Analysis and Evaluation of DAWN and Dropsonde Wind Measurements and Divergence for CPEX

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CPEX Science Team Workshop
June 7-8, 2018, HCl Research Building, Salt Lake City, UT
7 June 2018
Original DAWN CPEX Science Objectives

1) Utilize DAWN to study the dynamics of convective cloud initiation, maintenance, and decay, particularly over open tropical waters.

2) Study the dynamics of the tropical atmosphere and tropical convection by flying missions that allow us to compute mass budgets for 100 km x 100 km x 6-10 km volumes containing various degrees and life cycle of convection.

3) Provide cal/val for numerical models and other instruments.

4) Improve model assimilation of lidar wind observations into numerical weather prediction models (Z. Pu).
June 11, 2017

DAWN Profiles ~ Every 5km

5 Look 2 second dwell
Circled Area Moving W-E
Measurements below thin.
High clouds and through.
Low clouds.
Too much high cloud
To get below 7 km
Western S-N Leg A

CPEX DAWN - DROPSonde COMPARISON
Wind Speed
06/11/17

Height (m amsl)

Dropsonde (141900) - Black Line
DAWN (141952) - Red Circles

Wind Speed (m/s)

CPEX DAWN - DROPSonde COMPARISON
Wind Direction
06/11/17

Dropsonde (141900) - Black Line
DAWN (141952) - Red Circles

Height (m amsl)

Wind Direction (deg)
Objective
- Compute mass budgets and divergence for ~ 100 km x 100 km x 6-10 km volumes containing various degrees of cloud coverage to help describe the dynamics of the atmosphere over the tropical ocean

CPEX Boxes
- Over 20 ~ 100 km x 100 km boxes were flown during CPEX 2017 which included:
  1) Undisturbed conditions
  2) Disorganized or scattered/broken convection
  3) Decaying convection
  4) Organized (line/area) convective system (difficult for DAWN)
DAWN Profile ~ Every 5 Km

5 Look 2 second dwell

May 27, 2017
DROPSONDE - Start of Northern W-E Leg Both Boxes

Wind Speed Drops (0527)

Wind Direction Drops (0527)
Mid Point Box A
Southern Leg
Mid Point Box A
Eastern Leg

20170527 at 134642 (131)  Head: 179.61  Lat: 25.35  Lon: -88.71  Integration (secs): 4  Roll: 0.21  Climb: 0.03  U10m 0.75

 LOS SNR

Wind Speed

Wind Direction

Altitude (m MSL)

Speed (ms⁻¹)

Direction (deg)
Mass Divergence Over Consecutive CPEX Boxes
05/27/17

Box A - Black
Box B - Blue
May 29, 2017

DAWN Profile ~ Every 7 Km
5 Look 4 second dwell
June 23, 2017
June 16, 2017

DAWN Profile ~ Every 12 km

5 Look 2 second dwell
Summary

• The CPEX campaign has provided a unique set of more than 5000 DAWN wind profiles and ~ 275 dropsonde wind, temperature and water vapor profiles during all stages of the convective life cycle.

• The DAWN airborne instrument can provide the velocity fields in the clear condition and in the vicinity of scattered and to organized convection (at some levels).

• The DAWN data have been used to compute mass budgets and divergence for 100 km x 100 km x 8-10 km volumes containing various degrees of cloud coverage ranging from cloud free to broken and scattered convection.

• Future work will continue on the investigation of the dynamics in more active and growing convection using improved DAWN data coverage (Version 5).