UAVSAR

AIRBORNE L-BAND RADAR FOR REPEAT PASS INTERFEROMETRY

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G-III/UAVSAR Summary

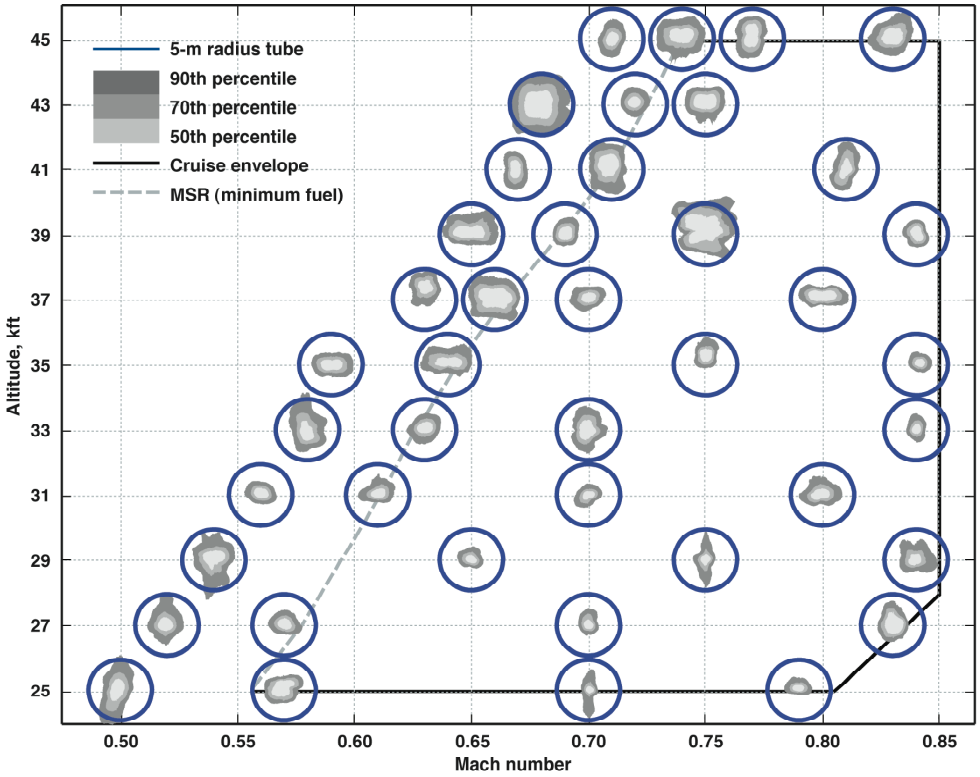
- G-III / UAVSAR Program began in 2004 funded by NASA
- Partnership between NASA Dryden (manages the G-III aircraft) and NASA JPL (manages the UAVSAR)
- The primary objectives of the UAVSAR Project were to:
  - develop a miniaturized polarimetric L-band synthetic aperture radar (SAR) for use on an unmanned aerial vehicle (UAV) or piloted vehicle
  - develop the associated processing algorithms for repeat-pass differential interferometric measurements using a single antenna
  - conduct measurements of geophysical interest, particularly changes of rapidly deforming surfaces such as volcanoes or earthquakes
- Two complete systems were developed
- Operational Science Missions began on February 18, 2009 … concurrent development and testing of the radar system continues

Repeat-pass Capability

To support science applications requiring repeat pass observations such as solid earth and vegetation applications, the UAVSAR design incorporates:

- A precision autopilot developed by NASA Dryden that allows the platform to fly repeat trajectories that are mostly within a 5 m radius tube.
- Compensation for attitude angle changes during and between repeat tracks by electronically pointing the antenna based on attitude angle changes measured by the INU.

Results from Validation Test Flights Using 220km lines at each flight condition



Project Roles & Responsibilities

- **JPL**
  - Operation and continuous improvement of the radar instrument
  - Development of processing algorithms and conducts data analysis
  - Responsible for all data delivery to customers

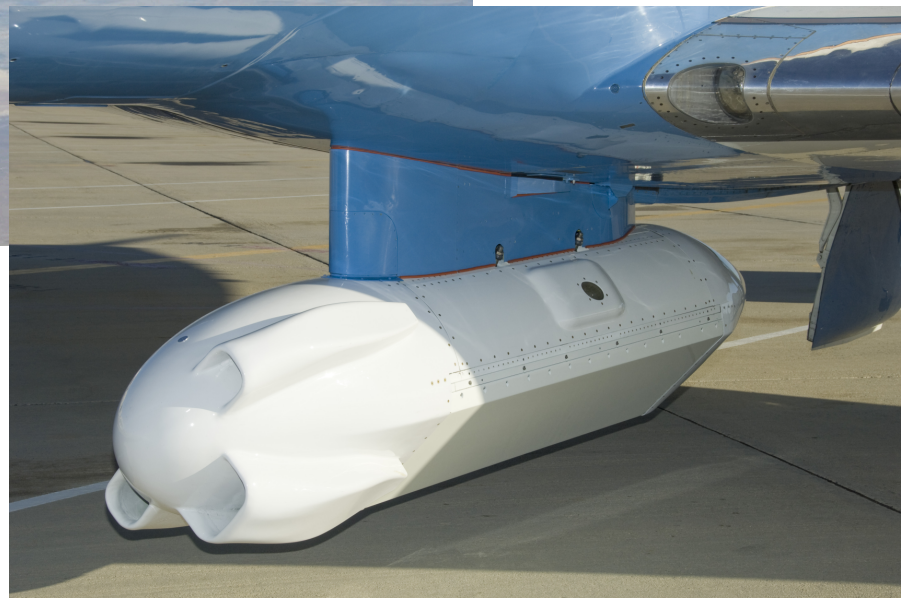
- **Dryden**
  - Operations of the G-III platform aircraft
  - Maintains Platform Precision Autopilot capability
  - Develop and demonstrate REVEAL operation of the UAVSAR
  - Support installation of UAVSAR on Global Hawk

- **Earth Science Discipline Focus Area Managers**
  - Provide oversight and funding for science missions
  - Primarily coordinated by the Solid Earth Discipline

2009 Science Missions Accomplished

- Earth Surface Deformation Missions
  - S California San Andreas and Hayward faults (improve earthquake prediction)
  - Levee evaluation (California and Mississippi)
  - Mudslide Prediction (burn areas)
  - US Gulf Coast Subsidence
- Volcano studies
  - Aleutian Islands
  - Cascades and Yellowstone
- Vegetation Structure
  - Boreal Forest (New England and Canada)
  - Harvard /Duke Forest
  - Everglades
- Ice Dynamics
  - IPY Greenland & Iceland
  - L-Band and Ka-Band

G-III UAVSAR



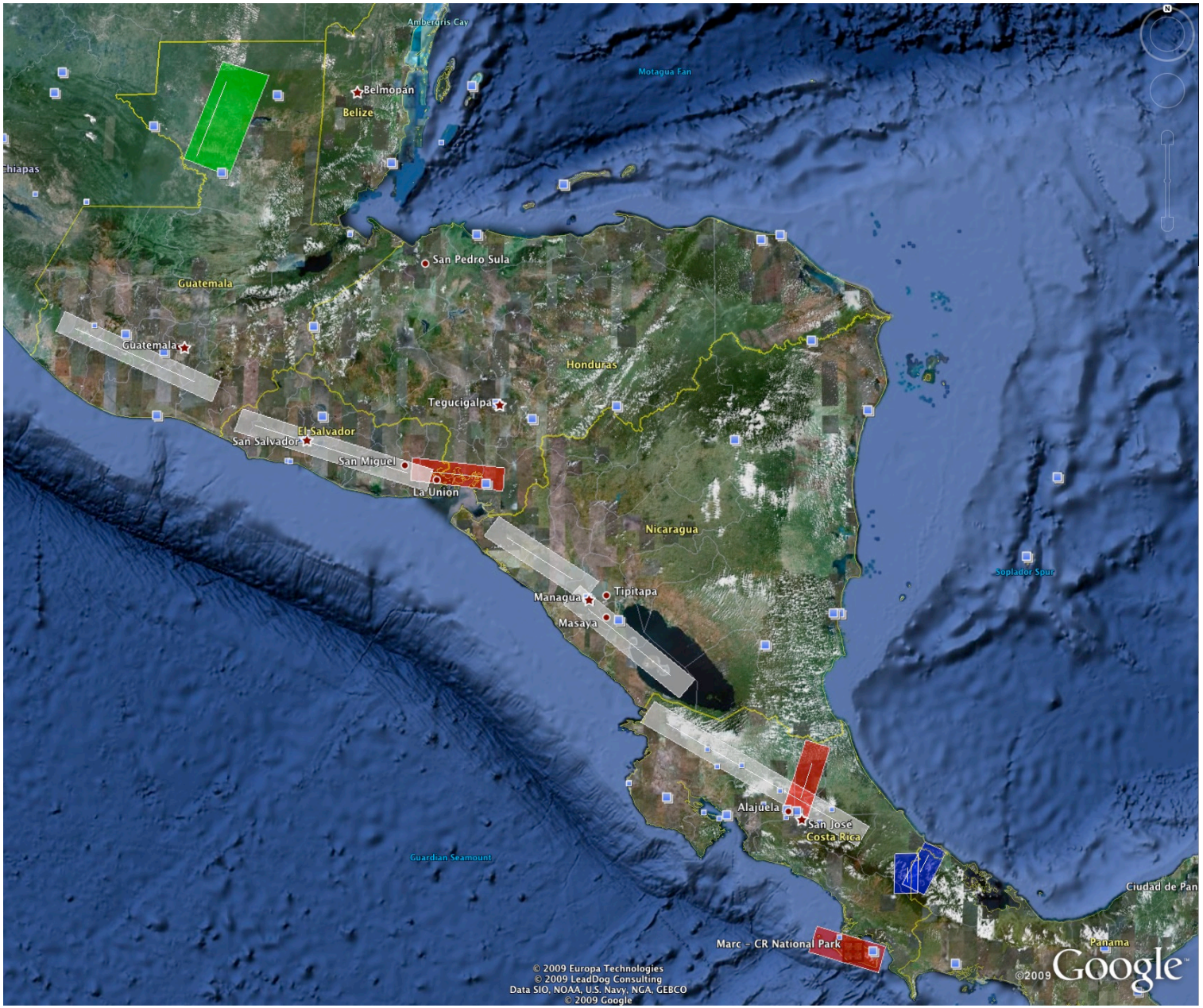
Key Radar Instrument Parameters

Parameter	Value
Frequency	L-Band 1217.5 to 1297.5 MHz
Bandwidth	80 MHz
Resolution	1.67 m Range, 0.8 m Azimuth
Polarization	Full Quad-Polarization
ADC Bits	2,4,6,8,10 & 12 bit selectable BFPQ, 180Mhz
Waveform	Nominal Chirp/Arbitrary Waveform
Antenna Aperture	0.5 m range/1.5 azimuth (electrical)
Azimuth Steering	Greater than ±20° (±45° goal)
Transmit Power	> 3.1 kW
Polarization Isolation	<-25 dB (<-30 dB goal)

Central America Deployment

- Jan 25 – Feb 14, 2010
- Based in San Jose, Costa Rica
- Terrestrial Ecology – Costa Rica, Honduras
- Volcanoes – Costa Rica, Guatemala, El Salvador, Nicaragua
- Mayan Archeology – Guatemala, Honduras

Regions of Interest



Legend

Simard - Red

Lundgren – white

Blom – Green

Hensley – Blue

Note: the coverage boxes are padded to be slightly bigger than actual UAVSAR image swath

Deployment Schedule

Day	Date	Day	Event(s)
1	25-Jan	Mon	Depart Palmdale - transit to Houston Ellington Fied (EFD)
2	26-Jan	Tues	10G002 - Gulf Coast Subsistence (PI: Ron Blum)
3	27-Jan	Wed	Depart Ellington Field - transit to Juan Santamaria International Airport (SJO), San Jose, Costa Rica 10Gxxx - Mayan Archeology (Guatemala enroute to Costa Rica, PI: Chapman)
4	28-Jan	Thur	
5	29-Jan	Fri	10G001 - Simard Day 1 (Costa Rica) 10G022- Lundgren Volcanoes (Guat x2, El Sal, Nicaragua, Costa Rica)
6	30-Jan	Sat	
7	31-Jan	Sun	10G001 - Simard Day 3 (Costa Rica, Corcovado, & La Selva)
8	1-Feb	Mon	
9	2-Feb	Tues	
10	3-Feb	Wed	
11	4-Feb	Thur	10Gxxx - La Amistad Intn'l Park (PI:Hensley)
12	5-Feb	Fri	
13	6-Feb	Sat	10G001 - Simard Day 9 (Costa Rica)
14	7-Feb	Sun	
15	8-Feb	Mon	
16	9-Feb	Tues	
17	10-Feb	Wed	10G001 - Simard Day 13 (Costa Rica)
18	11-Feb	Thur	
19	12-Feb	Fri	10Gxxx - Lundgren Volcanoes (Guat, El Sal, Nicaragua, Costa Rica)
20	13-Feb	Sat	
21	14-Feb	Sun	Depart Costa Rica - transit to Houston EFD for Customs Depart Houston- transit to Palmdale

Questions?