DISCUSSION, QUESTIONS, ACTION ITEMS

Data Issues

1. Ways of combining data sets from different agencies (IFEX, GRIP, PREDICT)
2. ECMWF data access for all agencies

   (a) The 2010 operational version of ECMWF data (analyses and forecast) that NPS collected in real-time should be at NCAR soon after the workshop

   (b) The 2010 "final" version of the ECMWF data (analyses only) should be at NPS by the end of June 2011

Analysis of Data

1. Evaluation of kinematic/thermodynamic results from the observational data and scientific interpretations

   (a) Pouch sweet spot position/pouch boundary/pouch phase speed

      i. Simple Best Track: To be complete by Boothe soon
         - 00Z (and some 12Z) consensus positions (lat/lon)
         - Std of lat/lon for consensus members
         - Levels tracked (consensus & individual models)
         - Phase speed (consensus & individual models)

      ii. More thorough version: Flight pattern overlaid on nearest analyses and satellite imagery

   (b) How do we use the GV data to augment our current analyses? For example, how do we use MTP and GISMOS?

   (c) Shall we define a pouch metric? (e.g., depth, OW, persistence) Development of some other broad characterizations? For example:
      - Depth of cyclonic maximum – warming relative to the environment
      - S.F. of pouch (measured by layer above BL which includes theta-e minimum). Findings from "Dry Air Troubles" below should be included
      - Alignment of lower and upper levels of pouch

2. Dry Air Troubles

   Is dry air getting in, and if so, laterally and then sinking? How is dry air getting into the pouch? (space and time scale)

   Space scale:

   (a) Large scale flow component

   (b) Small scale flow component associate with chaotic advection processes

   Need to develop more complete:

   (a) Flow visualizations

   (b) Lagrangian analyses

How do we go about determining the role of dry air at middle levels in the pouch? Does dry air cause stronger downdrafts and system-wide divergence near the surface? Does dry air cause enhanced entrainment, reduced water-loading and reduced vortex-tube stretching at low levels with negligible effect of downdraft strength?

What is the impact of the variability in the moisture field

What is the impact of dry air on the thermodynamics, the dynamics (vorticity), and the convective mode (CAPE, shear)?

Need to understand how findings on convective scale translate to the system-scale organization

- H1: Is overall effect simply less convection?
- H2: Is this hypothesized effect strongly dependent on cloud microphysics?

Can we use precipitation estimates (e.g., CMORPH data set)?

Action items:

(a) Assessment of model humidity compared to dropsondes [analyzed vs. initialized]
(b) Once the drops are in, what are their impacts on the forecast? Re-run with humidity and wind data separately

Stepping forward to tackle these problems: **D. Davis**, **R. Smith**, **J. Jensen**, **L. Bosart**, **M. Bell**, **R. Torn**, **B. Rutherford**, and **M. Montgomery**

Basis for follow-on experiment ("DRIP")

Future Projects and Collaborations

1. Focused investigation of mesoscale dynamics with NOAA Doppler radar and dropsonde data for pre-Karl
2. Focused investigation on genesis of Matthew with NASA-GRIP
3. Data denial experiments with ECMWF

Do dropsonde observations released in upper troposphere, and other observations, provide added value to tropical cyclogenesis forecast in 3-5 day window? If so, how & why? If not, why not?

Clouds produce low-level vorticity. However, if the local environment remains favorable, but clouds are not in close proximity, then an upscale vortical organization process will not take place

How does genesis occur in the ECMWF model, with and without observations?

Do global models represent diurnal cycle? What role do these convective pulses play in the genesis process?

Plan:

(a) Start with focused denial experiments for particular events (starting with ex-Gaston). Run three experiments:
   i. Take out all GV and DC-8 data
   ii. Put in wind data only

iii. Put in PTU data only

(b) Then, perhaps conduct a "complete denial experiment" over the course of the entire ex- periment

4. Predictability

Since tropical cyclogenesis is inherently a multiscale problem, can we quantify the predictability (e.g., error growth) at different spatial scales?

"Near linearity of the dynamics vs. intrinsic nonlinearity of the thermodynamics" The "WWW" problem: Where, When and Why

Regimes of predictability: Is Western Pacific basin less predictable than Atlantic basin?

Previous Paradigms of Tropical Cyclogenesis

We should conduct our research with these previous studies in mind:

- TEXMEX (Emanuel et. al.)
- TCM-93 (Harr et al.). Papers on Ophelia and Robyn (Westpac '93)
- Thermodynamic stabilization (Raymond et al.)

Publication and Presentation Goals

- Special PREDICT issue in ACPD
- Special session during AMS Hurricane Conference (April 2012, Ponte Vedra, FL)
- Present to NHC and establish constructive dialogue with our NHC forecasters