# Objectives for meeting

1) Summarize planned experiments
2) Discuss resource availability
   - Aircraft
   - Instrumentation
   - Expendables
3) Assign working groups to complete each experiment plan
   - Flight planning and patterns
   - Airborne and ground-based logistics
4) Identify timetable for completion of experiment plans

# Hurricane Field Program Operations for 2005

## Participating Experiments

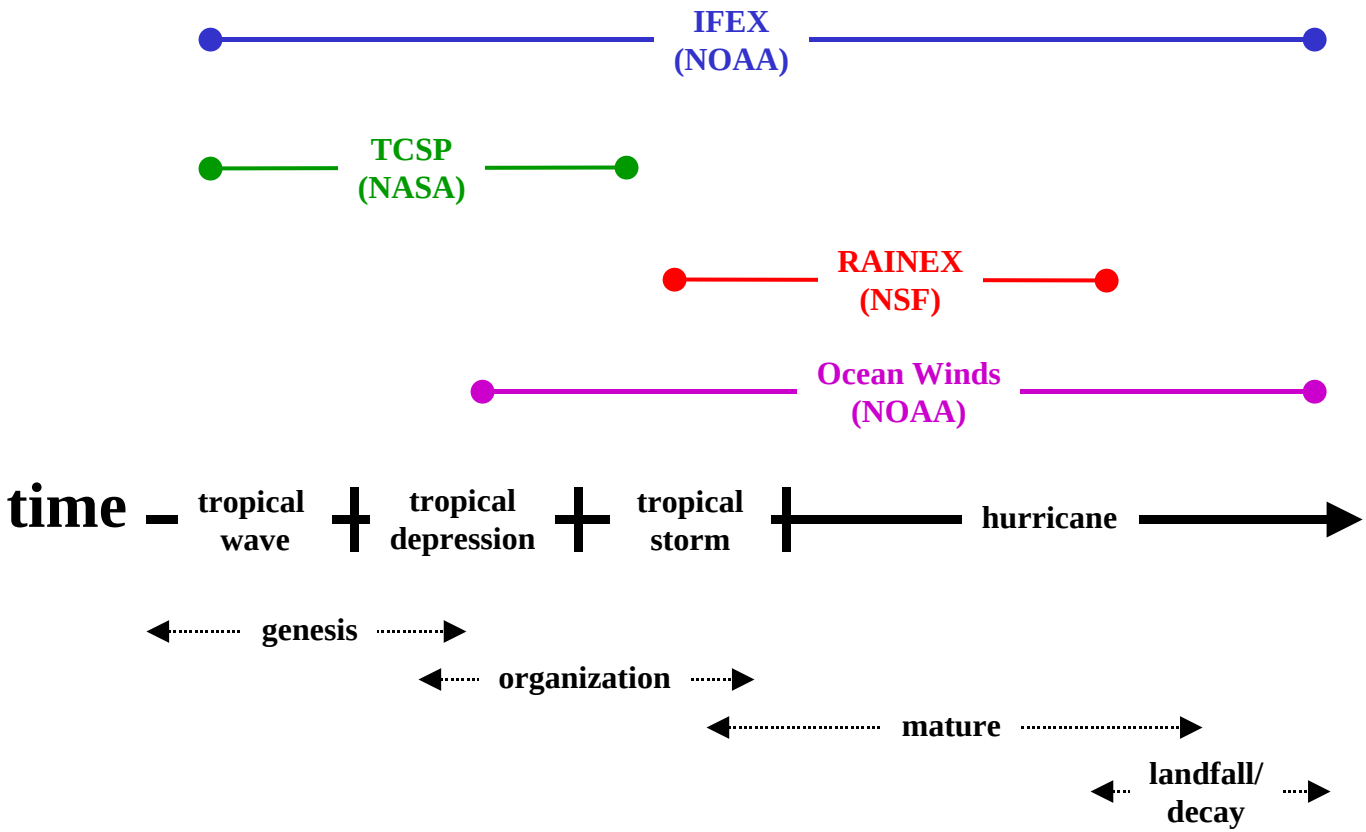
- **NOAA IFEX (HRD, Rogers P.O.C.)**
  - **Partnership among HRD, NHC, EMC**
  - **July 1 – September 30**
  - **Focus on all stages of TC lifecycle**
  - **Possible operations in Atlantic, Caribbean, Gulf of Mexico, and East Pacific**
- **NASA TCSP (multiple P.I.'s TBD)**
  - **July 2005**
  - **NASA aircraft based in San Jose, Costa Rica**
  - **Science team TBD soon**

# Hurricane Field Program Operations for 2005

## Participating Experiments

- **NSF RAINEX (Houze, Chen, Lee)**
  - **August 15 -September 30 2005**
  - **Ground operations based in Miami, flights in Atlantic**
  - **1 NRL P-3, 2 NOAA P-3's, 1 G-IV**
- **NOAA Ocean Winds (Chang)**
  - **Validation of satellite scatterometer**
  - **Measurements (GPS sondes, SFMR, IWRAP, and radar) in high-wind, high-rain environments**

# Tropical cyclone lifecycle and experiment coverage



# NOAA IFEX

**GOAL:**

**Multi-year effort to improve forecasts of TC intensity, structure, and rainfall by providing data to improve the operational numerical modeling system (i.e., HWRF) and by improving our understanding of the physics of intensity and structure change and rainfall**

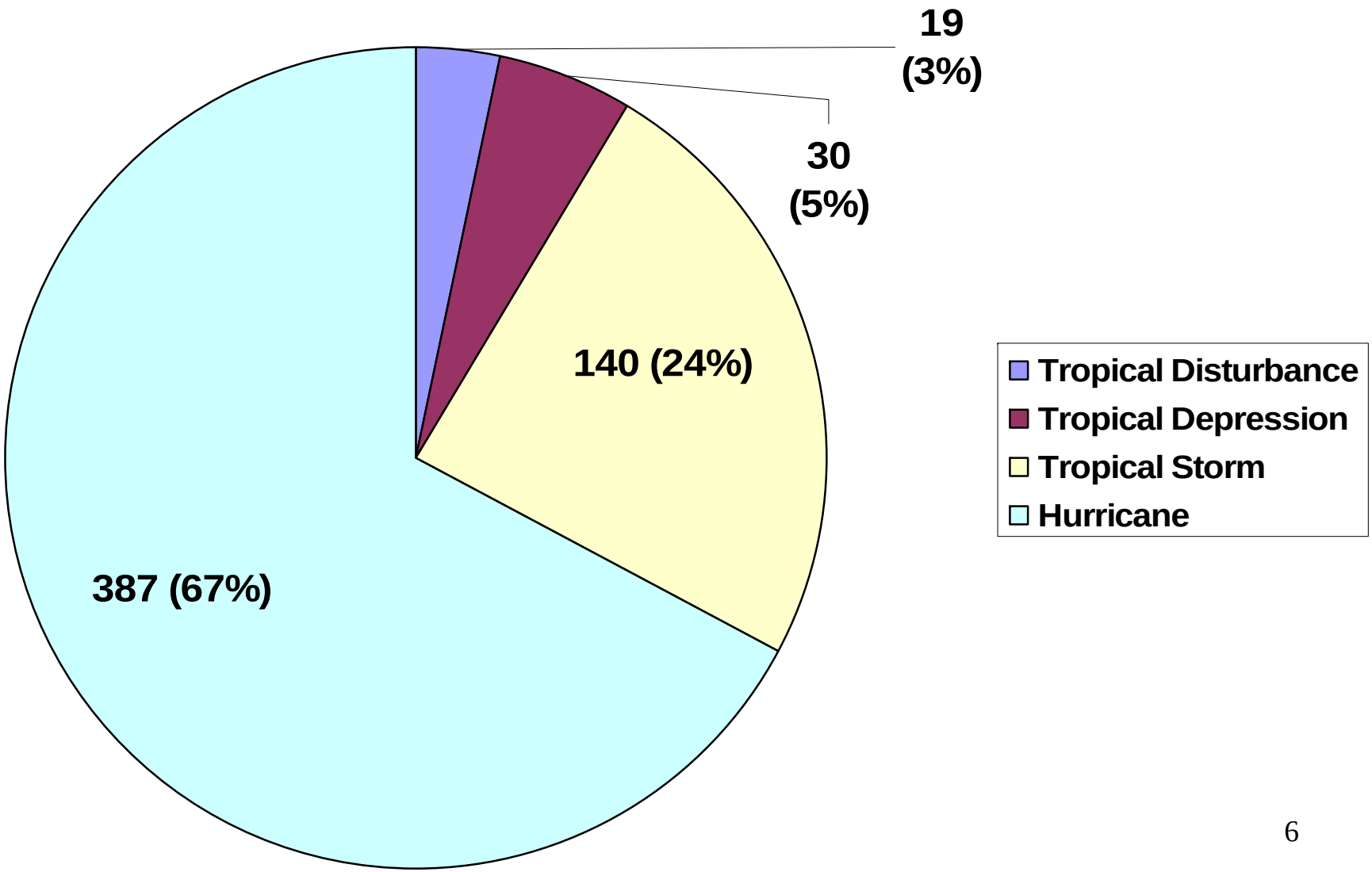
**APPROACH:**

**Experiments and their associated flight patterns will support model development by addressing one (or a combination) of these aspects of a numerical modeling system:**

1) **model initialization;**
2) **model parameterization;**
3) **model evaluation.**

**Focus on providing measurements of TCs in multiple basins at all stages of the their life cycle, from pre-genesis to intensification and subsequent landfall or decay over water.**

# Proportion of HRD research flights stratified by lifecycle stage in the P-3 era (1976-2004)



# IFEX objectives

1) **Collect observations throughout the life cycle of a TC for development of a variational assimilation of the hurricane core circulation.**

2) **Collect observations of the atmosphere and ocean in and around the storm scale circulation that can be used to develop an evaluation and validation package for the high resolution HWRF.**

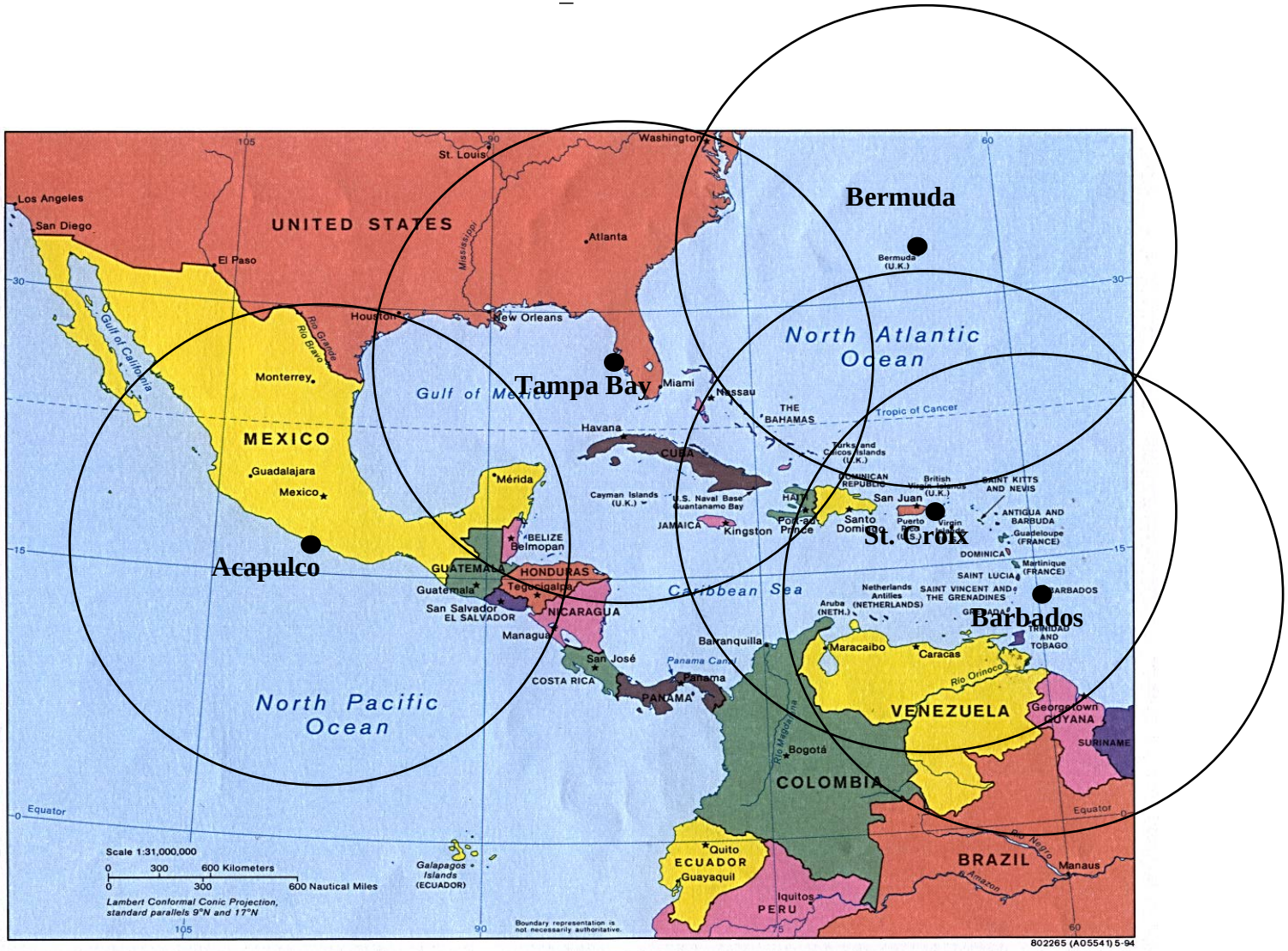
3) **Collect observations in a variety of atmospheric/oceanic conditions (e.g. atmospheric shear and humidity environments, oceanic warm core eddies) to assess the influence of these features on observed and model TC intensity and structure changes.**

4) **Improve understanding and develop improved model representations of sea spray/surface flux effects on boundary layer structure and microphysics, especially in the core and rainbands.**

5) **Improve the understanding of the phase changes of moisture.**

6) **Determine the storm intensity and structure change during decay over cold water.**

# Possible bases of P-3 operations (with approximate ranges) for IFEX in 2005.

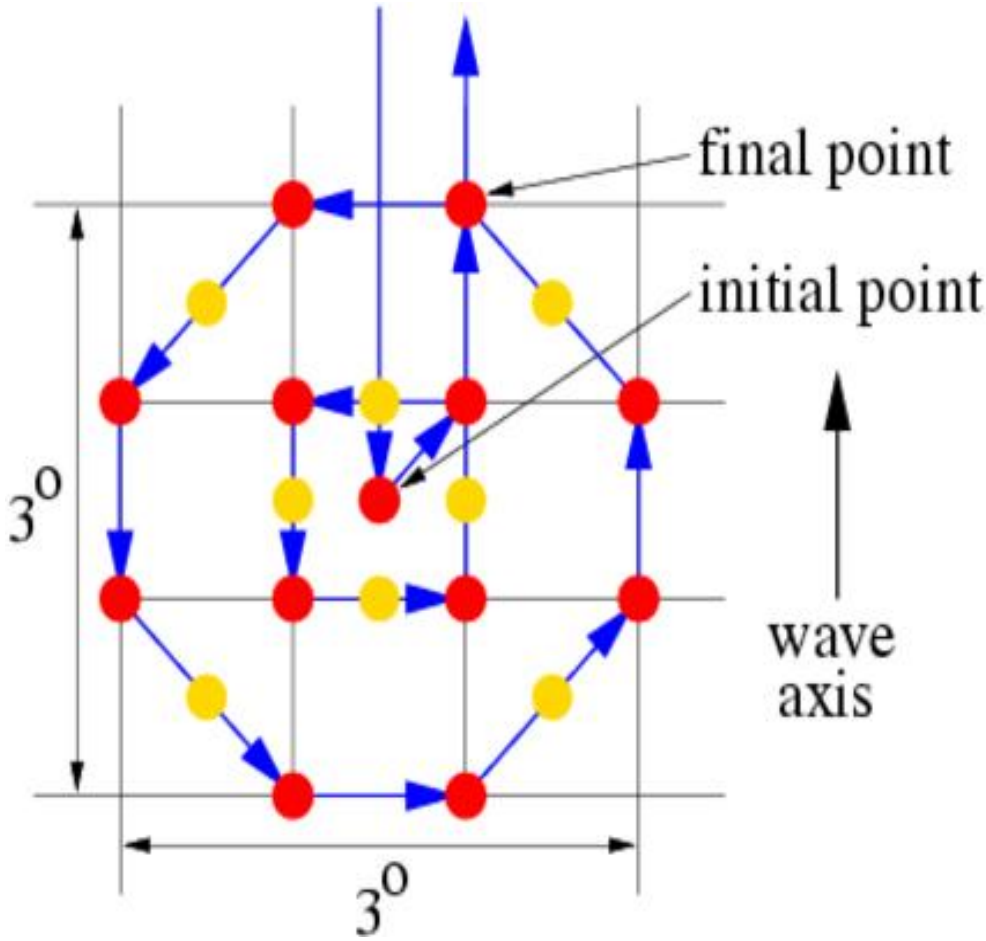


# 2005 IFEX Experiments

- **Tropical Cyclogenesis Experiment (Rogers)**
  - **Investigate role of thermodynamic transformations and vortex interactions in genesis (2 P-3's, 1 G-IV)**
- **Mature Storm Experiment (Gamache)**
  - **Collect observations from the sub-surface to the upper atmosphere for a mature TC, from the inner core to the synoptic environment (2 P-3's, 1 G-IV) – Modules for CBLAST, RAINEX, Ocean Winds part of this**
- **Tropical Cyclone Wind Fields near Landfall Experiment (Dodge)**
  - **Mapping of the TC kinematic and thermodynamic changes during landfall (2 P-3's)**
- **Tropical Cyclone Decay Experiment (Franklin, NHC)**
  - **Mapping of the thermodynamic and kinematic changes in the atmospheric boundary layer upon passage over a sea-surface temperature front (1 P-3)**
- **Saharan Air Layer Experiment (Dunion)**
  - **Study the mechanisms by which the SAL's embedded mineral dust, thermodynamic properties, and low-level wind surge affect Atlantic TC genesis and intensity change (1 G-IV, 1 P-3)**

# Sample Flight Patterns

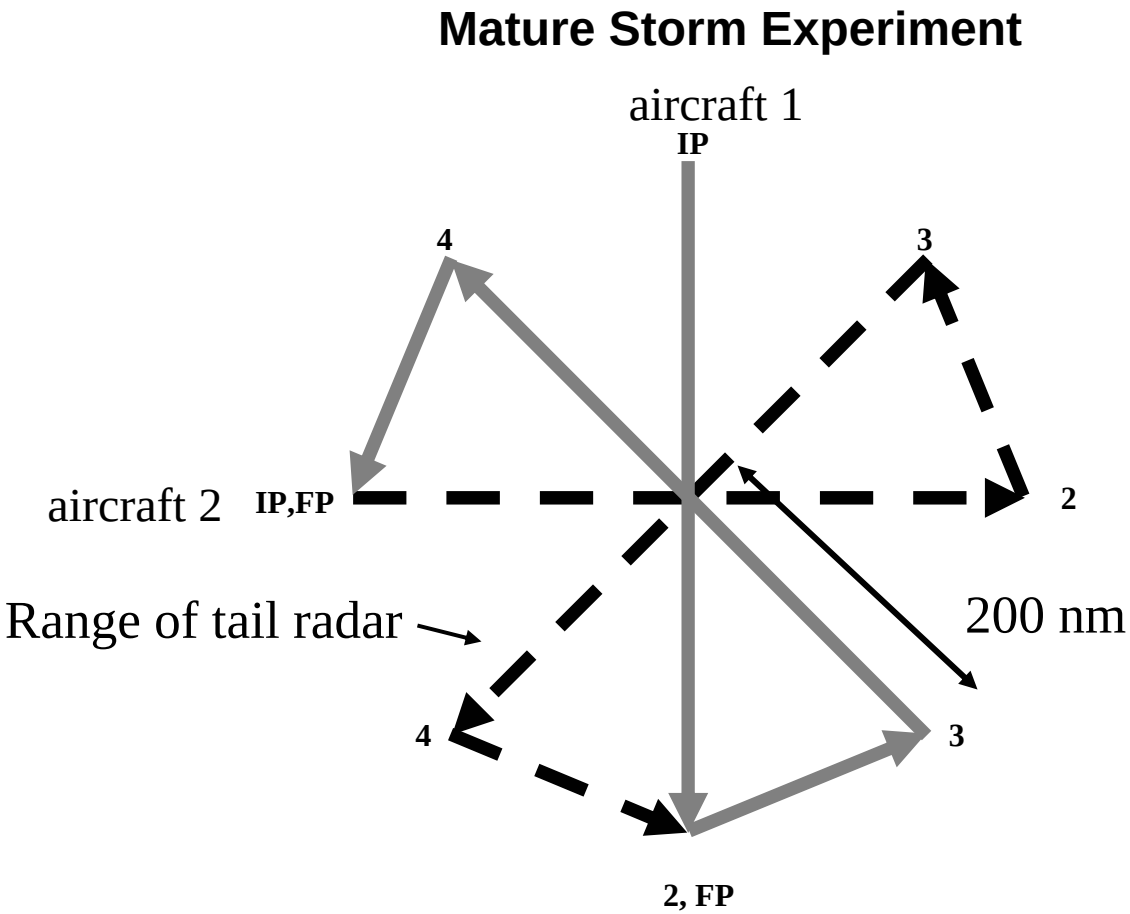
**Tropical Cyclogenesis Experiment**




**Vortex survey pattern – Square-spiral pattern**

# A Genesis Flight Scenario

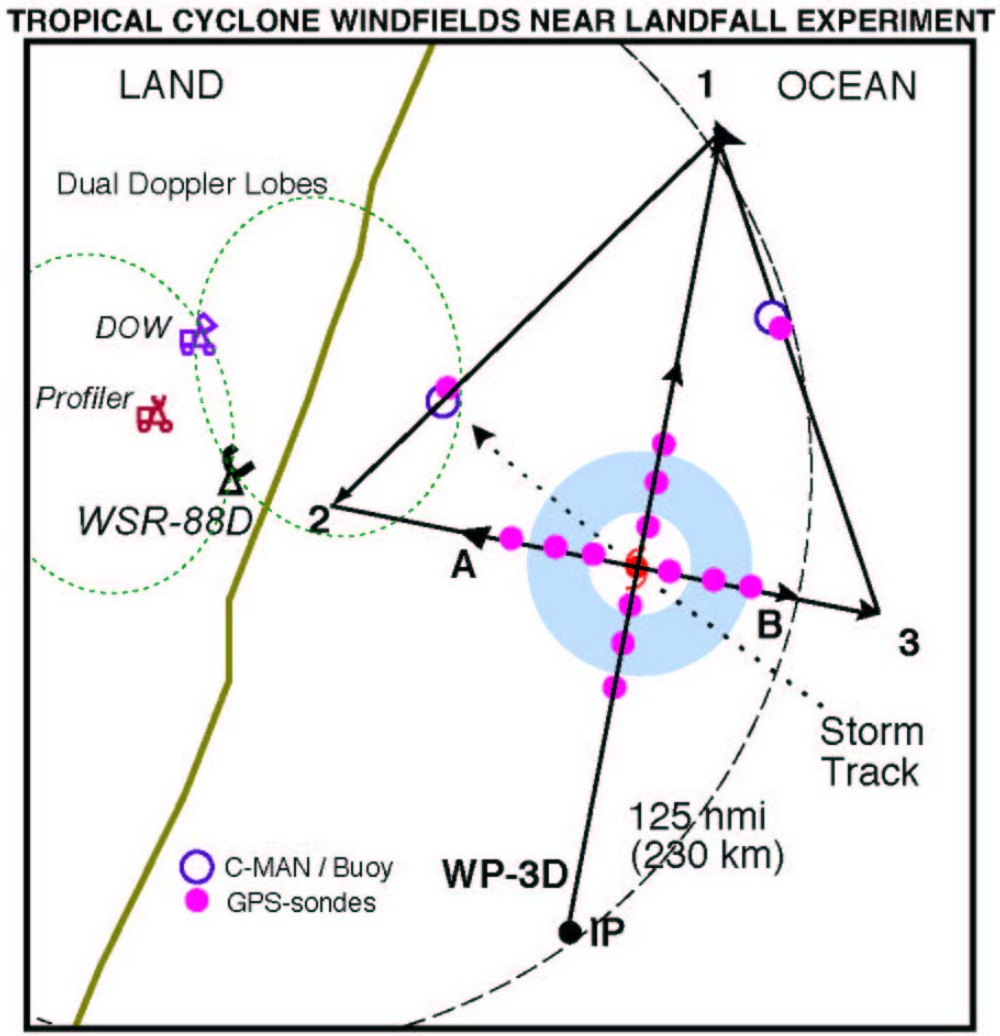
# Sample Flight Patterns




**Coordinated dual-aircraft pattern**
**Doppler Coverage for 200 nm radius**

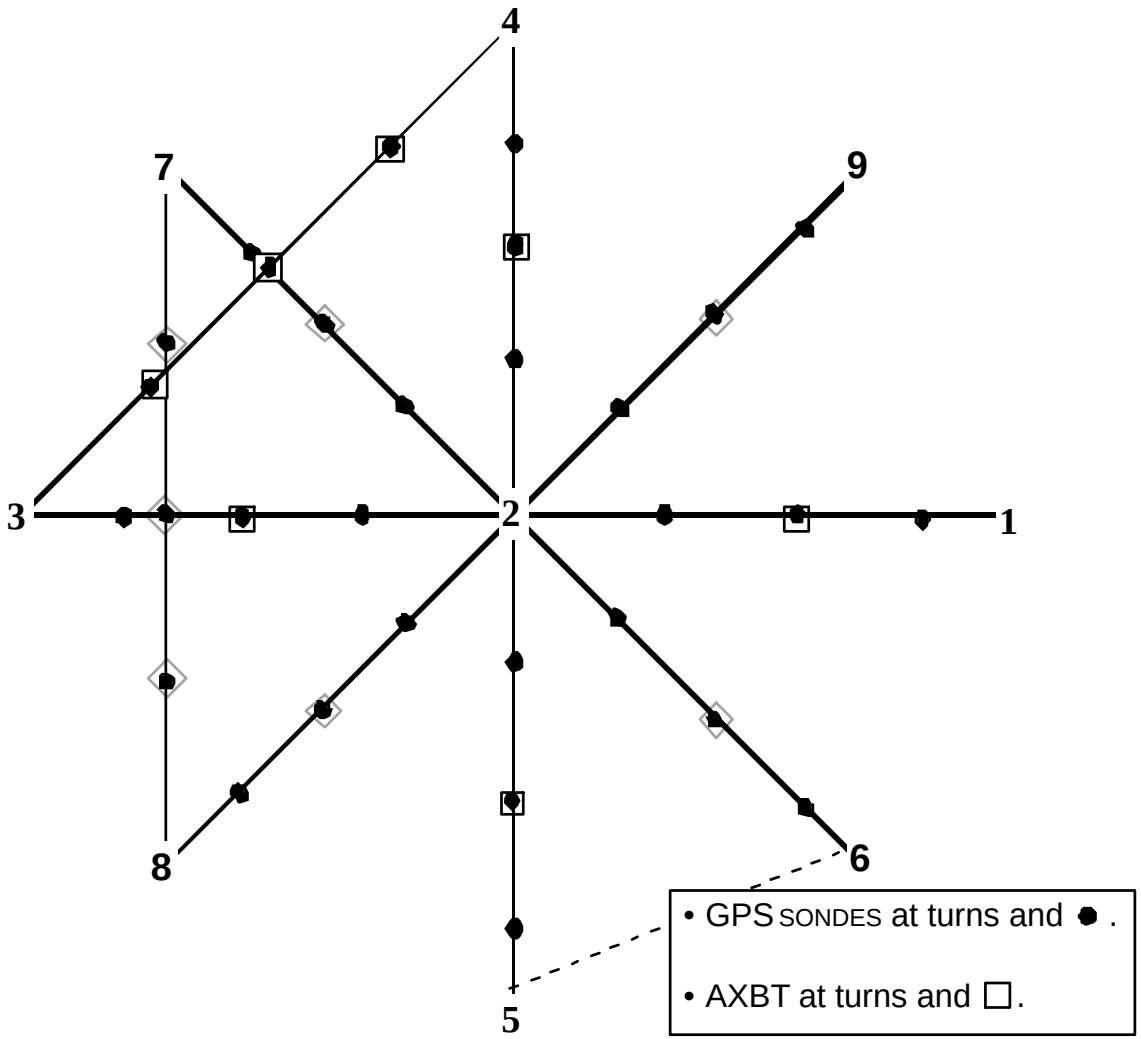
# Sample Flight Patterns

## Tropical Cyclone Wind Fields near Landfall Experiment



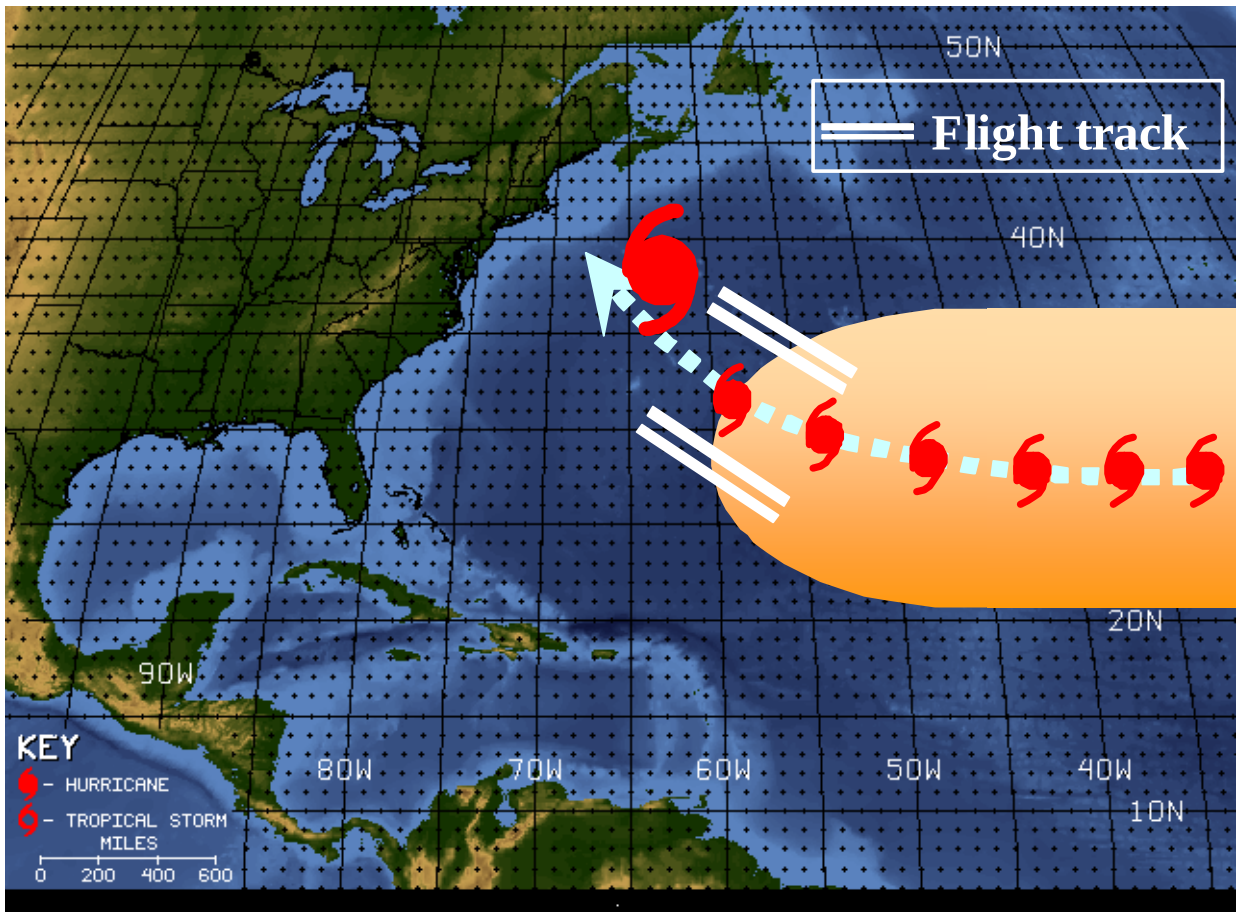
# Sample Flight Patterns

## Tropical Cyclone Decay Experiment



# Sample Flight Patterns

## Saharan Air Layer Experiment



# Instrument Priority List for 2005 HFP (IFEX)

## Highest Priority

1) Radar system installation
   - CRPE on 42, AOC on 43
2) Onboard networking and satellite communication
   - networking capabilities on 43 made equivalent to those on 42

## High Priority

3) SFMR
4) Dropsondes
5) Microphysical probes
   - pylon installation on 43
6) Ocean measurements and profilers (AXBT, Sonobuoy)
7) CBLAST turbulence systems
8) SRA
9) CBLAST videography

# Matrix of Aircraft Availability

| Aircraft | Operationally Tasked Reconnaissance | Operationally Tasked Inner Core | Operationally Tasked Surveillance | HRD and NESDIS Research |
|---|---|---|---|---|
| C-130 J | None (except psbl incr # sondes <10k ft) | N/A | Possible (limited) | N/A |
| WP-3D | None (except psbl incr # sondes <10k ft) | N/A | Possible (limited) | Possible through interactions with HRD and NESDIS |
| G-IV | N/A | Possible (TD - Cat. 1 mainly) | Very limited | Possible through interaction with HRD (45 h) |

All operationally tasked missions originate at NHC (James Franklin, POC) and are passed to AOC or the AFRES via Chief Aircraft Reconassance Coordination, All Hurricanes (CARCAH) (John Pavone, POC).

## Working Groups

- **Genesis experiment: Rogers (HRD), Halverson (NASA)**
- **Mature storm experiment: Gamache (HRD), Chang (NESDIS), Houze (UW)/Chen (UM), P. Black (HRD)**
- **Landfall experiment: Dodge (HRD), Chang (NESDIS)**
- **Decay experiment: Franklin (NHC)**
- **SAL experiment: Dunion (HRD), Houze (UW)**

## Timetable

- **Drafts due April 15**
- **In final form May 15**