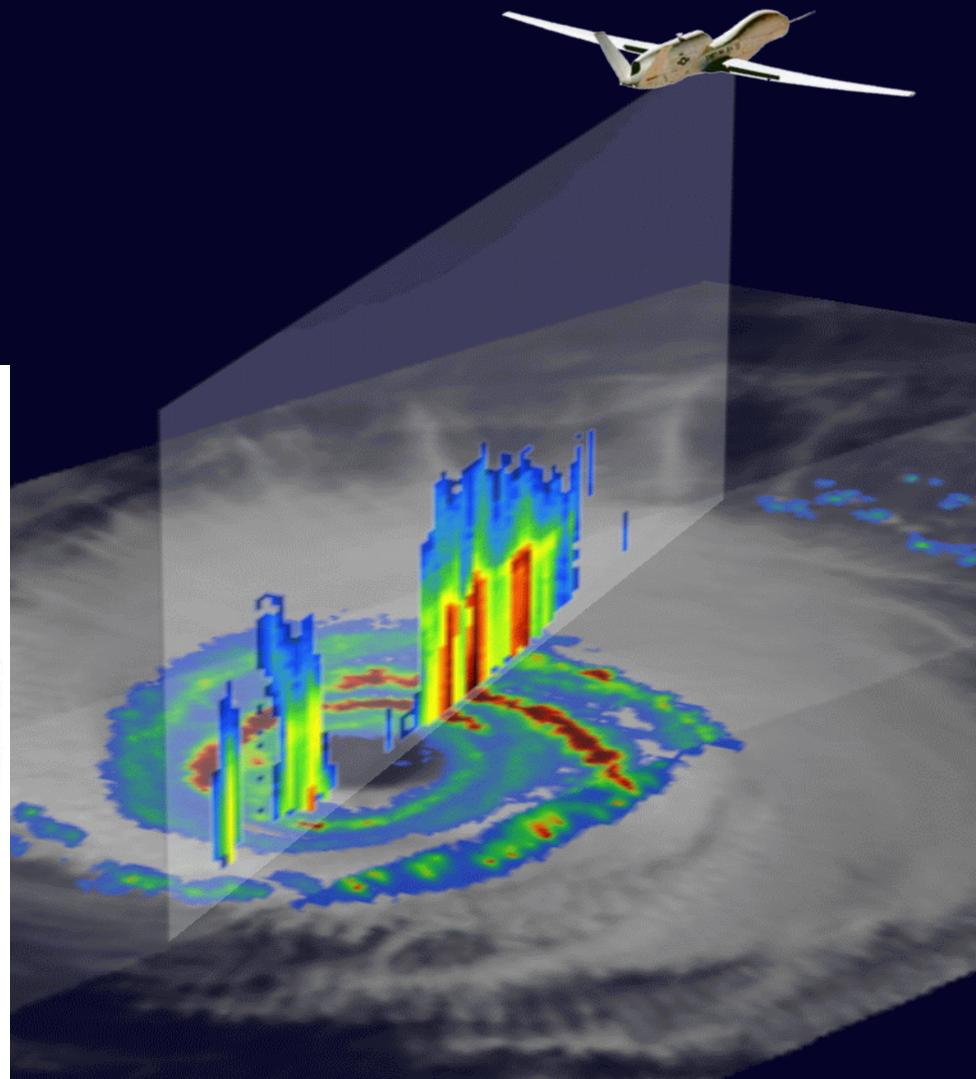# Genesis and Rapid Intensification Process (GRIP) Experiment

- How do hurricanes form?
- What causes rapid intensity changes?
- How are these processes related to environmental vs. in-storm processes?

- Genesis and Storm Environment
  - **Hypothesis**: Genesis is favored when the wave-relative flow favors isolation of the vortex from unfavorable environmental influences

Genesis and storm internal processes
  - **Question**: Do mesoscale or convective scales dominate the genesis process?
  - **Hypothesis 1**: Genesis is a top-down process related to the formation and merger of mesoscale convective vortices and/or stratiform precipitation processes
  - **Hypothesis 2**: Genesis is a bottom-up process related to vortical hot tower spin-up of low-level vorticity and subsequent mergers.

Formations of Karl and Matthew, failure of Gaston to reform

- Intensity and Storm Environment
  - **Hypothesis 1**: The potential for rapid development into a major hurricane is determined by interaction of the storm with features of the large-scale flow in the upper troposphere.
  - **Hypothesis 2**: The SAL has a detrimental impact on intensification

Intensity and storm internal processes
  - **Question**: Are convective hot towers in the eyewall actively contributing to storm intensification beyond merely contributing to the total mass flux required for intensification?
  - **Hypothesis 1**: Hot towers actively contribute to storm intensification through localized strong enhancement of vorticity.
  - **Hypothesis 2**: Rapid intensification is tied to sustained convectively induced surges of boundary layer inflow.

Hurricanes Earl and Karl provide excellent cases for RI
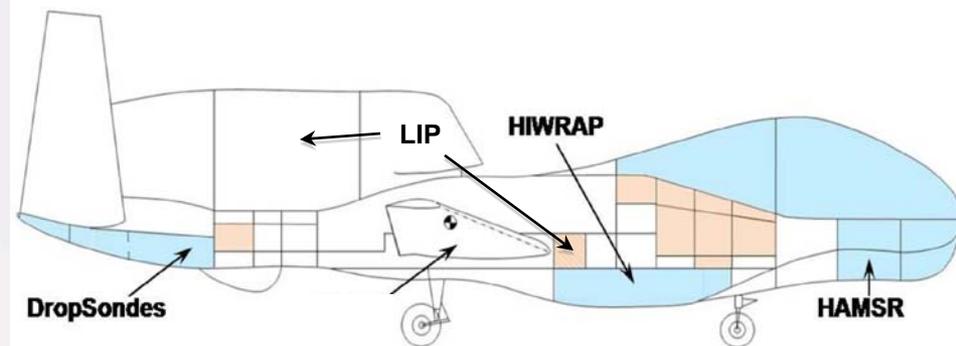
GRIP RESEARCH SYNERGY

Models

Aircraft

Satellite

TRMM

Aqua

CloudSat

Calipso

Parasol

Aura

A Three-Pronged Approach

Global Hawk Payload

- HIWRAP, Heymsfield/GSFC
  - Surface winds in rain-free areas
  - 3D winds, reflectivity in rain
- HAMSR, Lambrigtsen/JPL
  - Soundings in rain-free regions
  - LWP, retrieved precip. profiles in rain
- LIP, Blakeslee/MSFC

Dropsondes
(Vertical Profiles of Temp, Press, Humidity and Winds)
Halverson

CAPS, CVI, PIP
(Cloud Particle Size distributions, Precip Rate, Rain & Ice water content)
Heymsfield

LASE
Lidar Atmospheric Sensing Experiment (H2Ov, Aerosol profiles and Cloud distributions)
Ismail/Ferrare

DAWN
Doppler Aerosol Wind Lidar (Vertical Profiles of Vectored Horizontal Winds)
Kavaya

APR-2
Airborne Precipitation Radar Dual Frequency (Vertical Structure Rain Reflectivity and Cross Winds)
Durden/Tanelli

MMS
Meteorological Measurement System (Insitu Press, Temp, 3D Winds and Turbulence)
P. Bui

Issues for discussion at this meeting

- Status of all data sets
- Interagency discussions (GRIP, IFEX, PREDICT)
- Updates on science activities (talks & posters)
- Focus on discussions & collaborations
- Lessons learned
- Discuss the BAMS article
- Data systems