

# Observations Of C-Band Brightness Temperature And Ocean Surface Wind Speed And Rain Rate In Hurricanes Earl And Karl (2010)



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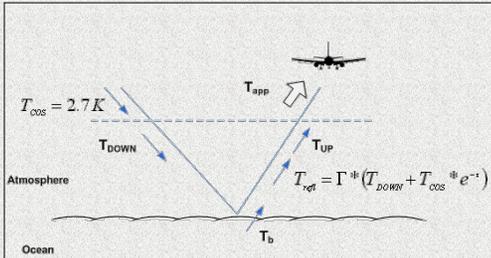


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## HIRAD Physical Principles



Ocean surface emission is affected by:

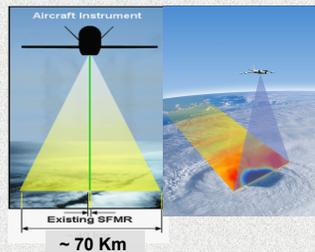
- Sea surface temperature
- Wind speed (foam fraction)
- Salinity

After production of calibrated  $T_b$  fields, geophysical fields wind speed and rain rate (or column) are retrieved

## Hurricane Imaging Radiometer (HIRAD)

**HIRAD utilizes NASA Instrument Incubator Technology:**

- Provides unique observations of sea surface wind, temp and rain
- Advances understanding & prediction of hurricane intensity
- Expands Stepped Frequency Microwave Radiometer capabilities
- Uses synthetic thinned array and RFI mitigation technology of Lightweight Rain Radiometer (NASA Instrument Incubator)



**Passive Microwave C-Band Radiometer with Freq: 4, 5, 6 & 6.6 GHz:**

- Version 1: H-pol for ocean wind speed,
- Version 2: dual-pol for ocean wind vectors

**Performance Characteristics:**

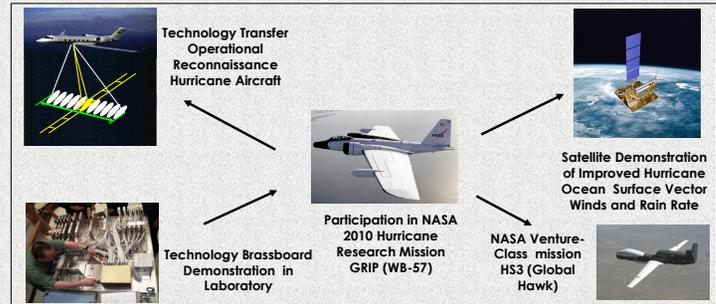
- Earth Incidence angle: 0°- 60°,
- Spatial Resolution: 2-5 km,
- Swath: ~70 km for 20 km altitude

**Observational Goals:**

WS 10 - >85 m/s RR 5 - > 100 mm/hr

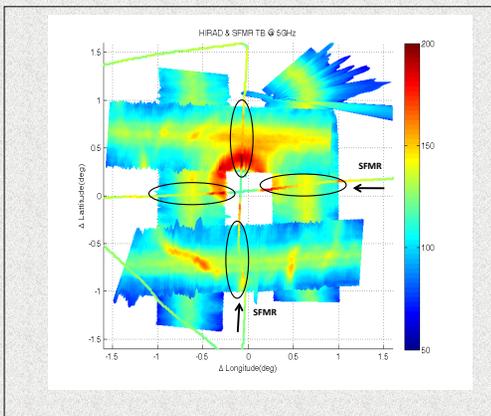


## HIRAD Technology Investment Roadmap

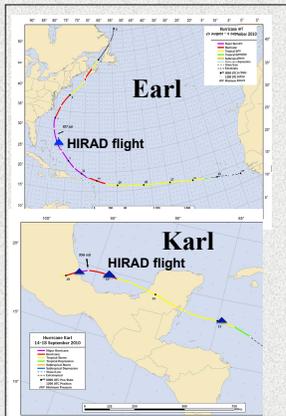


## Karl 16 Sept 2010

## Earl Flight 1-2 Sept 2010



## Earl and Karl Flights



In the figure to the right, HIRAD 5 GHz excess  $T_b$  (left) and P-3 lower fuselage radar reflectivity at flight level are shown for two times. The green "diamond" indicates approximate position of the WB-57 at the time of P-3 storm center crossing in the corresponding figure to the right. Key features may be seen in both observations:

- 1) Peak eyewall Z centered left of track and open eyewall right of track due to easterly environmental shear.
- 2) Outer eyewall concentric rainband, which together with the eyewall contracts slightly between the two composites.
- 3) Evolving outer rainband structure.

