Relation of Hurricane Inner Core Precipitation and Wind Structure to Tropical Cyclone Intensification and Landfalling

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Science Objectives

• Role of inner core convective bursts on hurricane intensification.
• Relations of vertical motions and microphysical structure.
• Improved understanding of the rain estimation in coastal and inland regions.

**Emphasis on EDOP participation, processing, and case studies**
Hurricane Bonnie
9/23/98
Convective Burst
During Storm Intensification
Heymsfield et al., 2001
Mon. Wea. Rev.
ER-2 Doppler Radar (EDOP)

- Precipitation X-band (9.6 GHz) Doppler radar located in nose of NASA ER-2 high-altitude aircraft emulates satellite view
- Dual-fixed antennas for nadir and forward views along aircraft track
- Forward and nadir beam measure intensity and air motions in precipitation region
- Forward beam provides dual polarization capability for microphysical characterization of precipitation (liquid, snow, hail)

![Diagram of ER-2 Doppler Radar](image)

Vectors are combined to obtain vertical hydrometeor motions and along-track winds.
## EDOP DATA SUMMARY

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<th>Time (UTC)</th>
<th>Description</th>
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G. Heymsfield/GSFC CAMEX-4 Workshop 3/13/02
EDOP Post-processing

- **ARINC-429 (GPS and INS) Serial Nav GPS (pcode) Radar status**
- **Raw Data**
- **Universal Format Conversion (UF)**
- **Calibration & Artifact Removal**
- **Aircraft Motion Removal and Doppler Unfolding**
- **Attenuation Correction**
- **2-D Gridding**
- **2-D Winds**
- **Quick-looks**
- **Distribution UF Files & Quick-looks**

Available March 2002

G. Heymsfield/GSFC CAMEX-4 Workshop 3/13/02
Reflectivity Calibration, Attenuation

- External (lab) calibration before and after experiment - about 1 dB differences from previous campaigns due to higher transmit power.
- Calibration stability monitored during flight using internal calibration.
- Examination of ocean return ($\sigma^o$) and comparison with surface radars (ongoing).

(Attenuation correction not performed on distribution data sets)
CASE STUDIES

• Hurricane Bonnie landfalling (8/26/98)
  – *HRD collaboration, paper in progress*
• TS Chantal (8/20/01) (sheared storm)
  – *Tropical Conf. Paper, HRD & other collaboration*
• Hurricane Humberto (9/22/01)
  – Convective burst
• KAMP: Strong convection cases (9/07/01, etc.)
Hurricane Bonnie West Eyewall

Role of dry intrusion on west half of storm on weakening storm and on precipitation structure.
TS Chantal 20 Aug 2001

Why didn’t storm develop?
Why was convection so intense and persistent?
Hurricane Humberto
22 Sept 2001 Convective Burst
Humberto 23 Sept 2001
Future Work

• Archive EDOP UF data files soon.
• Bonnie landfalling case completion.
• Chantal case study (8/20/01)
• Properties of secondary circulation and inner core convection with EDOP from other cases (2001: Humberto, Erin; 1998: Georges)
• TRMM-related studies (KAMP)
• Collaboration on case studies