Convective Process Experiment (CPEX) 2017

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Science objectives:

- Improve understanding of convective processes including cloud dynamics, downdrafts, cold pools and thermodynamics during initiation, growth, and dissipation.

- Obtain a comprehensive set of simultaneous wind, temperature, and moisture profiles in vicinity of deep convection in all phases of convective life cycle.

- Improve model representation of convective and boundary layer processes.
CPEX Website
https://cpex.jpl.nasa.gov

- Served as the official project website, offering the following resources:
  - Event Calendar
  - Flight and Science Summaries
  - Daily Forecast Reports
  - Quicklook Images
  - Information about aircraft and instruments
  - Team contact information and campaign image gallery
  - Gateway to related data resources –
    - Data Portal (https://cpexportal.jpl.nasa.gov)
    - FTP server for all observed data and GFS
    - Model Forecast pages, etc.

DC-8 flight tracks during CPEX (May-June 2017)

16 missions:
- 4 non-convective, 3 isolated convection, 2 “cloudy”, 3 convective, 2 pre-TC, 2 TS Cindy
CPEX Mission on 11 June 2017

NASA DC-8 flight tracks (red and green) overlaid with GPM and ASCAT overpasses.
Red curves mark the DC-8 flight path and the color shading is the Rain Index derived from AMSR-2 microwave radiance. The HAMSR relative humidity and APR2 radar reflectivity curtain plots are along the southern segment of the flight path. Gray lines are GPM overpasses. Orange arrows are DAWN wind vectors at 850 hPa. The agreement between DAWN and dropsondes winds (insets) is very good.

- The 1st of its kind observations with DAWN and dropsondes that captured 3D winds and shear in a TC (in Tropical Storm Cindy).
Dropsondes deployed by regions during CPEX

Classification of weather conditions:

Clear/Undisturbed

Disturbed

Convective
<table>
<thead>
<tr>
<th>Category</th>
<th>Gulf</th>
<th>Caribbean</th>
<th>W. Atlantic</th>
<th>All Regions</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convective</td>
<td><img src="image1" alt="Gulf Convective" /></td>
<td><img src="image2" alt="Caribbean Convective" /></td>
<td><img src="image3" alt="W. Atlantic Convective" /></td>
<td><img src="image4" alt="All Convective" /></td>
<td><img src="image5" alt="All Convective" /></td>
</tr>
<tr>
<td>Near-storm/disturbed</td>
<td><img src="image6" alt="Gulf Near-storm/disturbed" /></td>
<td><img src="image7" alt="Caribbean Near-storm/disturbed" /></td>
<td><img src="image8" alt="W. Atlantic Near-storm/disturbed" /></td>
<td><img src="image9" alt="All Near-storm/disturbed" /></td>
<td><img src="image10" alt="All Near-storm/disturbed" /></td>
</tr>
<tr>
<td>Clear/undisturbed</td>
<td><img src="image11" alt="Gulf Clear/undisturbed" /></td>
<td><img src="image12" alt="Caribbean Clear/undisturbed" /></td>
<td><img src="image13" alt="W. Atlantic Clear/undisturbed" /></td>
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<tr>
<td>All</td>
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<td><img src="image19" alt="All All" /></td>
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**Summary:**

- For the first time, wind lidar (DAWN) and dual-frequency precipitation radar (APR2) measurements captured convective structure and near-storm winds including convective in/out flow in the boundary layer and above the convection on June 11.

- First of its kind observations of a tropical storm development from pre-tropical disturbance in the Caribbean Sea, to tropical depression, and formation of Tropical Storm Cindy in the Gulf of Mexico from June 15-21. It also captured 3D winds and vertical wind shear in Cindy.

- Sixteen DC-8 aircraft missions from 27 May-24 June covered a wide range of weather conditions, which provide observations in convection, near-storm/disturbed, and undisturbed conditions.