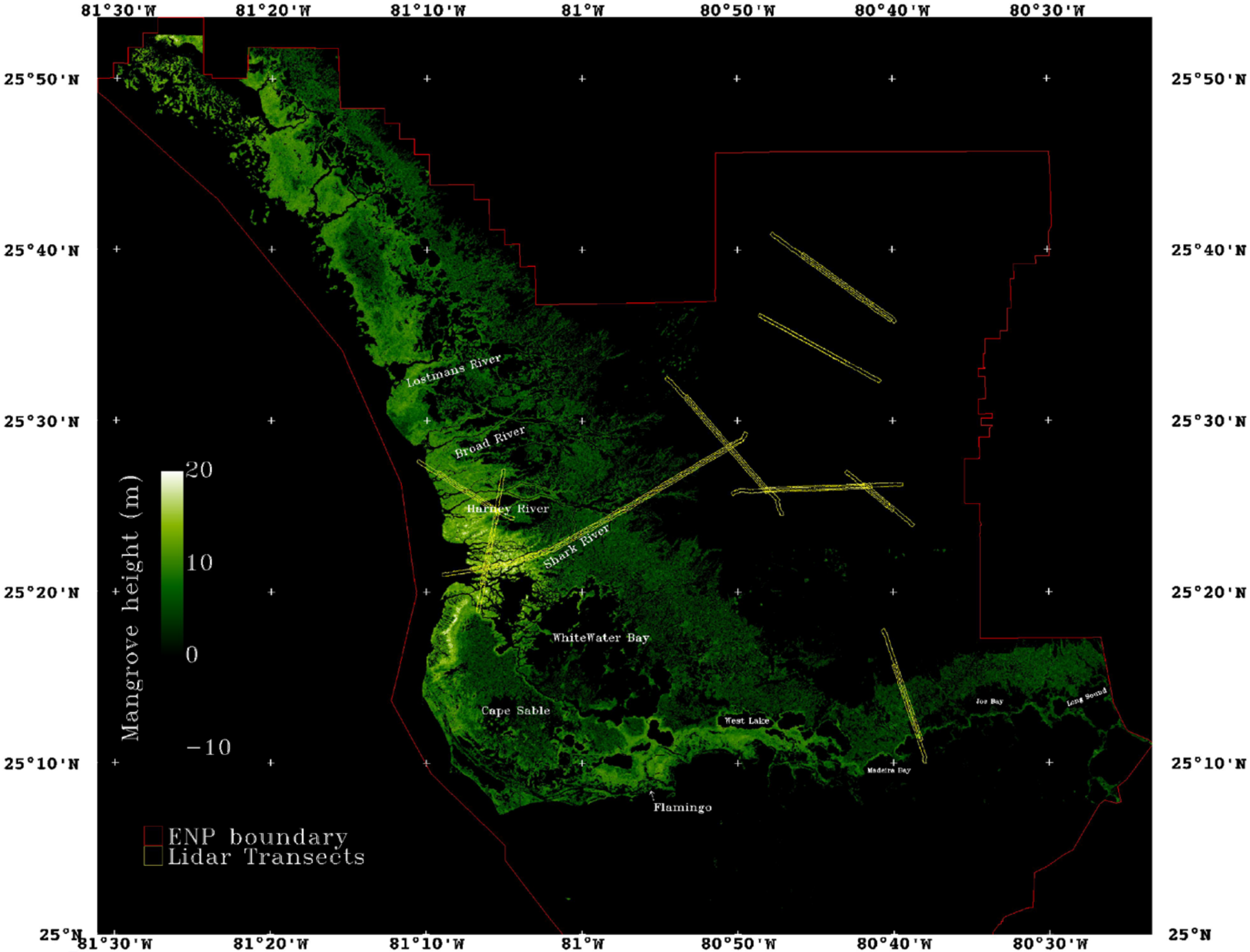
Modeling



Field data

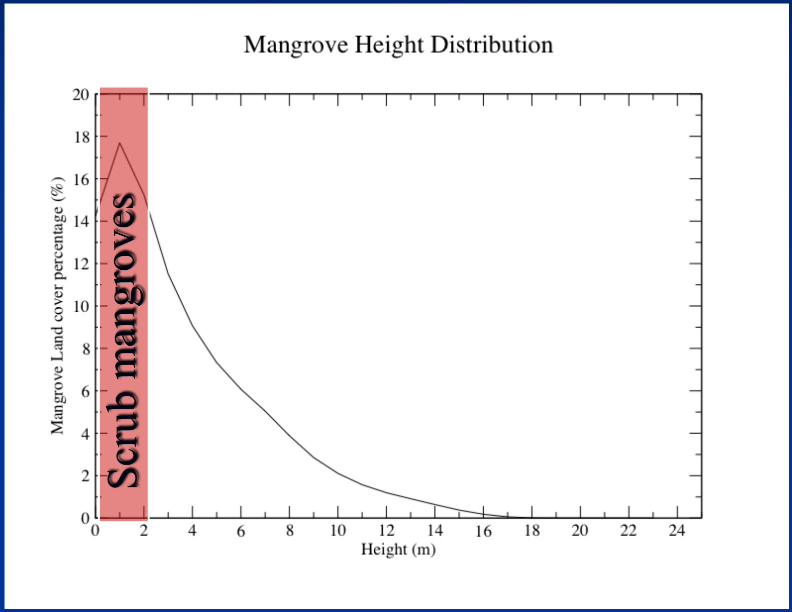
We use interferometric radar data, LIDAR data, field data and ecosystem modeling

Jet Propulsion Laboratory
California Institute of Technology

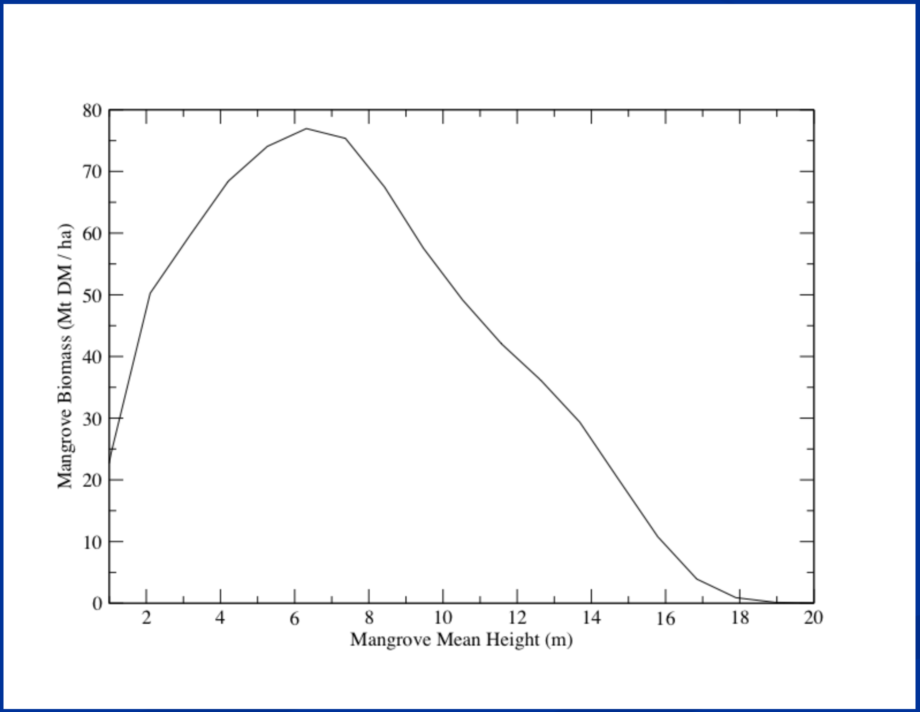


Map of Mangrove Mean Height

Mangrove Height and Biomass Distribution in the Everglades

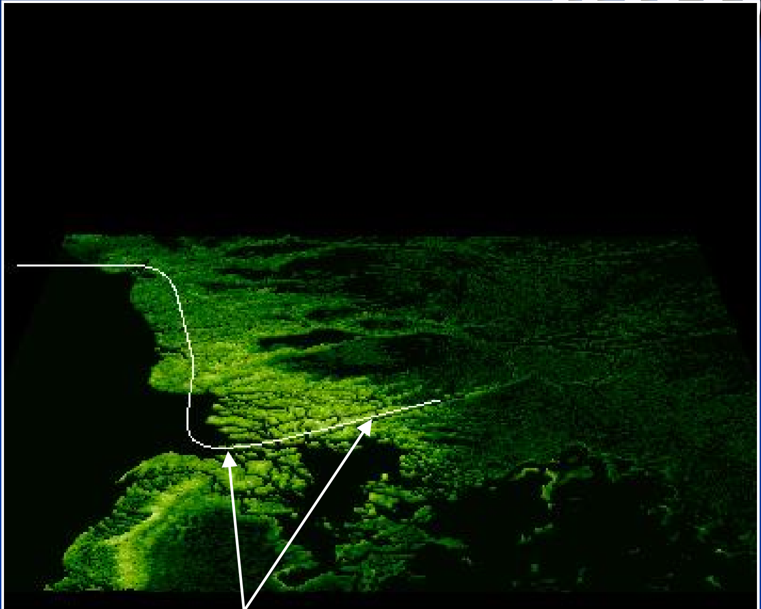


Using field and published data we related mean height to forest stand biomass.
The total mangrove standing biomass In the Everglades is 420Mt Dry Matter



Jet Propulsion Laboratory
California Institute of Technology

3D Mapping of Mangrove in the Everglades and the *Airborne* Tour



Shark River (West Coast)

The Brighter the Green the Taller the Tree

QuickTime™ and a
YUV420 codec decompressor
are needed to see this picture.

Double click to play

Jet Propulsion Laboratory
California Institute of Technology