

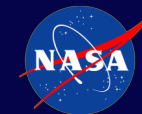
The Geosynchronous Hurricane Observatory

National Aeronautics and Space Administration

Bjorn Lambrigtsen

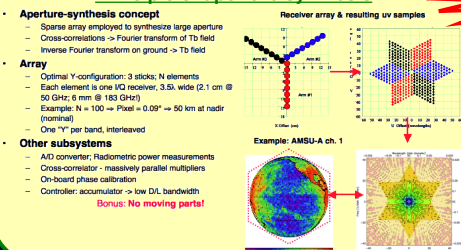
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Technology

Principle of aperture synthesis

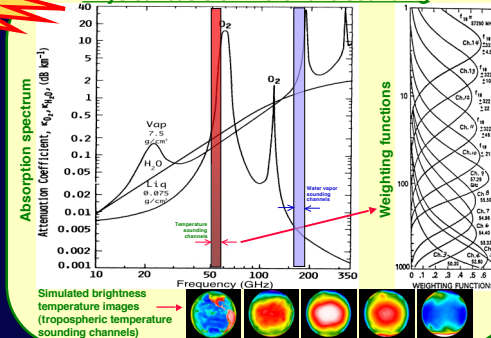


NASA's investments in GeoSTAR are approaching \$15M

A GeoSTAR mission will meet key NOAA needs re. NWP & hurricanes

Science

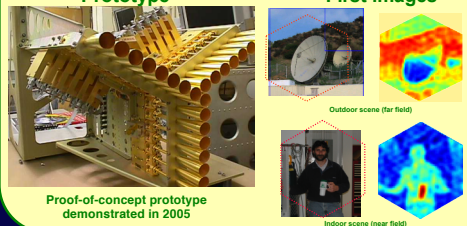
Physical basis of microwave sounding



Concept development

Prototype

First images

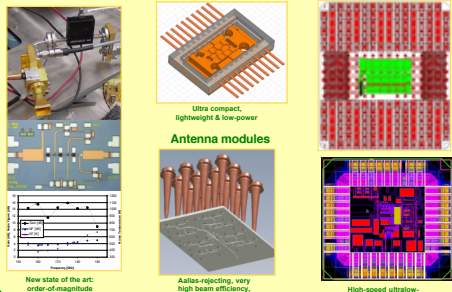


Technology development

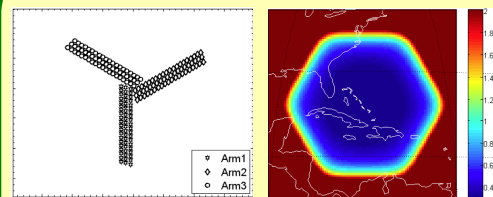
183-GHz LNAs

Receiver modules

Correlator & digitizer ASICs



Design innovation



Mission plans

Near-term
GOES-R/S time frame

"Venture" mission

New NASA program
a) Venture-M: Full mission
b) Venture-I: Instrument only
4-5 years rapid development
Venture-M AO in 2011, 2015, etc.
Venture-I AO in 2011, 2012, 2013, etc.

GeoSTAR/Venture mission
Sensor: GeoSTAR
Objective: Hurricanes/storms
Funding: NASA + partners

Satellite
Hosted on commercial commsat

Timeline
Start: 2012
Launch: 2016

Long-term
GOES-U time frame

"PATH" mission

Decadal-survey mission
Recommended by NRC
Third tier
5+ years development
Third-tier missions not yet funded

GeoSTAR/PATH mission
Sensor: "Array radiometer"
Objective: Hydrologic-cycle obs.
Funding: NASA

Satellite
Dedicated S/C

Timeline
Start: 202X
Launch: late 2020's?

Data products

Mature products:

Parameter	Horizontal	Vertical	Temporal	Accuracy
Tb (50 GHz)	50 km	(6 channels)	3 min per ch.	= AMSU-A
Tb (183 GHz)	25 km	(4 channels)	3 min per ch.	= AMSU-B
Temperature	50 km	2 km	30 min	1.5-2 K
Water vapor	25 km	2 km	30 min	25%
Liquid water	25 km	3 km	30 min	40%
Stability index	50 km	N/A	30 min	N/A
TPW	25 km	N/A	30 min	10%
LWC	25 km	N/A	30 min	20%
SST	100 km	N/A	1 hour	0.5 K

Evolving experimental products:

Parameter	Horizontal	Vertical	Temporal	Accuracy
Rain rate	25 km	N/A	30 min	2 mm/hr
Reflectivity	25 km	1-2 km	30 min	4-6 dBZ
IWC	25 km	N/A	30 min	30%
Wind vector	25 km	2-3 km	30 min	TBD

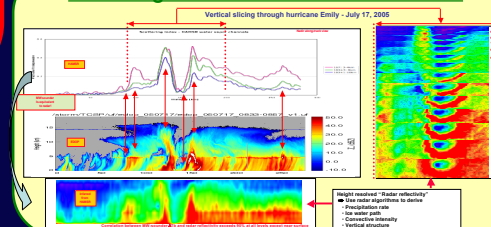
Hurricanes & severe storms

Warm core anomaly @ 55 GHz (continuously, in real time)
→ Surface pressure anomaly = Intensity, intensification/weakening
Radar-emulating reflectivity (continuous coverage of entire life cycle)
→ Convective structure/shear, precipitation, microphysics
Complete diurnal-cycle observations (< 15-minute time resolution)
→ Model improvements
Real-time atmospheric stability indices (including under full cloud cover)
→ Severe storm warnings, tornado precursor detection
AMV-inferred wind vectors (regardless of cloud cover)
→ Improved general forecast accuracy
Hurricane forecast initialization (accurate "bogos" location & structure)
→ Improved hurricane forecasts

Synergy

Complements GEO IR sounders (cloud clearing)
Complements LEO sounders (swath-gap & temporal-gap filling)
Complements GEO imagers (resolution enhancement of MW)

Dissecting hurricanes: 3D internal structure



The GeoSTAR team
Bjorn Lambrigtsen/JPL - PI
Todd Gaiser/JPL - Task Manager
Alan Tanner/JPL - System
Pekka Korpasjarvi/JPL - Receivers
Boon Lim/JPL - Electronics
Chris Rufu, Michigan - Correlators
Linda Herrell/JPL - Mission