



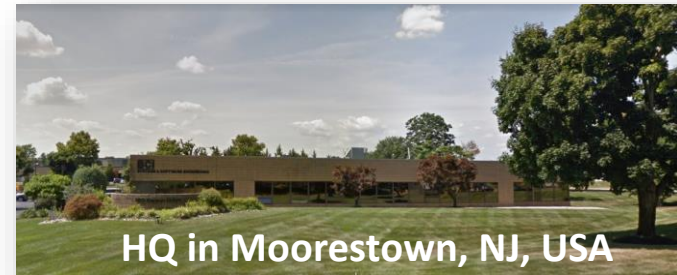
BASIC COMMERCE & INDUSTRIES (BCI), INC
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General Introduction and Availability of Global Cloud
Top and Convective Weather
May 24th 2022

Corporate Background

Founded in 1981
~200 Employees
Over \$27M annual revenues



Technical Expertise

Research & Analysis

FAA Aviation Weather Research Programs
Meteorological Data Analysis
Mobile Application Development
Quality Management System (QMS)
Information Security
Flexible Terminal Sensor Network (FTSN)
Data Link

System Engineering & Test Support

Common Support Services Weather (CSS-Wx)
NAS Information Display System (NIDS)
Weather Technology in the Cockpit (WTIC)
NextGen Weather Processor (NWP)
Mobile application development
System Wide Information Management (SWIM)
Controller Pilot Data Link Communications

Software Development Commercial & Government Services

Tower Data Link Services (TDLS) – FAA
Electronic Flight Bag (EFB) applications – FAA and commercial
EFB applications – Delta Air Lines/Lufthansa Airlines/Apple appstore



**Federal Aviation
Administration**

Partners & Customers



Lufthansa



LOON™



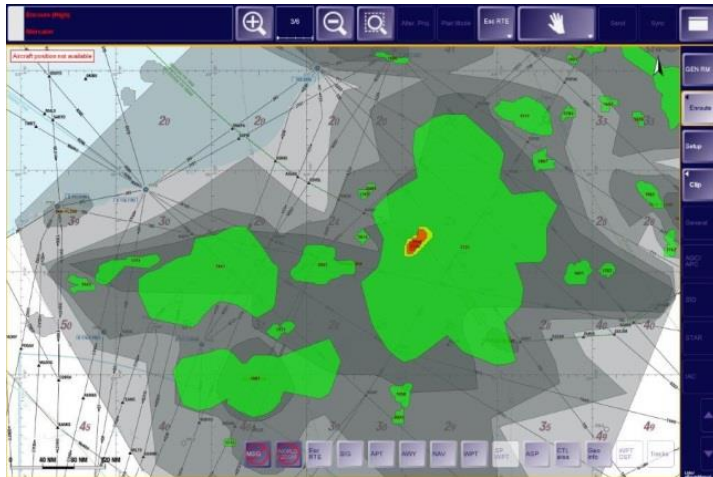
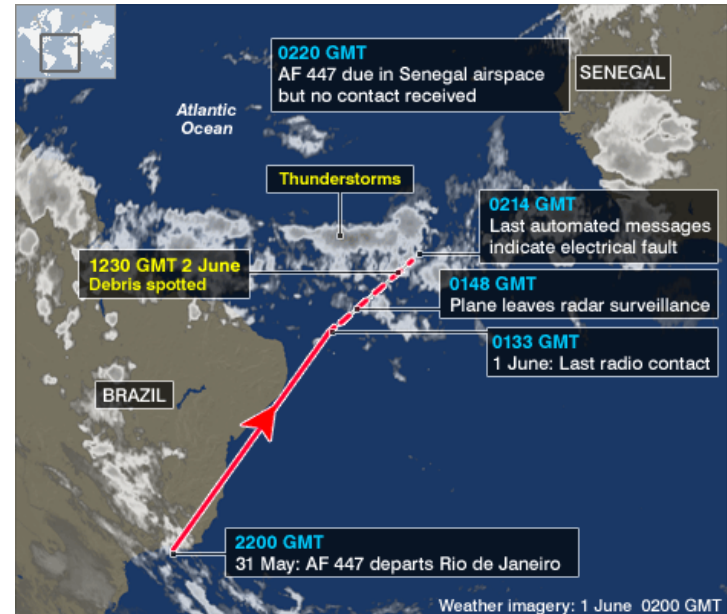
Lufthansa Systems



Oceanic Weather Data/Product History

Product Shortfall Solution Search

- 1990 - Initial FAA/NCAR oceanic weather research to produce meteorological products utilizing Satellites
- 2006 – NASA/ FAA sponsored MetEval with United Airlines
 - Positive results and feedback
 - Shelved due to bandwidth limitations
- 2009 - Air France Flight 447 incident
 - Investigate benefits of remote oceanic weather for commercial airlines



Lufthansa Airlines initiates Global Wx Hazard program

- 2012 ~ 2014 - Lufthansa Airlines contracts BCI
 - Leverage FAA/NCAR oceanic weather research
 - Expanded data coverage to worldwide
 - Weather data optimization
 - Meteorological acceptance trials with airline and German Weather Service
 - Approval to integrate non-government weather into Flight Chart Software

BCI CTH/CDO Timeline transition to Global Operational Status

Global Wx Hazards

Lufthansa Airlines initiates contract with **BCI/NCAR** for implementing flight trial of CTH/CDO. Limited to non-operations status limited to US coverage

2012

2014

2015

2016

2018

2020

2021

2022

Contract Award

Lufthansa Airlines issues contract to BCI/NCAR to implement/maintain CTH/CDO with **Global Coverage** under an Operational **24/7/365** basis

Product Review

The DWD issued a temporary authorization of use. Limited to Lufthansa Front-line check pilot. Approximately 30 aircraft

Expanded Use

The German Air Force began using the CTH/CDO products across all large body aircraft. This added to the likelihood of DWD approval. The FAA WTIC PO also initiated the early stages of ROMIO

Product Acceptance

BCI/NCAR Lufthansa Airline grows to include Lufthansa Systems since the DWD issued full approval of the CTH/CDO products. ROMIO commenced test flights with 3 domestic airlines limited to business day service/US Coverage

MILESTONE

Lufthansa Systems included the CTH/CDO products to several airlines in addition to Lufthansa. ROMIO concluded flight trials

Expanded Products

In response to customer requests/feedback, BCI contracted with NCAR to build complimenting forecast products. These products are used by clients across difference displays and capacities.

Today

BCI continues to offer the CTH/CDO data with latest satellite inputs on a 10 minute update on CTH and 2 minutes update on CDO. Other products continue to be supported

BCI Operational Product Overview

Operation Global Cloud Top and Convective Products Flexible Delivery

- BCI established a backend system and network co-located at a meteorological data center. BCI purchased and owns their own racks and systems, benefits from critical power plus backup services on data, power and communications. Since BCI developed and implemented 100% of the backend and client facing systems, we can customize to client's individual needs.
- BCI maintains the contract/license with NCAR for algorithm performance enhancements and complimenting product development.
- Lufthansa utilizes data delivery across various networks
 - Lufthansa's original mechanism was DataLink before WIFI migration
 - Lufthansa continues to ingest "vector" data
- Other Users receive tailored products
 - Multiple Users receive the Global Sat/IR product
 - Google Loon contracted BCI to develop a 50K to 75K product
 - Google Loon contracted BCI to develop complimenting CTH/CDO forecast products
 - Clients with TBO requested special products with specific thresholds and blended data



BCI Operational Weather Data Provisions

Global Cloud Top and Convective Product Implementation

- Contracted to Lufthansa Airlines to provide:
 - Global Cloud Top Height and Motion Vectors
 - Global Convective Diagnosis for Oceanic Areas and Motion Vectors
 - Global SIGMET, AIRMET and VAAC
- Hosted Operational service for Lufthansa and Subsidiary Airlines
 - Service utilizes licensed NCAR Algorithms
- Maintains contract with NCAR
 - Algorithm performance enhancement
 - Future product development
- Incorporate User Feedback
 - Product maintenance and upgrade
 - Weekly interactions with customers and stakeholders

BCI Product Enhancements and Sustainability

BCI added satellites for global coverage as well as for backup services

- Originally deployed with GOES E/W, MSG3, MeteoSat 7, and COMS in 2015
 - Added/Migrated to GOES R, Himawari, MeteoSat 10, MeteoSat 11, FY
 - Added Global Lighting from multiple vendors and Satellite resources
 - BCI worked with NCAR to provide “No Coverage” areas
 - BCI optimized the polygon processing to minimize bandwidth utilization
- Introduced new data product “No Coverage”
- Implement additional quality control on NCAR produced vector products
- Additional tuning of CDO levels
- Customer tailored Products:
 - Additional cloud top level from 50K to 75K for Google Loon
 - Additional cloud top forecast products for Google Loon
 - Increase cloud top height vertical resolution from 5k to 2k
 - Custom CTH/CDO blended products for Trajectory Based Operation clients
 - Custom raster format for Sheorey Digital Systems



Enterprise Service

- Data Center
 - Co-located at meteorological data center w/ BCI owned hardware
 - Critical power, data and communication backup
 - Reduce latency of raw data feeds
 - Duplicated systems for failover redundancy
- Data Distribution
 - Leveraging commercial cloud infrastructure
 - Web Feature Service (WFS)
 - Web Mapping Service (WMS)
 - Local Data Manager (LDM)
 - FTP
- Data Format
 - IWXXM
 - GeoJSON
 - NetCDF
 - PNG

BCI Brings Value-Added CTH/CDO benefits

Experienced

- 7+ years working under NCAR license
- Operationalized and evolving CTH/CDO
- Delivering to EFB and ground products

Operational

- Providing CTH/CDO data now
- Enterprise-grade delivery and monitoring
- Integration capabilities with your systems

Customer-focused

- Customer needs driven
- Airlines/operators should have choices!
- Data agnostic approach

Philosophy

- Strongly believe in the CDO/CTH tech
- Working to bring this tech into operations
- Value-driven, aviation met data provider



Lido eRoute Manual

The screenshot displays the Lido eRoute Manual software interface. At the top, a navigation bar includes the text "Enroute (High) Mercator" in red, followed by a zoom-in icon, a scale bar showing "5/6", a zoom-out icon, a search icon, and buttons for "Alter. Proj.", "Plan Mode", "Esc RTE", a hand icon, "Send", "Sync", and a menu icon. A red-bordered box in the upper left corner of the map area contains the text "Aircraft position not available". The main map area shows a flight route in green and yellow, overlaid on a terrain map with various flight levels (e.g., FL300, FL350, FL400, FL450, FL500) and navigation aids. A scale bar at the bottom left indicates distances of 160 NM, 320 NM, and 480 NM. At the bottom center, there is a row of icons for "MSG", "WO MAP", "Esc RTE", "SIG", "APT", "AWY", "NAV", "WPT", "SP WPT", "ASP", "CTL area", "Geo Info", and "WPT DEF". On the right side, a vertical menu contains buttons for "GEN RM", "Enroute", "Setup", "Clip", "General", "AGC/APC", "SID", "STAR", "IAC", and a scroll bar. At the bottom right, the text "Lido/eRouteManual" is visible.

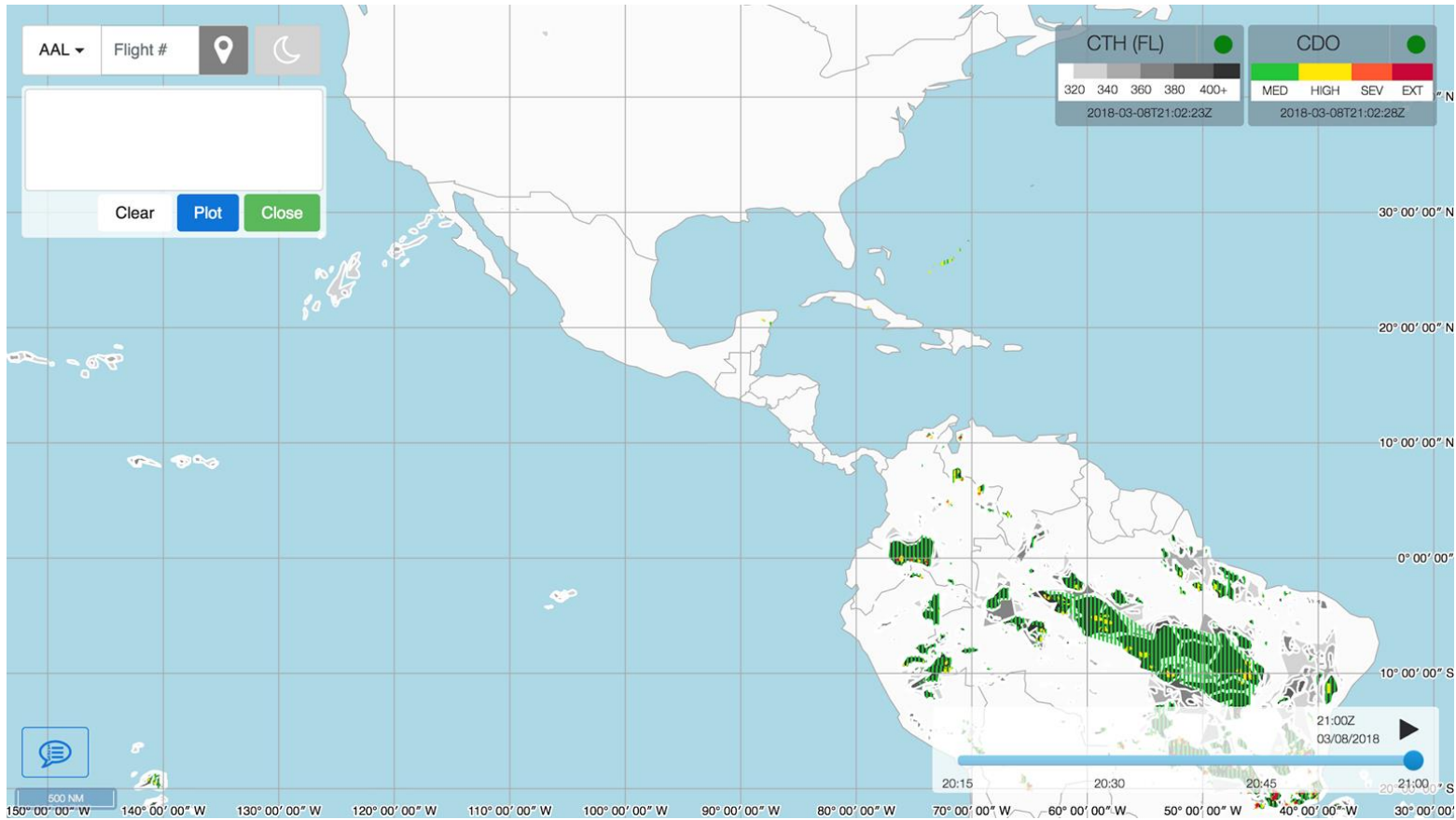
Lido eRoute Manual

The screenshot displays the Lido eRoute software interface. At the top, the title "Enroute (High)" is shown above the "Lambert North" projection. The main map area shows a complex network of flight routes with various waypoints and distances. A "Weather Areas" panel is overlaid on the right side of the map, providing details for several weather-related features:

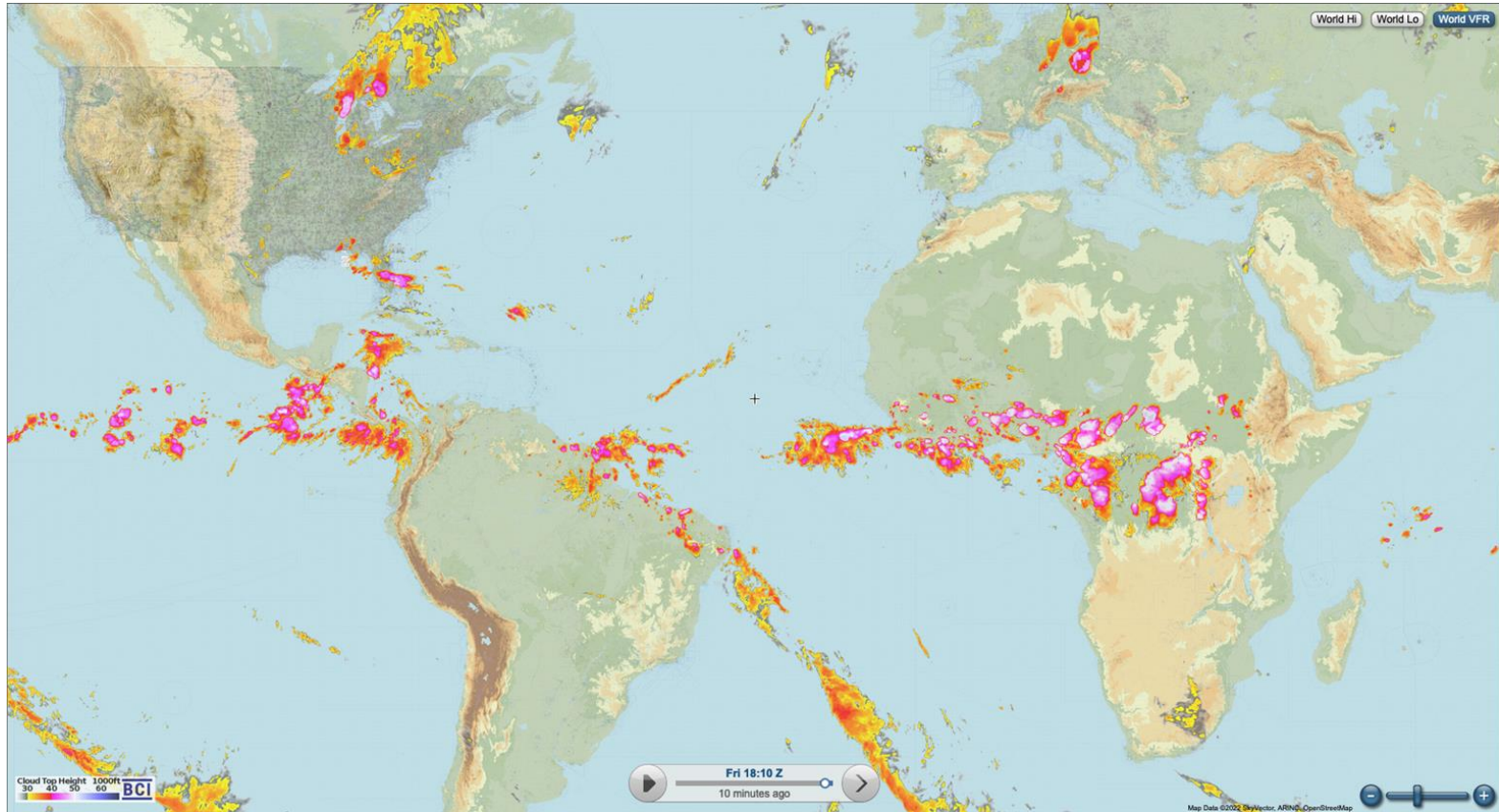
- Data unavailable:** A toggle switch is currently turned off.
- User polygons:** A toggle switch is currently turned off.
- Cloud Top Height:** A toggle switch is turned on. The observation time is 22May 16:50Z and the expiration time is 22May 17:25Z.
- Convection:** A toggle switch is turned on. The observation time is 22May 16:55Z and the expiration time is 22May 17:30Z.
- SIGMETs:** A toggle switch is turned on. The issue time is 22May 16:55Z and the expiration time is 22May 22:34Z.

At the bottom of the interface, there is a toolbar with several icons: LBL, MSG, WX, ZOOM, APT, AWY, NAV AID, WPT, SPEC WPT, ASP, CTL, and MGA. The MSG icon is highlighted in yellow.

FAA ROMIO

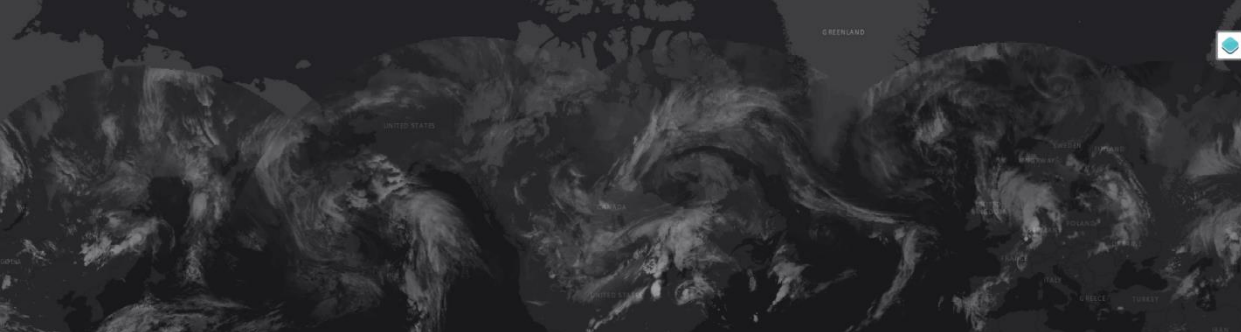


Skyvector

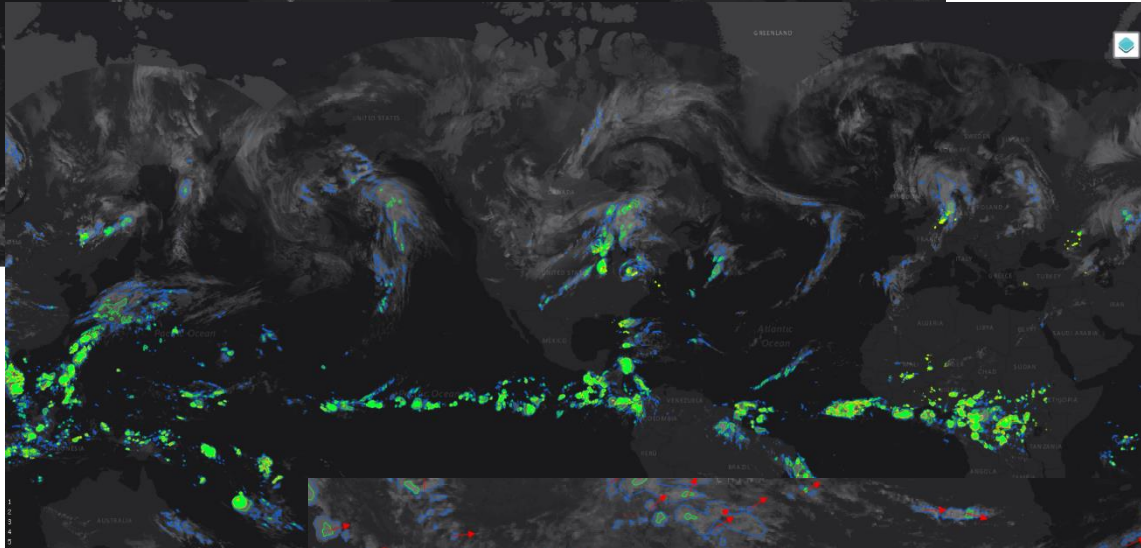


<https://skyvector.com/>

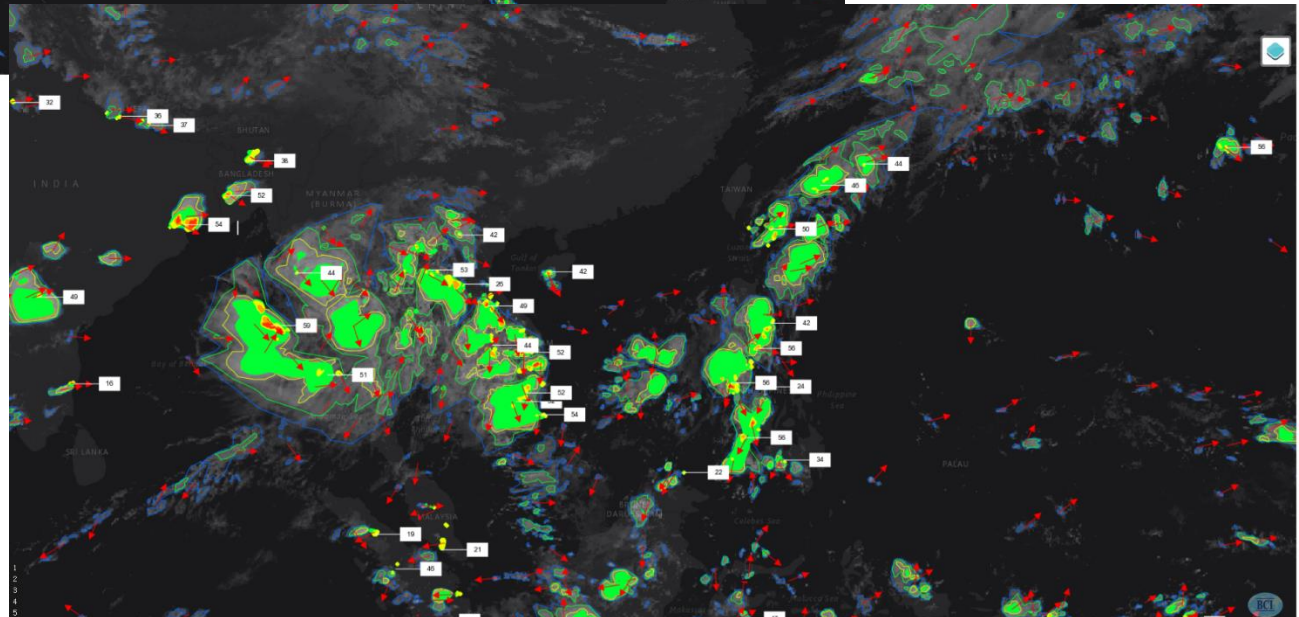
Go to Layers; Select SAT IR4 or Cloud Tops Heights



0714 30 00Z
CDO
2022-05-20T14:40:00Z



0714 40 00Z
CDO
2022-05-20T14:40:00Z



CDO CCHT MV CDO MV Max Ht RADAR

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