

THE REMOTE OCEANIC METEOROLOGY INFORMATION OPERATIONAL DEMONSTRATION

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Federal Aviation
Administration



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Outline

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Remote Oceanic Meteorology Information Operational (ROMIO) Demonstration

- **Sponsored by the Weather Technology in the Cockpit (WTIC) NextGen Weather Research Program**
- **Collaborative effort between FAA, weather research community, airlines, and airlines inflight entertainment communications (IFEC) providers**
- **Develop and demonstrate operational strategies for use of rapidly updated satellite and model derived Cloud Top Height (CTH) and Convective Diagnosis Oceanic (CDO) products;**
 - On flight deck
 - At Airline Operations Center (AOC) flight dispatch operations
 - At Oceanic Air Route Traffic Control Centers (ARTCC)
 - At Center Weather Service Units (CWSU)



Purpose

- **Data link cloud top and convective weather product information to the aircraft flight deck on electronic flight bag (EFB) during commercial oceanic operations**
- **Identify meteorological information gaps that are not fully resolved by providing cloud top and convective weather product information on flight deck**
- **Evaluate safety and efficiency benefits**
- **Provide additional cockpit weather information to complement onboard weather radar**



Objective

- **Evaluate feasibility of uplinking convective storm products to commercial aircraft flying routes over remote and oceanic regions for display on an EFB**
 - Identify minimum meteorological information for remote and oceanic regions
 - Conduct benefit assessment for both safety and efficiency
- **Demonstrate operational strategies for use of rapidly updated Cloud Top Height (CTH) and Convective Diagnosis Oceanic (CDO) products by:**
 - Flight deck
 - AOC flight dispatch operations
 - Oceanic ARTCC
 - CWSU
- **Determine pilot decisions that can be facilitated with more-frequent weather updates while enroute**



Domain for Storm Product Creation

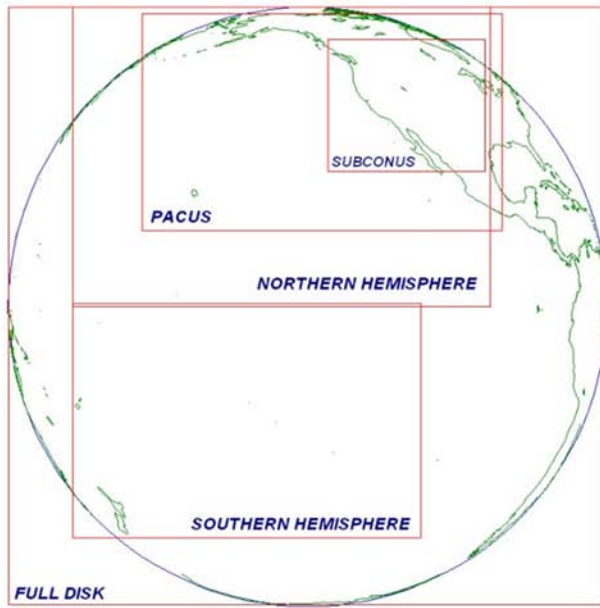
- **Scanning area Geostationary Operational Environmental Satellite (GOES)-East and GOES-West satellites**
 - Satellite mosaics are created at 15 min intervals using latest data available from each sector scan
 - Provides outside shell of convective cloud top and anvil and not within the cloud
 - Products communicate cloud structure with maximum altitude and where convective hazard associated with strong updrafts / downdrafts are located



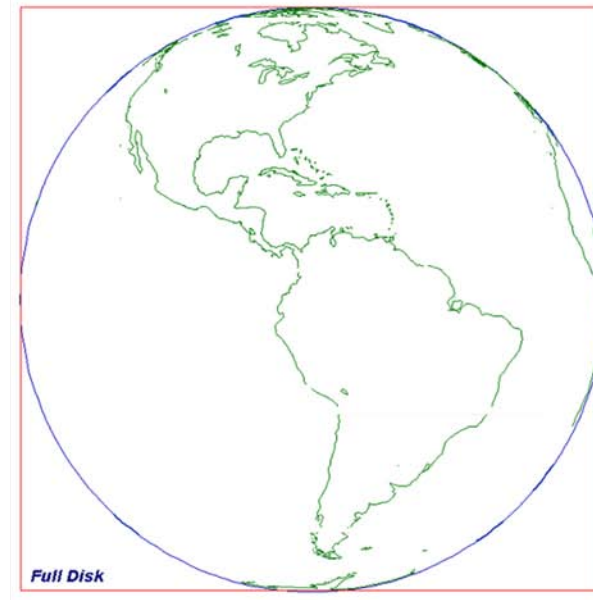
GOES-West Sector Sub-Domains

GOES-East Full Disk Scan Domain

- Coverage Domain -180°W to -20°W Longitude and -50°S to 75°N Latitude



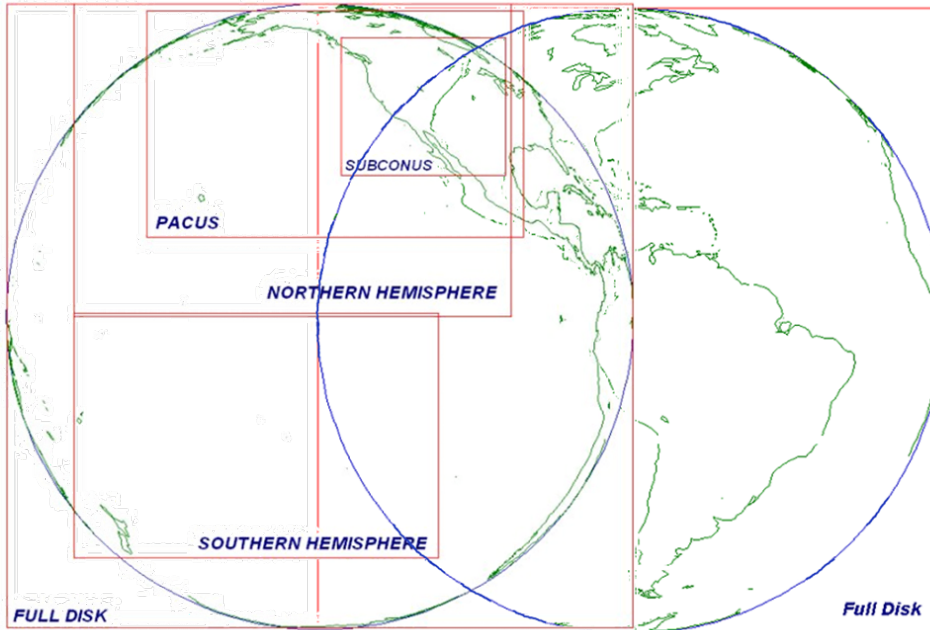
GOES-West
Centered over -135° Longitude



GOES-East
Centered over -75° Longitude



Merged Satellite Mosaic

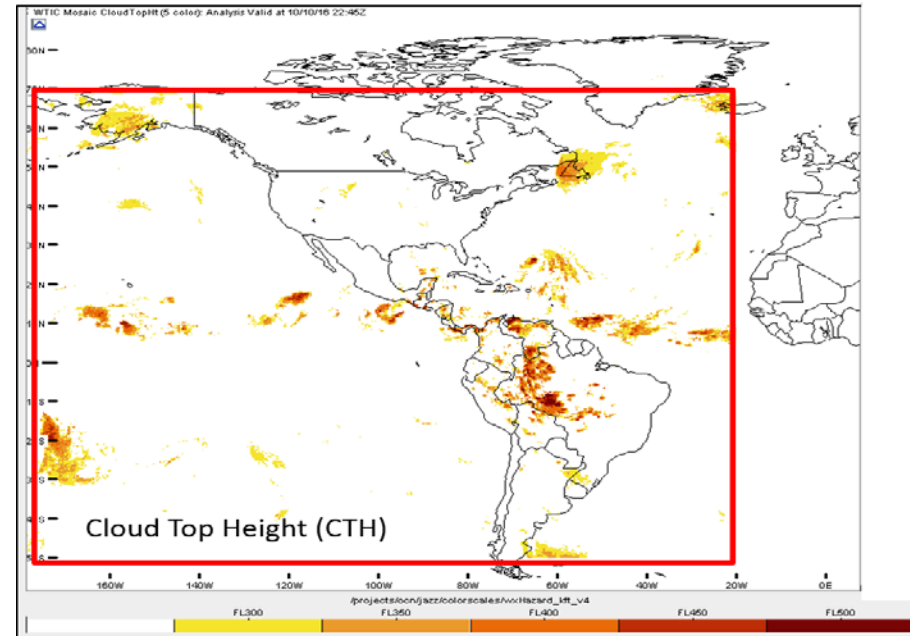


0115 UTC Example	GOES-West		GOES-East	
	Start Time	End Time	Start Time	End Time
Sub-CONUS (Filled by North Hemi. Sector)	01:00:00	01:02:14	No Scan	
CONUS	No Scan		Not Used	
PACUS (Filled by North Hemisphere Sector)	01:00:00	01:06:29	No Scan	
Northern Hemisphere	01:00:00	01:10:05		
Southern Hemisphere	00:52:00	00:58:54		
Full Disk	00:00:00	00:26:00	00:45:42	00:55:42
1 hr Fulldisk Extrapolation	Not Used		No Scan	
2 hr Fulldisk Extrapolation	Not Used		No Scan	



Cloud Top Height (CTH) Algorithm

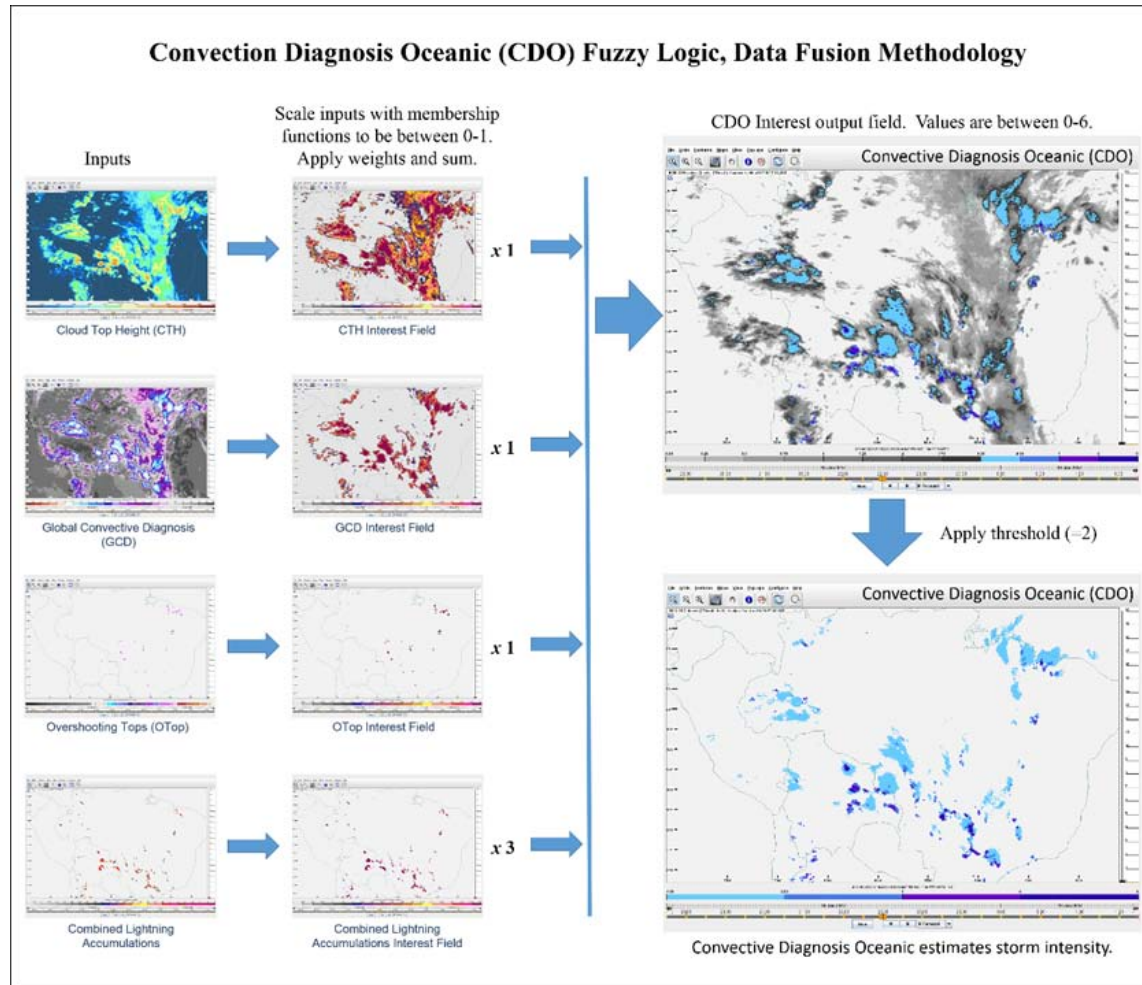
- **Converts satellite infrared brightness temperature (BT) from 11 micron channel to flight altitude**
- **BT compared to atmospheric temperature of Global Forecast System numerical model for matching temperature**
- **Using standard atmosphere equation, pressure converted to flight level**



CTH; Miller et al. 2005, Donovan et al. 2008



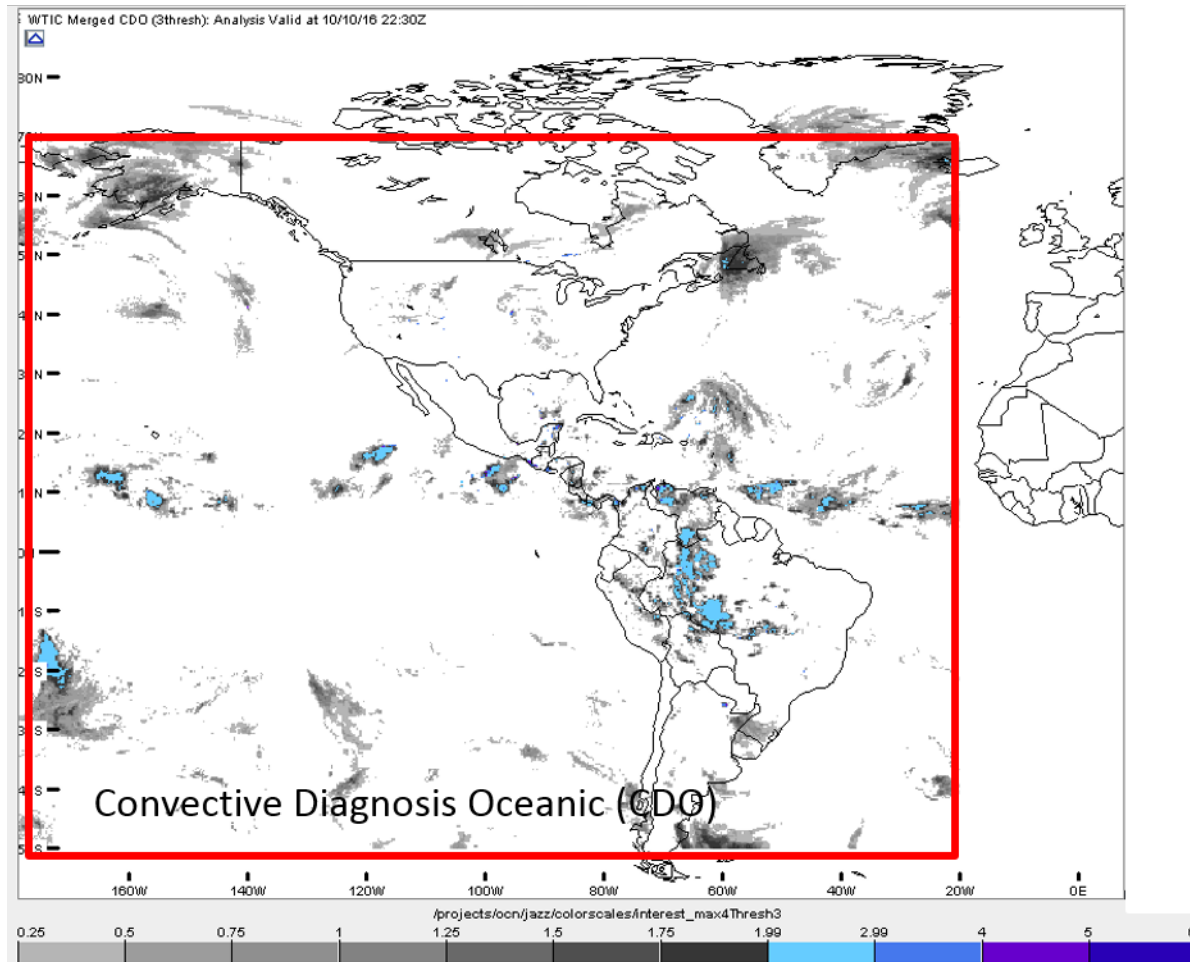
Convective Diagnosis Oceanic (CDO) Algorithm



Kessinger et al. 2017; Donovan et al. 2009

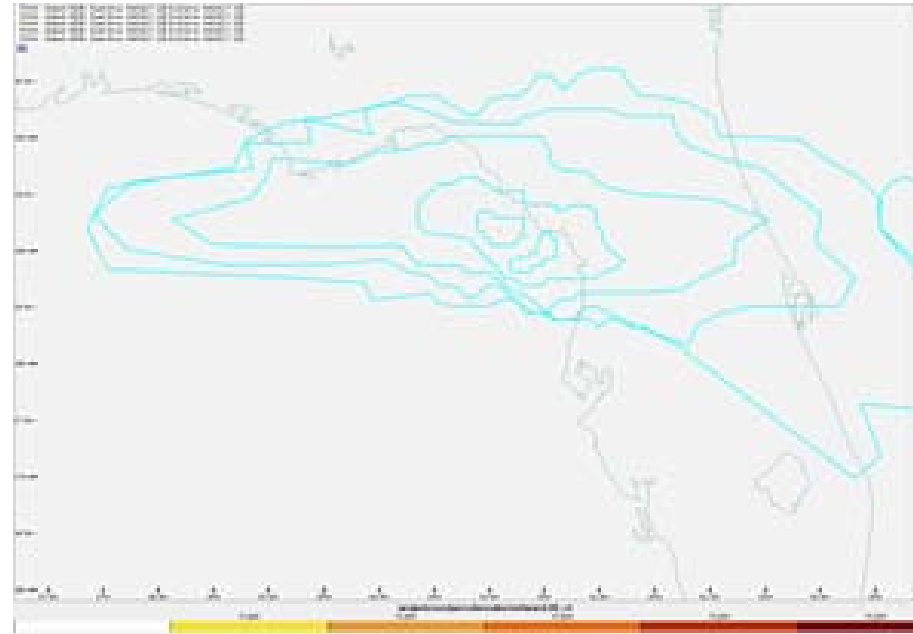


CDO Over ROMIO Domain



CTH Polygon Creation to Define Storm Features

- **Uplinking convective weather products into flight deck requires reduction in file size to reduce bandwidth**
- **Thunderstorm Initiation, Tracking, Analysis and Nowcasting algorithm***
- **Contours are created for altitudes between FL320-FL400 at 2,000 foot intervals**

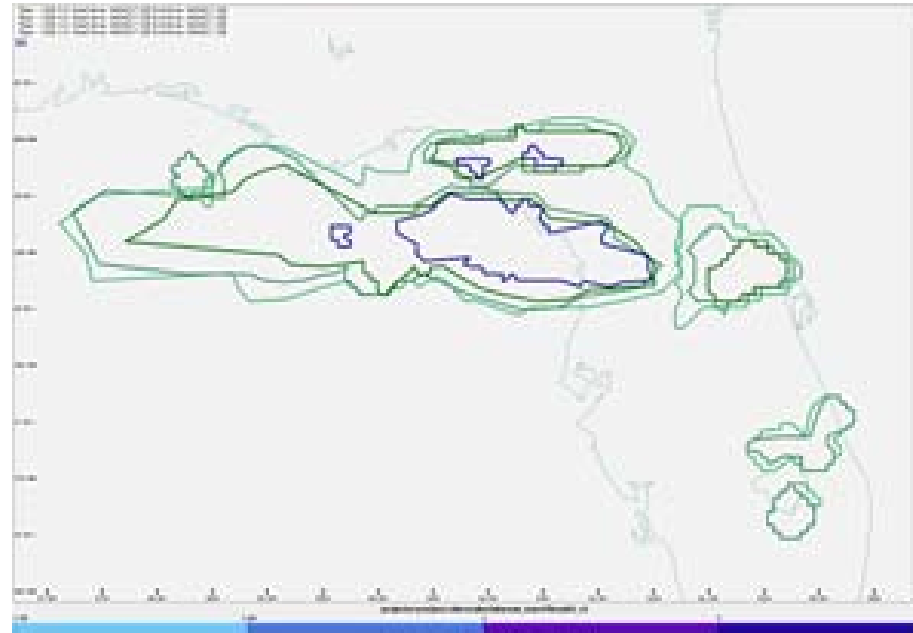


*Dixon, M.J., and G.M. Wiener, 1993



CDO Polygon Creation to Define Storm Features

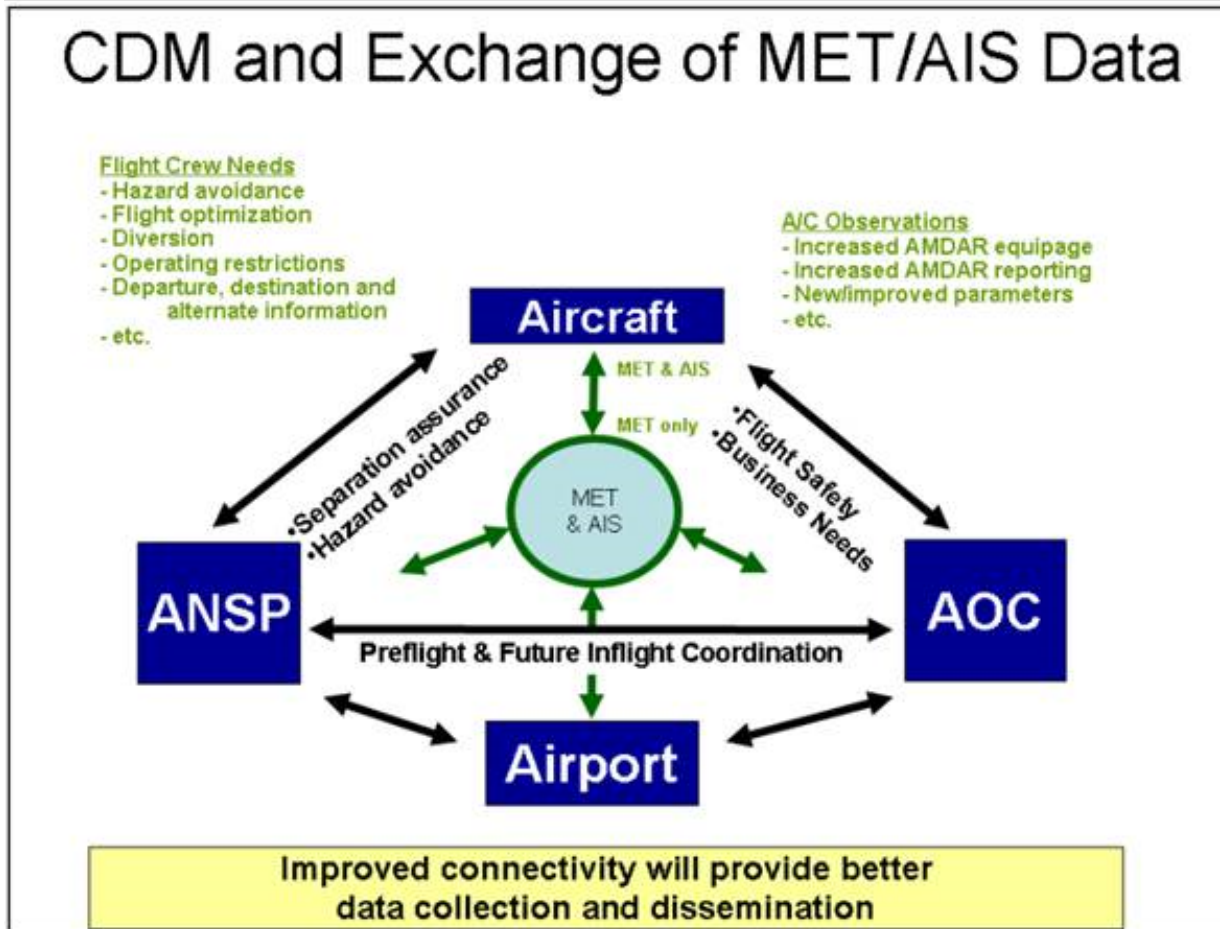
- Values are contoured for integers between 2-5
- Polygons are converted to eXtensible Markup Language (XML) format for transmission via Web Feature Service



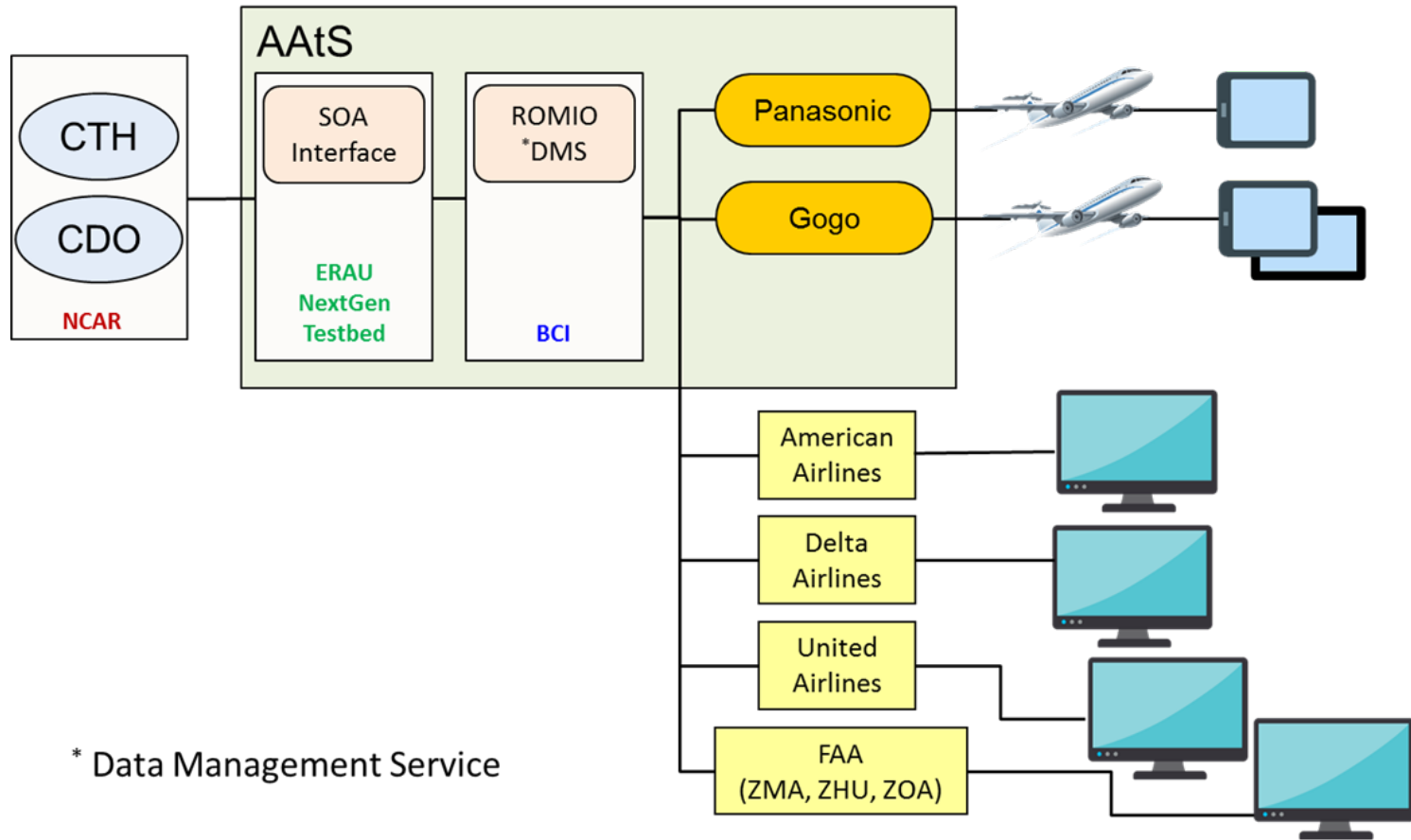
Missing Data Polygons



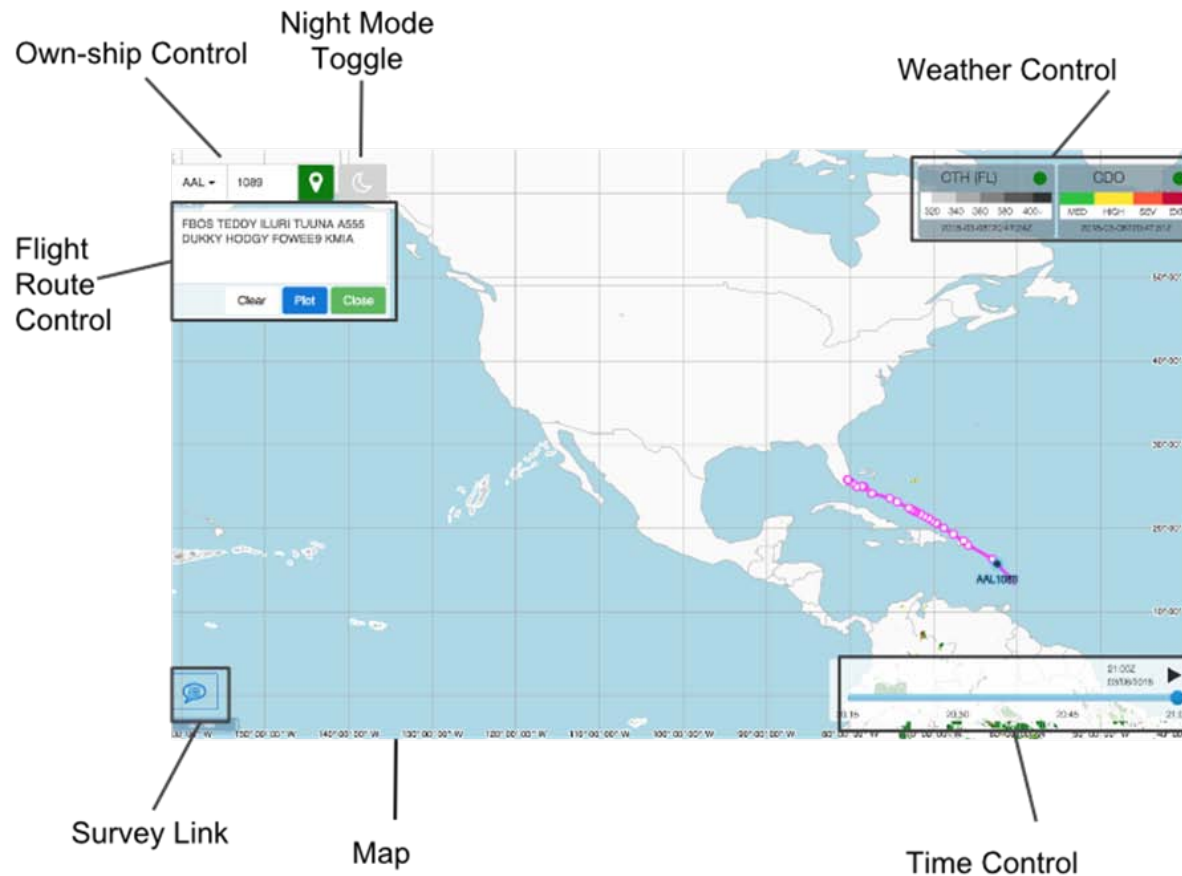
DO-340 – Collaborative Decision Making



ROMIO Demonstration System



ROMIO Viewer



CDO / CTH Legends



CTH

CDO



FL 320



FL 340



FL 360



FL 380



FL 400+



Medium



High



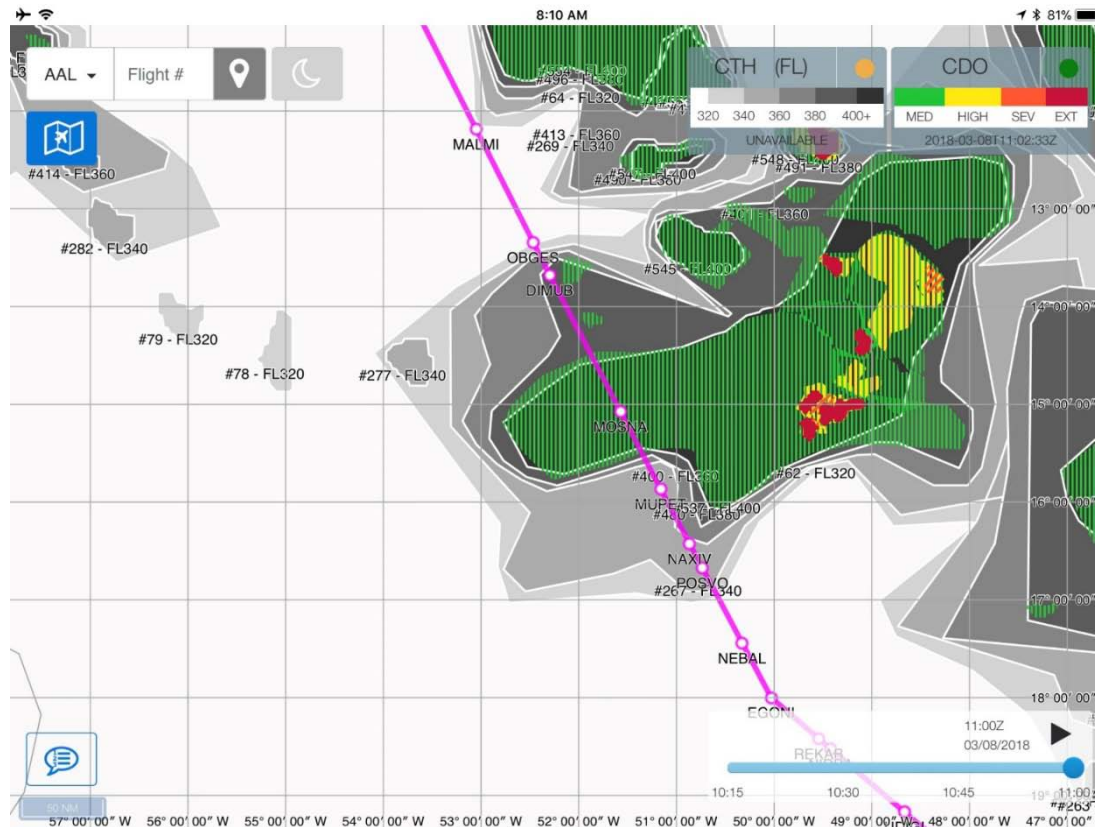
Severe



Extreme



ROMIO Product, UAL 845-7, Chicago – Sao Paulo 3-7/8



“Although CDO displayed medium convection, we didn’t encounter any storms that required deviation. However, the information was useful, as we did encounter light turbulence throughout the area depicted as having moderate convection. The CDO product allowed me to pre-brief our flight attendants to plan on being seated while we were in this area, and it worked very well for this purpose. The CTH product seemed to be displaying tops accurately.”



Questions ?



Thank You

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