NATIONAL AVIATION METEOROLOGISTS

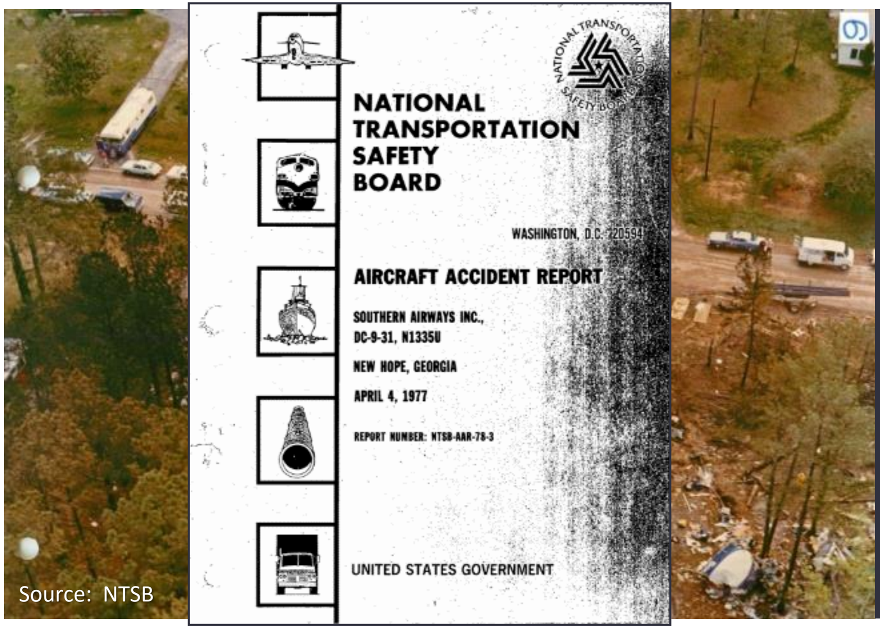
Air Traffic Control System Command Center

Impact-Based Decision Support Services for the National Airspace System

February 26, 2020

David G. Bieger
Meteorologist-in-Charge
National Aviation Meteorologists

Why We Are Here



Southern Airways Flight 242 crash in New Hope, GA on April 4, 1977…72 souls lost

Total loss of thrust from both engines due to damage from ingest of water/hail while penetrating an area of severe thunderstorms

NTSB recommendation A-77-068 to formulate procedures for the timely dissemination of all available severe weather information by controllers

"…limitations in the Federal Aviation Administration's air traffic control system which precluded the timely dissemination of real-time hazardous weather information to the flight crew." – NTSB-AAR-78-3, Jan 1978

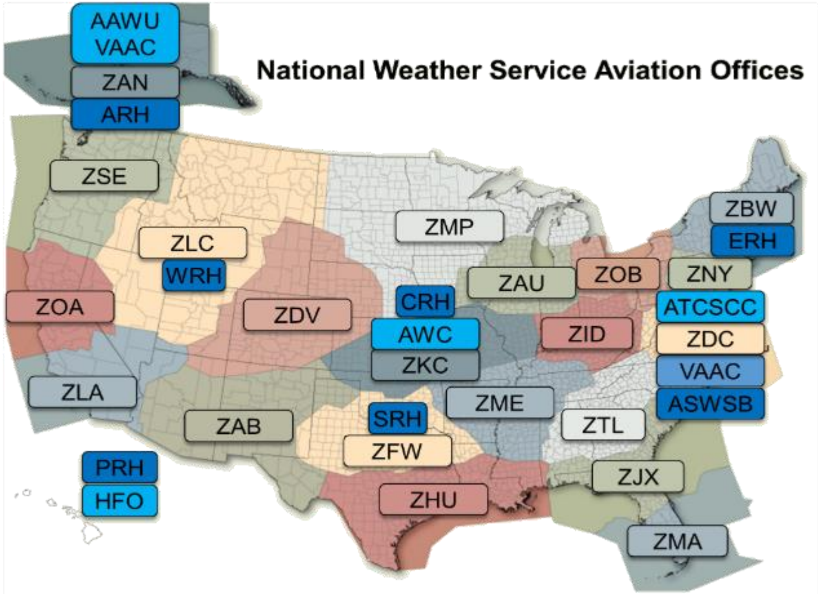
NOAA/NWS Aviation Program

MWO

VAAC

CWSU

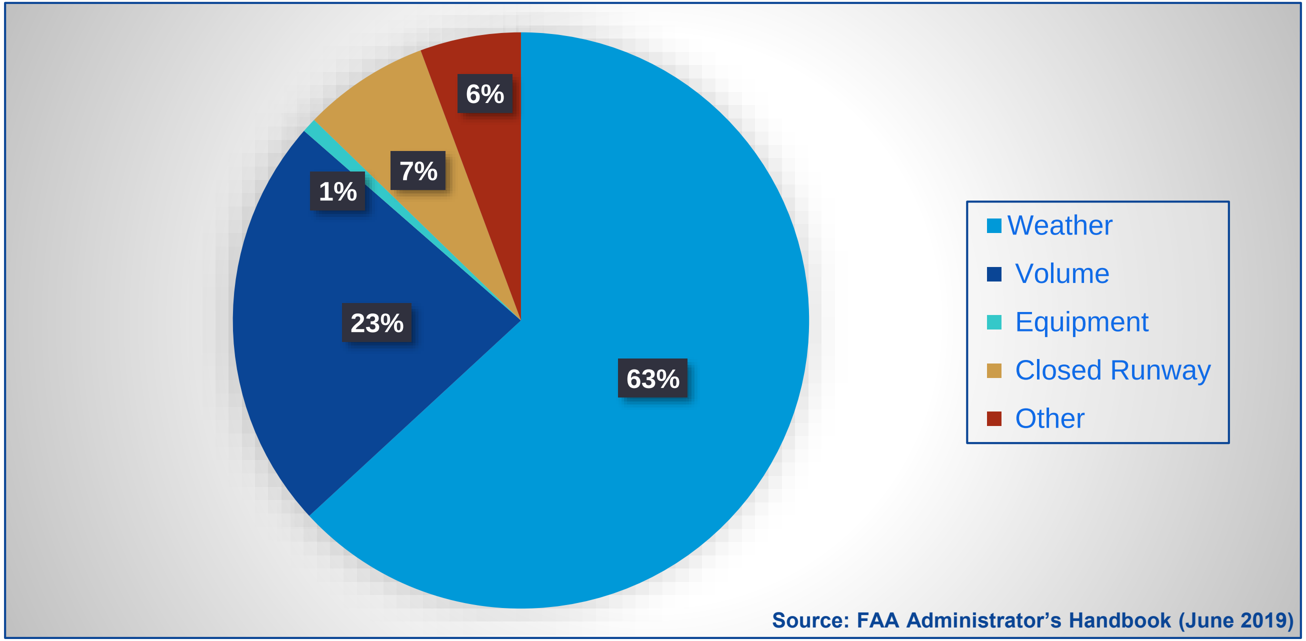
WFO



NWS Meteorologists provide embedded Impact-Based Decision Support Services at the ATCSCC as well as the 21 ARTCCs

Causes of National Airspace System Delays

Oct 2012 through Sep 2018



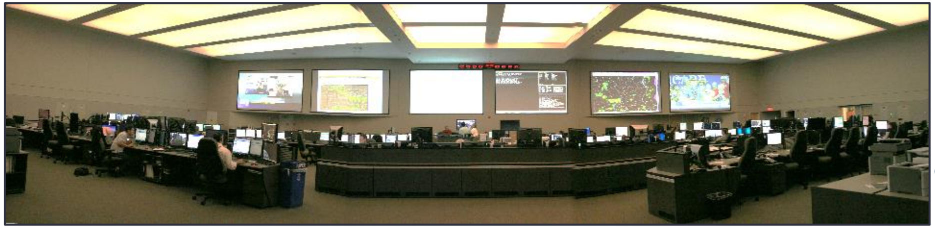
63% of delays in the NAS are attributed to weather, resulting in aviation industry losses in excess of $20,000,000,000 annually.

NWS Support to ATCSCC

Improve safety, efficiency, and decision making for the National Airspace System

Support Collaborative Decision Making

Balance air traffic demand with system capacity



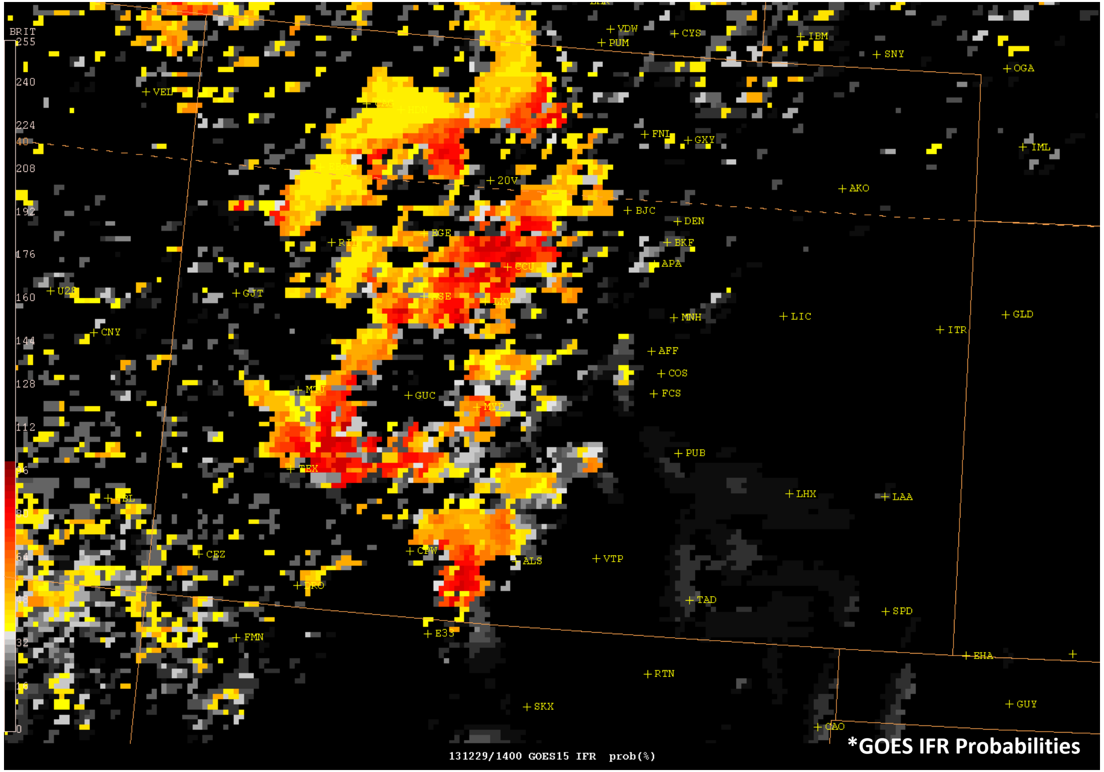
Decision support at the ATCSCC

Fully Integrated and Embedded IDSS

Focus on greatest NAS weather impacts

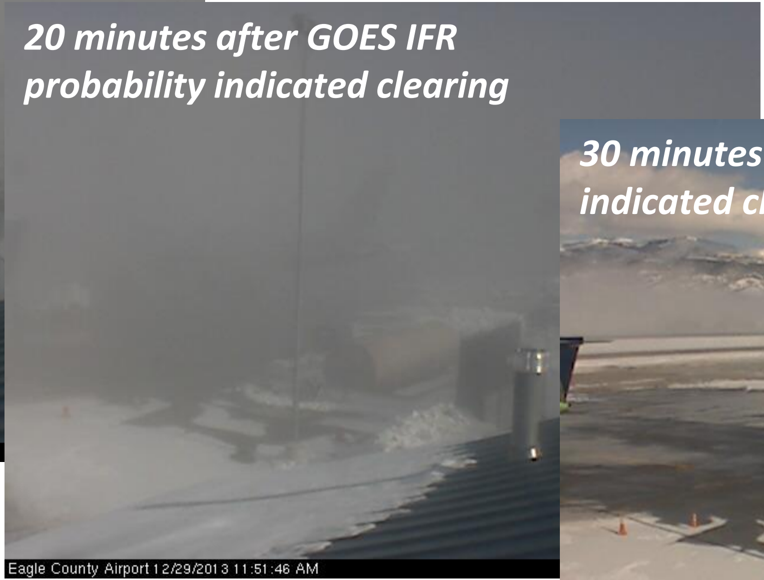
Our goal is to paint a cohesive national weather picture to the Command Center to improve safety, efficiency, and decision making.

Eagle (EGE) Fog Event 12/29/13



Source: Eckert, 2015

Eagle (EGE) Fog Event 12/29/13



Source: Eckert, 2015

Eagle (EGE) Fog Event 12/29/13

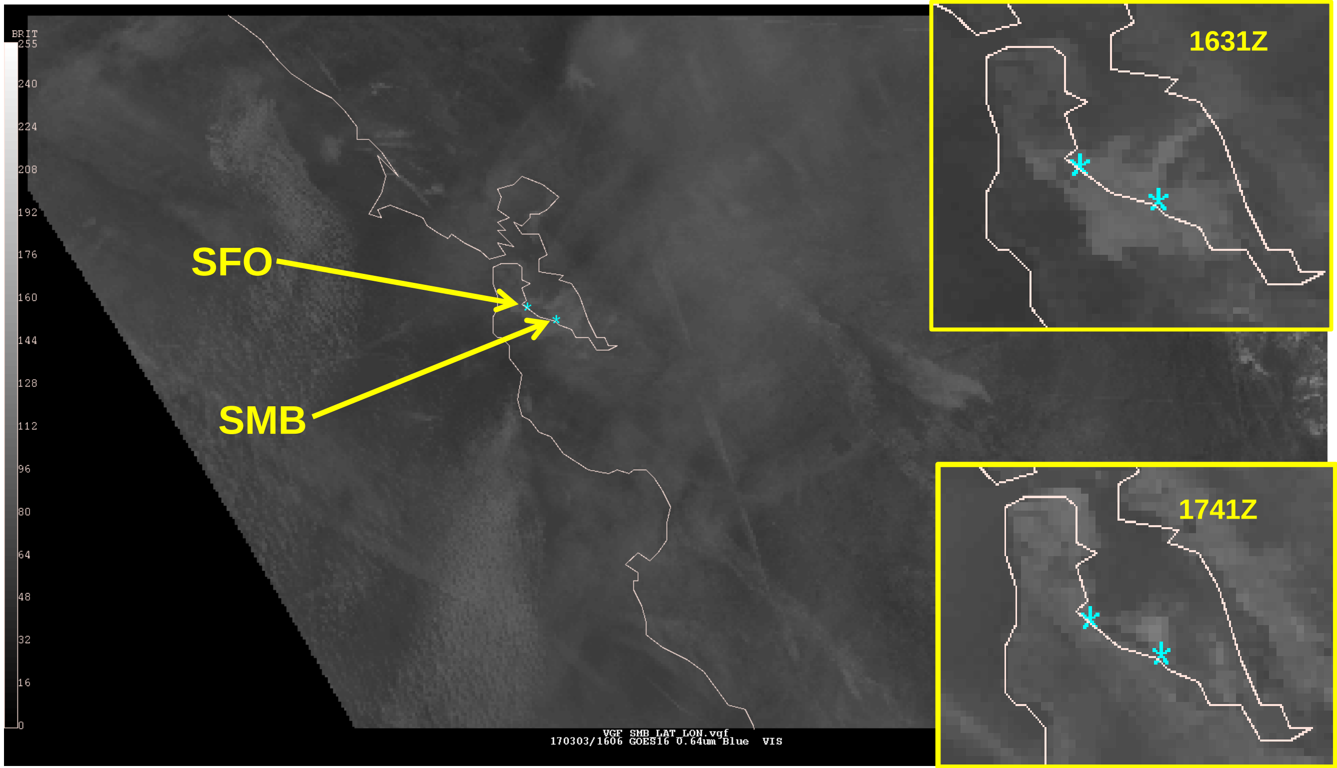
KEGE 291450Z 00000KT 1/4SM FZFG OVC002 M11/M11 A3022
KEGE 291550Z 00000KT 1/2SM FZFG OVC002 M09/M10 A3024
KEGE 291650Z 00000KT 1/2SM FZFG OVC003 M07/M08 A3025
KEGE 291750Z 00000KT 1/4SM FZFG OVC002 M04/M05 A3025
KEGE 291859Z 00000KT 10SM FEW030 M01/M03 A3021 RMK VIS E 3/4 FG BANK E

- NAM monitored GOES probability of IFR conditions and coordinated with ZDV CWSU throughout the event due to increased holiday volume into "Ski Country"
- Once GOES lost the "one pixel" of 70% probability over EGE, the NAM notified the ATCSCC terminal specialist, their supervisor, and ZDV that clearing was imminent
- Normal flight operations resumed ~60 min ahead of schedule, thereby saving both time and money for the airlines and their customers

Delay cost → $76.00/min × 60 min × 50 aircraft = $228,000 savings

Source: Eckert, 2015

San Francisco (SFO) Stratus Event 3/3/17



Source: Eckert, 2017

San Francisco (SFO) Stratus Event 3/3/17

1600Z – Patch of stratus formed over SFO & SMB resulting in a Ground Delay Program (1700Z-1959Z)
1700Z – GOES-16 loop shows edges of stratus starting to erode
1715Z – GOES-15 loop shows edges of stratus starting to erode
1719Z – NAM notifies ZOA CWSU & ATCSCC Specialists that stratus is clearing rapidly
1730Z – GOES-16 loop shows stratus almost clear
1747Z – CWSU ZOA reports pilots are getting visuals into SFO
1756Z – ATCSCC cancels GDP

Original GDP impacted 48 flights @ 38 min average delay per flight
48 x 38 = 1824 minutes of delay x $81.00/min cost = **~$150,000.00 (Total Delay Costs)**

GOES-16 Estimated Savings:

32 flights freed up

32 x 38 = 1216 min of delay recovered x 81.00/min = **~$100,000.00 (Costs recovered)**

GOES-15 Estimated Savings:

16 flights freed up

16 x 38 = 608 min of delay recovered x $81.00/min = **~$50,000.00 (Costs recovered)**

Source: Eckert, 2017

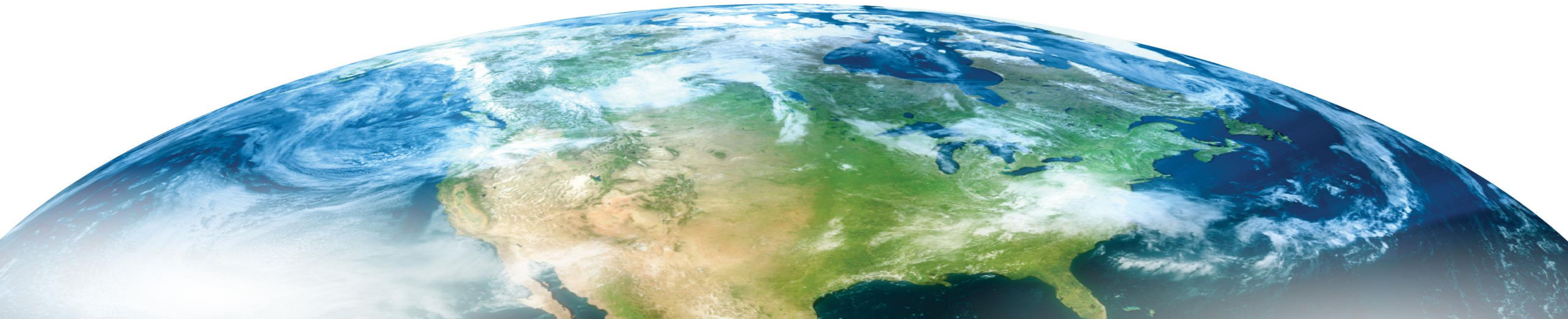
GOES-16…5 min updates & higher resolution –vs– GOES-15…15 min updates & lower resolution
→ Provided NAM with earlier & higher confidence that clearing would hold
→ Imparting this information to the FAA resulted in earlier Ground Delay Program cancellation

Questions?

Weather Satellite Data in FAA Research

Randy Bass
Manager, Weather Research Branch
Aviation Weather Division
NextGen Organization
Federal Aviation Administration

26 February 2020



FAA Weather Research Background

- The FAA's Aviation Weather Division (AWD) manages the weather research portfolio toward new concepts/capabilities that reduce the impact of weather in the National Airspace System (NAS)
  - ➢ Assures development and integration of productive weather information into Air Traffic Management (ATM) decisions by pilots, controllers, flight operators, and airport operators
- The Aviation Weather Research Program, under AWD, manages and funds applied research projects to minimize the impact of weather on the NAS
  - ➢ Collaborative, complementary initiatives with National Weather Service to transition new capabilities to meet aviation requirements
  - ➢ Focused projects to help mitigate safety and/or efficiency issues associated with well-documented weather problems
- The Weather Technology in the Cockpit program, also under AWD, conducts research to:
  - ➢ Enhance safety by resolving/reducing adverse-weather safety risks before they result in an accident/incident, including resolution of pilot MET-training shortfalls
  - ➢ Enhance efficiency and increased capacity by improving predictable pilot adverse-weather decision making by establishing cockpit minimum weather standards and services

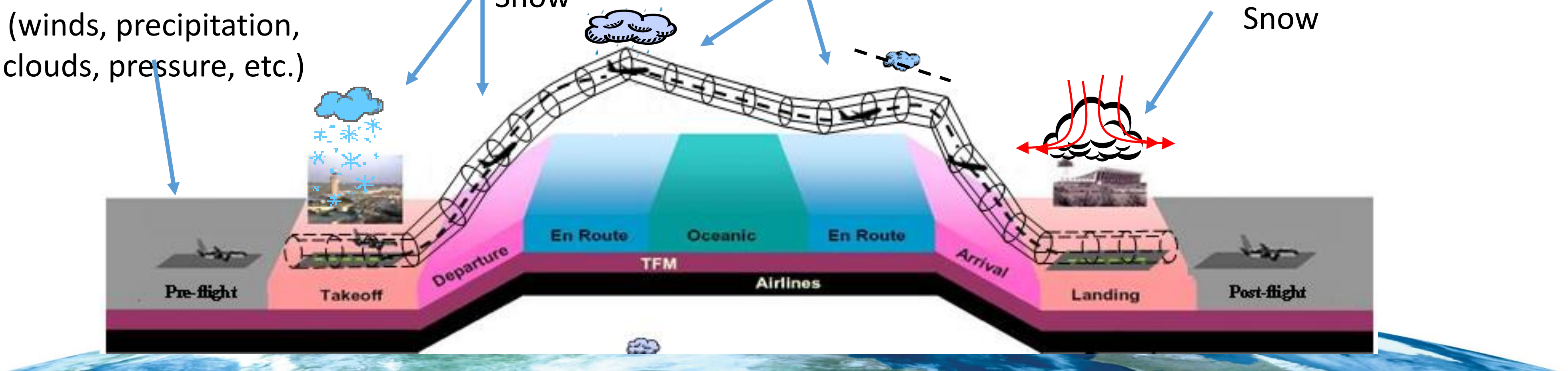
NOAA satellites provide advanced weather information to enable collaborative planning and efficient utilization of airspace routes through the entire flight

Nowcasting,
Convective Initiation,
Hazards,
Numerical Weather
Prediction Forecasts
(winds, precipitation,
clouds, pressure, etc.)

Cloud Classification,
Lightning,
Convective Initiation,
Cloud & Moisture
Imagery,
Low Ceiling &
Visibility
(Aerosols, clouds,
dust),
Overshooting Tops,
Precipitation,
Snow

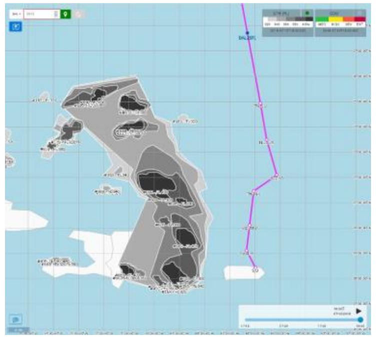
Cloud Classification,
Jet Stream,
Volcanic Ash,
Turbulence,
Icing,
Winds,
Convective Initiation,
Mountain Waves,
Cloud & Moisture
Imagery,
Cloud Top Information

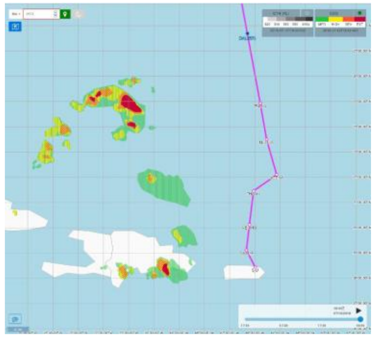
Cloud Classification,
Lightning,
Convective
Initiation,
Low Ceiling &
Visibility,
Overshooting Tops,
Icing,
Precipitation,
Snow



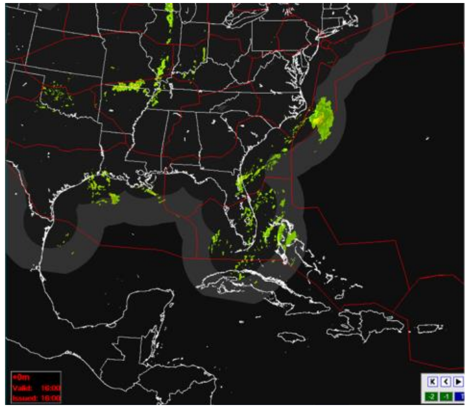
Research Project Examples

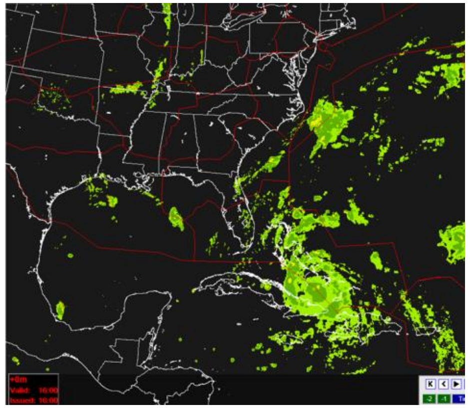
- **Remote Oceanic Meteorology Information Operational (ROMIO) Demonstration**
  - ➢ Operational demonstration to evaluate the feasibility to uplink convective weather information to aircraft operating over the ocean and remote regions
  - ➢ Key satellite inputs:
    - Cloud Top Height
    - Global Convective Diagnosis (WV-IR)
    - GOES-R Overshooting Tops Algorithm
    - GOES-16 and GOES-17 Geostationary Lightning Mapper



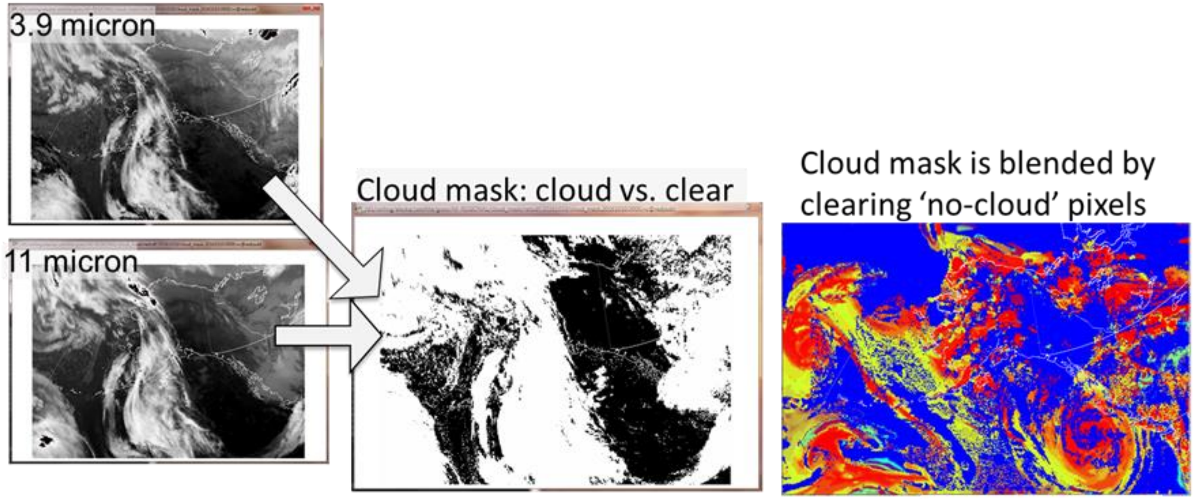


- **Offshore Precipitation Capability**
  - ➢ Provides offshore situational awareness of weather activity beyond the range of current weather radars for Air Traffic Controllers and other aviation users
  - ➢ Blends satellite imagery, lightning data (including GLM) and weather model data using machine learning to produce a near-real-time estimate of precipitation for areas that lack radar coverage

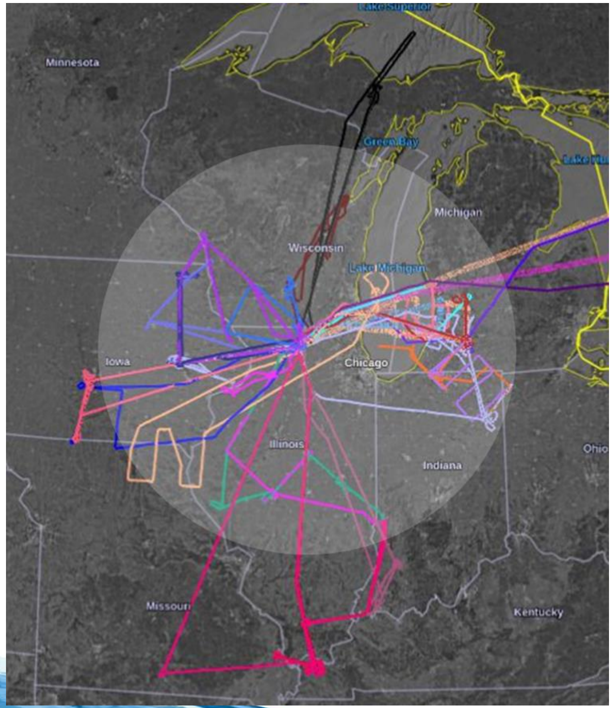




Research Project Examples

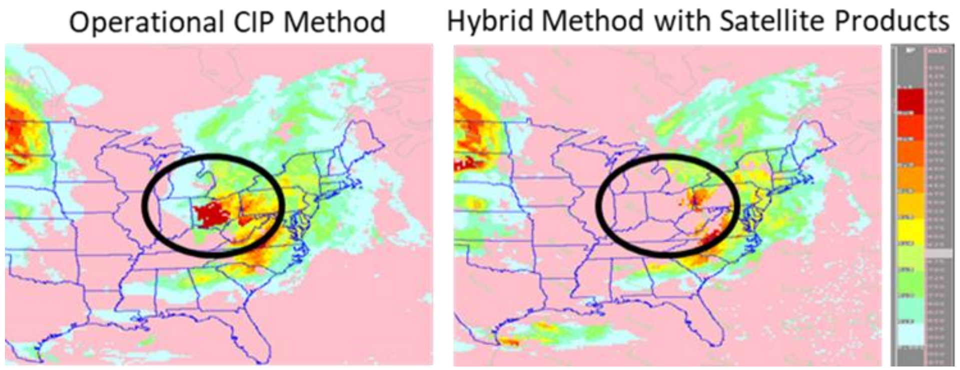


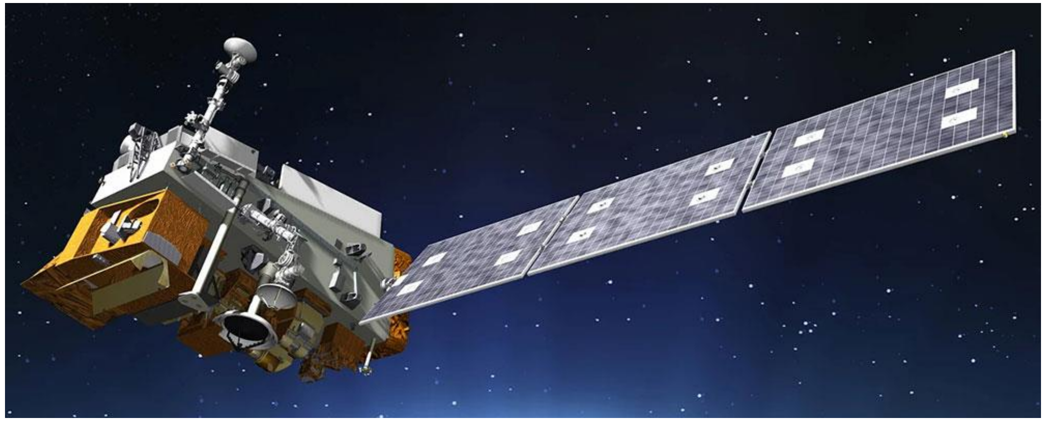
- **Integrate satellite cloud mask in Alaska ceiling and visibility products**
  - ➢ Gridded analysis of ceiling, visibility, and flight category based on model data, surface observations (METARS) and satellite data
  - ➢ Prototype being evaluated by the Alaska Aviation Weather Unit
- **Satellite data used in the In-Cloud ICing and Large-drop Experiment (ICICLE) field campaign**
  - ➢ Data collection program to verify the accuracy of current and developmental products, capabilities, and other icing tools, as well as advance the understanding of cloud microphysical processes
  - ➢ GOES-16 imagery key input to help plan the flight route and altitudes needed to capture the various environments in which supercooled liquid water can exist



Potential Future Projects

- **Turbulence detection and intensity using satellite data**
- **Integrate satellite data into Current Icing Product**
  - ➢ Use satellite radiances to identify the locations and altitude of clouds
  - ➢ Satellite data reduces the volume of air classified as icing
- **Investigate the use of JPSS data in aviation weather research**
  - ➢ CrIS, ATMS and VIIRS
  - ➢ Ceiling and visibility, turbulence, icing, convection
  - ➢ Alaska, CONUS and oceanic
- **Lightning strikes to aircraft**
- **Convective initiation 2-4 hours in advance**
  - ➢ 4 hour requirement: Within 3 miles and 10 minutes





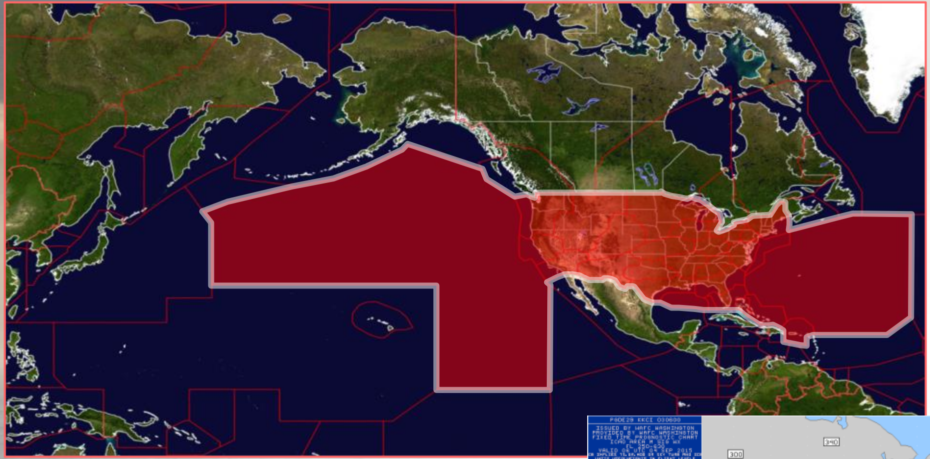
Cloud Research and Satellite R20 at the Aviation Weather Center

Ty Higginbotham
CIRA, CSU, NOAA, NWS, AWC
February 26, 2020

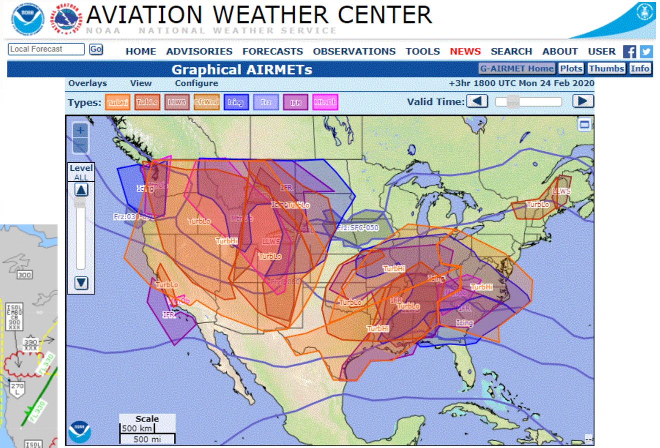
Outline

- Introduction to AWC
- GFA, sky cover research, and cloud layer research
- RGB Operational Use Case
- GLM Operational Use Case
- AWC Forecaster Feedback
- Possible Implementations and Future Research

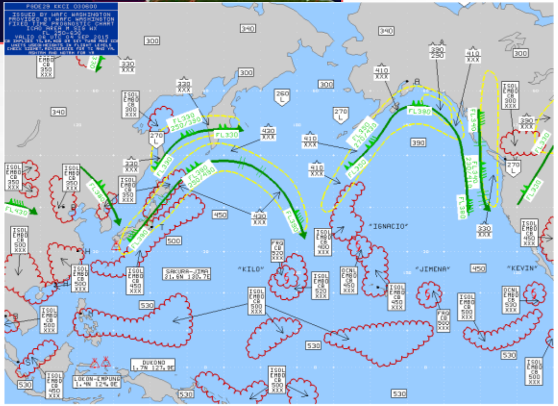
The Aviation Weather Center



One of the nine NWS National Centers

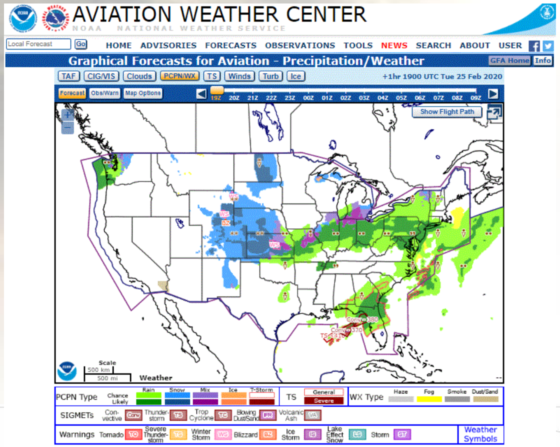


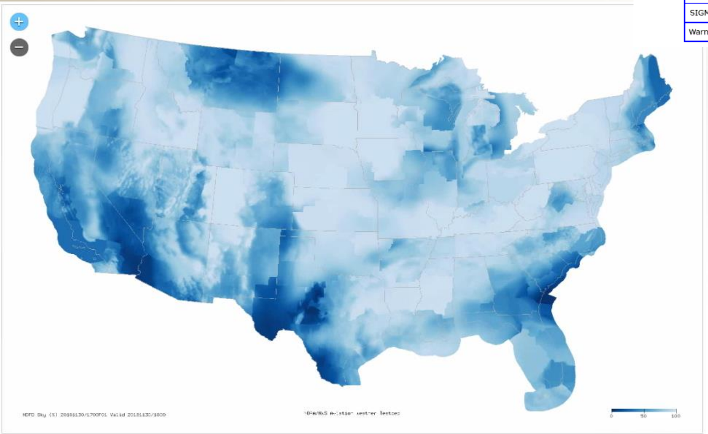
Domestic and International Aviation Forecasts and Warnings



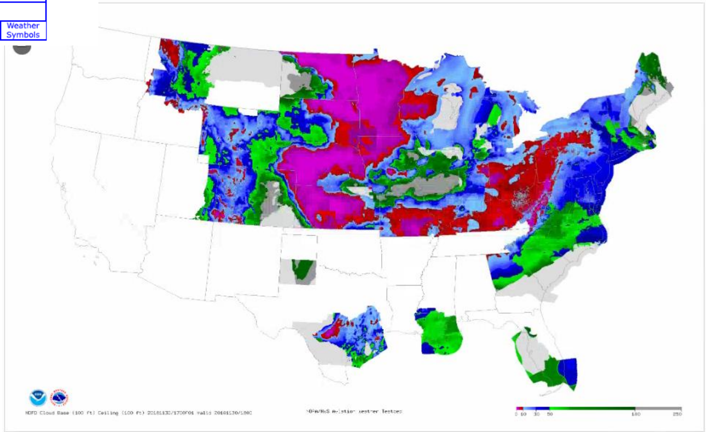
www.AviationWeather.gov

Graphical Forecasts for Aviation (GFA)

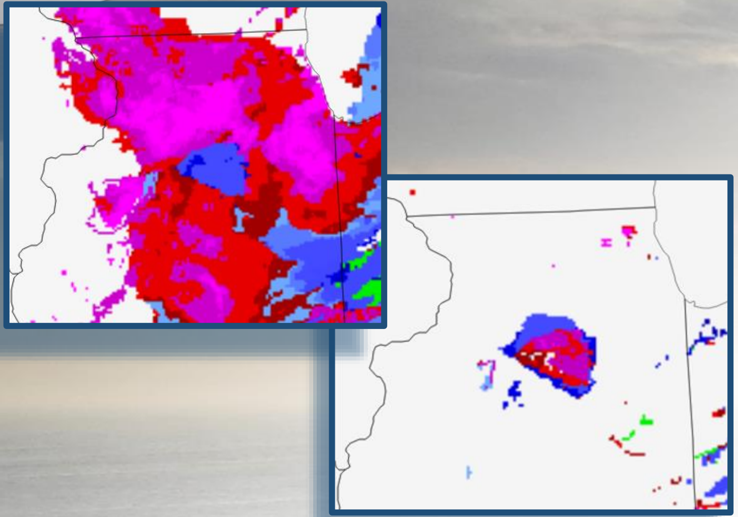


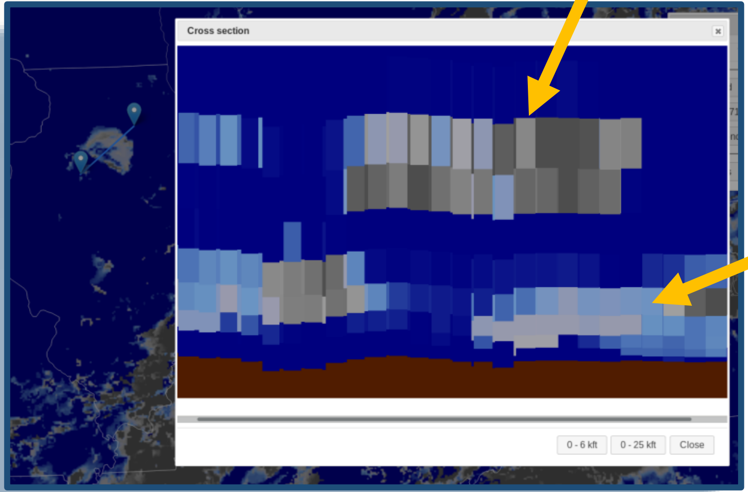


How do we create one common operating picture that meets the needs of all aviation users?



Cloud Coverage and Cloud Layers

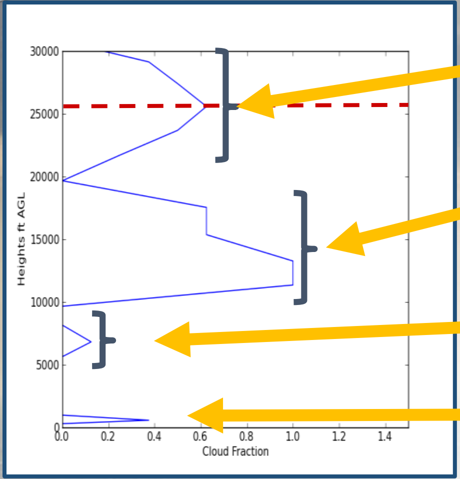




The **Primary layer** with higher cloud base and fractional coverage

The **Secondary layer** with lower cloud base and fractional coverage

Cloud Coverage and Cloud Layers

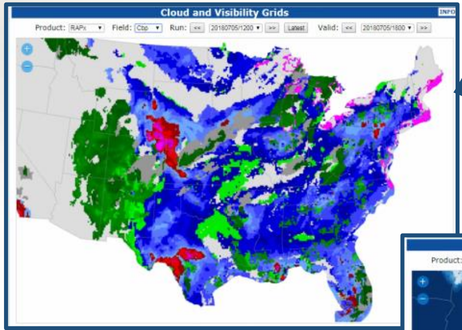


This is our Secondary layer, the lowest SCT layer

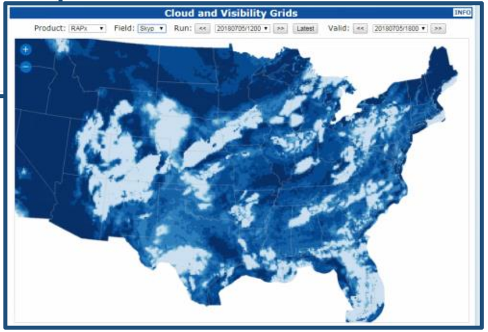
This is the Primary layer It is the lowest >= BKN cloud

This layer is not added to a grid

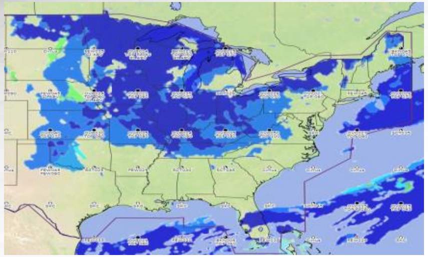
This layer is our Tertiary layer, lowest FEW cloud after SCT and BKN layers defined



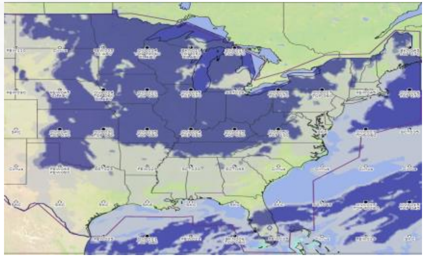
Primary Cloud Base & Primary Sky cover



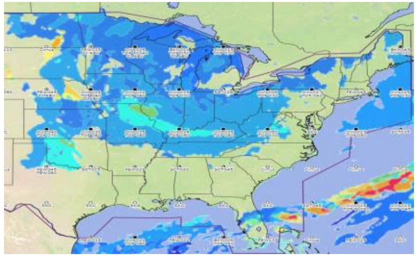
GFA Cloud Bases



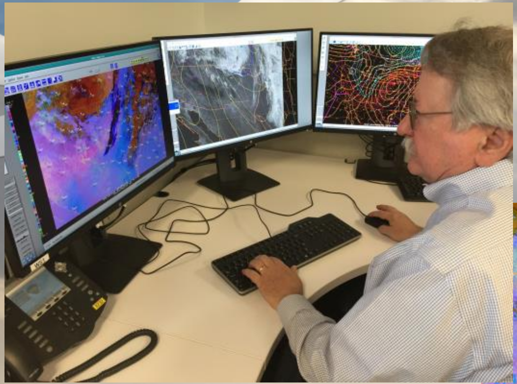
GFA Cloud Coverage



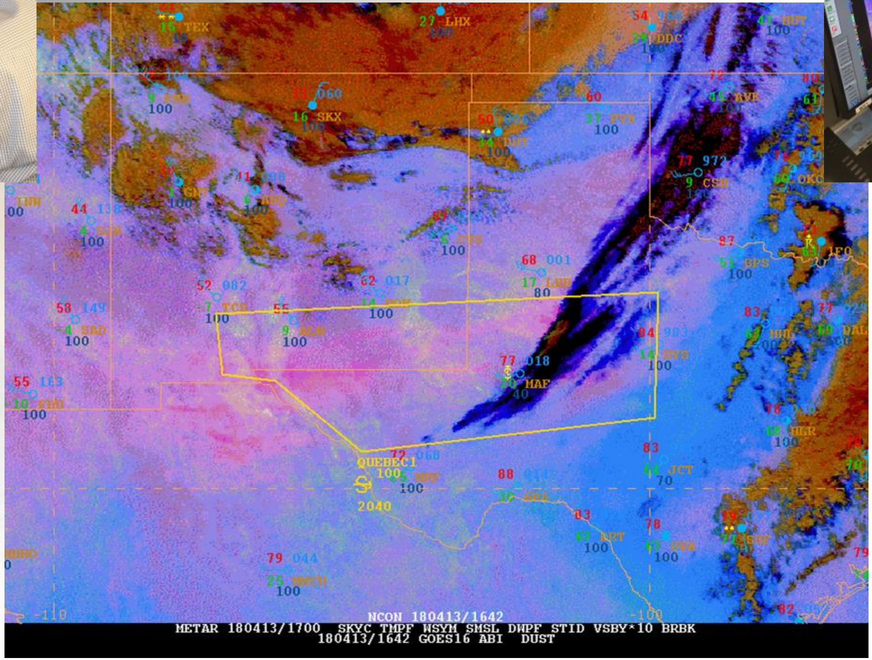
GFA Cloud tops

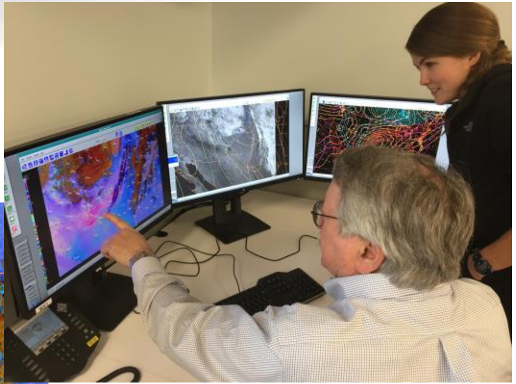


Blowing Dust



“This imagery worked to perfection today as I was able to get the jump on a blowing dust SIGMET over southern NM and western TX based on the darkening pink area. It also showed movement of the area which helped in determining what points to use for the SIGMET.”



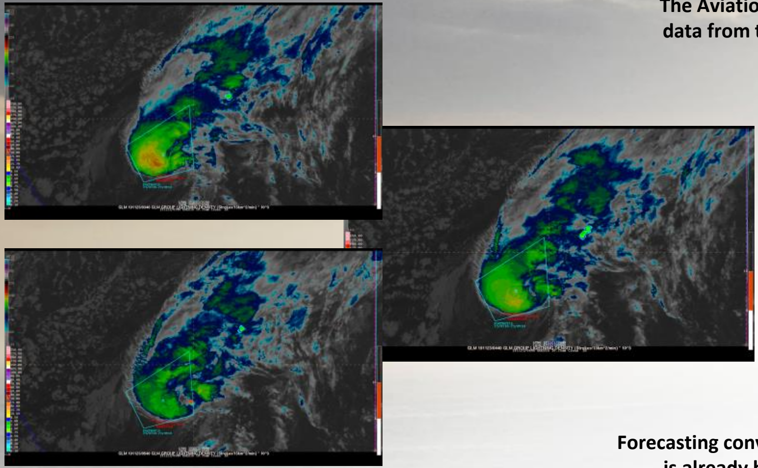


Senior Aviation Meteorologist Pete Reynolds confers with CIRA Satellite Meteorologist Amanda Terborg on an area of blowing dust in western Texas on April 13, 2018.

Blowing dust SIGMET issued by Senior Aviation Meteorologist Pete Reynolds at 1640 UTC overlaid with the 1642 GOES-16 Dust RGB imagery. The dark magenta coloring clearly identifies the blowing dust.

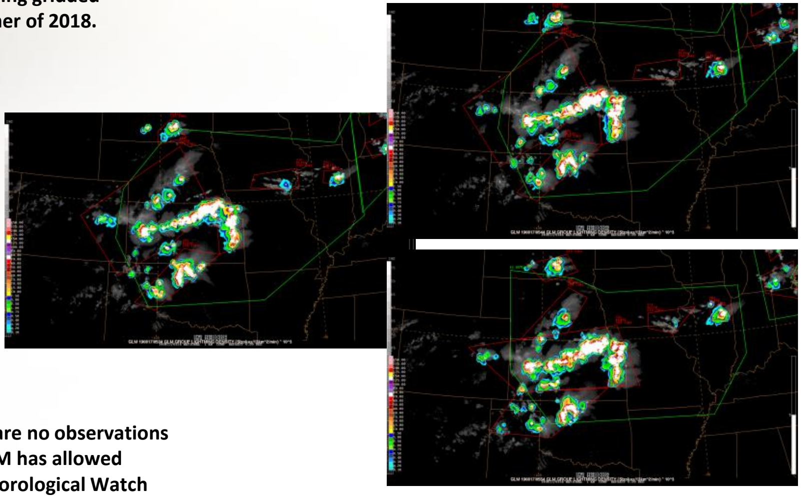
Operational Case Using GLM

Oceanic Coverage



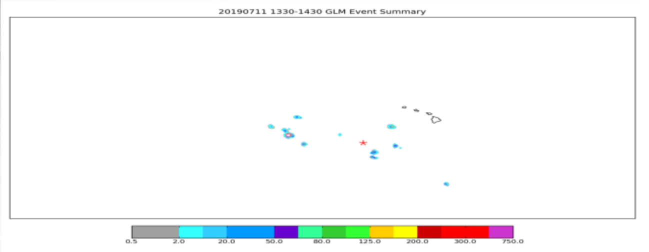
Improved Lead Time

The Aviation Weather Center has been using gridded data from the GOES GLM since the Summer of 2018.

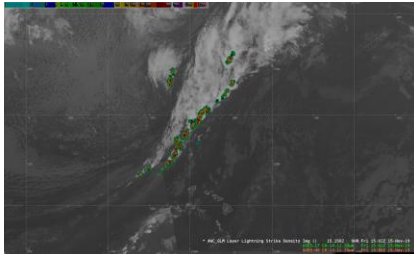


Forecasting convective SIGMETs where there are no observations is already hard enough, but adding in GLM has allowed forecasters to use the data to support Meteorological Watch Offices (MWOs) with Impact-based Decision Support Services (IDSS).

IDSS

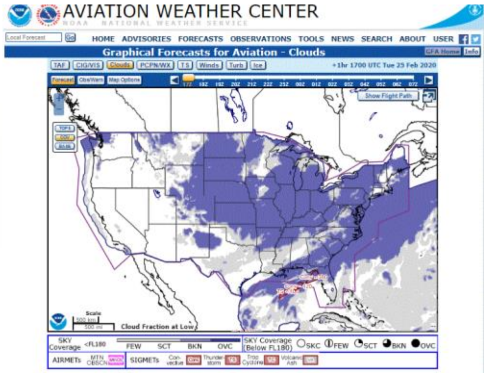


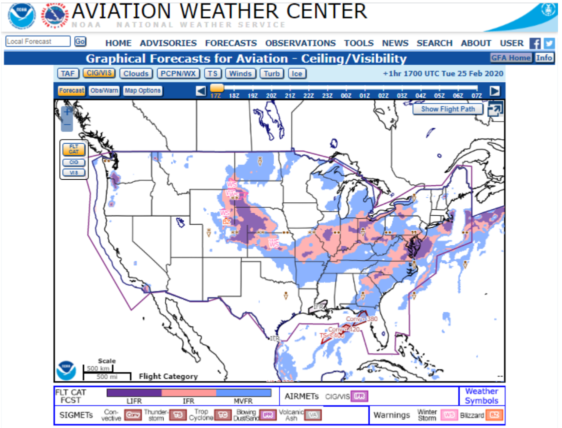
Transition to AWIPS



Forecaster Satellite Use Feedback

- **Ceiling and Visibility Desk**
  - *Use Vis/Fog product the most*
    - *Vis during the day and Vis/Fog at night*
  - *Satellite helps see the trend of fog dissipating or low stratus building*
  - *Drawing AIRMETS, or making an amendment…*
    - *Satellite is used to determine cloud extent*
  - *Very critical for situational awareness of current conditions for low clouds and fog*
  - *From the RGB suite, great for seeing smoke*
    - *Only tool for seeing blowing dust*



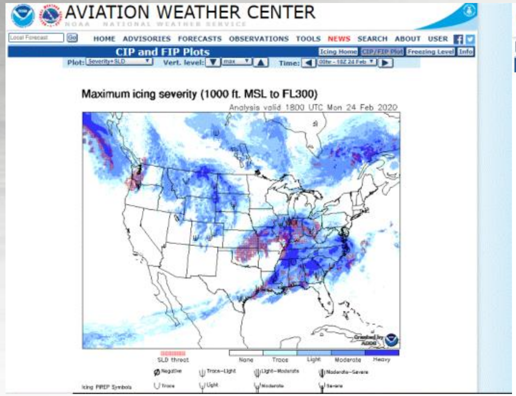


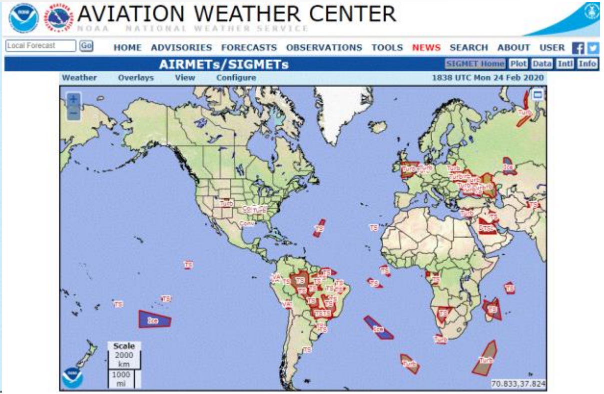
Forecaster Satellite Use Feedback

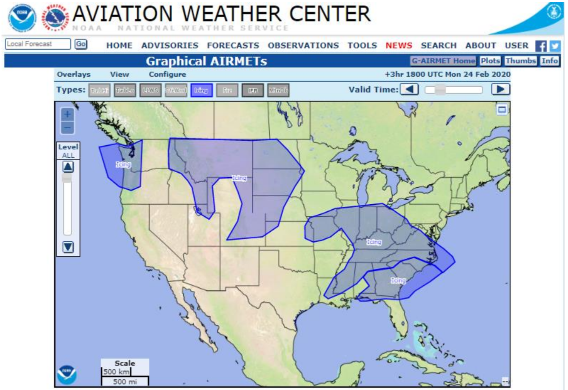
- **Convective Desk**
  - *Satellite is critical when issuing CSIGs. GOES-16/17 and GLM have vastly improved CSIG coverage and led to greater lead time for developing areas of TS. The availability of CONUS scans every 5 minutes is extremely valuable. In fact, given the shortfalls of radar coverage over the West, CSIG forecasters can rely heavily on GOES-17 and GLM for issuance.*
  - *Anticipating convection. CSIGs are hourly products and so much can evolve with convection in between those issuances. Use visible satellite imagery (including the 1-min loop when available) to look for towering cumulus and signs of new development.*
  - *IR imagery to help shape CSIG areas. When there is a well developmed MCS, convectively induced severe turbulence can be found many miles away from the apparent system i the cold cloud shield. Make sure area is covered by CSIG.*
    - *Cloud height tool for a second confirmation on storm tops.*

Forecaster Satellite Use Feedback

- **Tropical and Icing Desk**
  - *The main issue with JPSS -> Images take a long time to process and have a large temporal disparity.*
  - *GOES -> Getting the ABI cooling problem fixed.*
  - *Get the next version of Himawari with GLM capability in space. GLM = Good!*
  - *Shortwave IR imagery, with a color table set up to emphasize cloud tops with temperatures in the 0°C to -15°C range.*
    - *Indicates the presence of super-cooled liquid water droplets, which is the primary concern of the icing desk.*
    - *Anything colder is likely to be glaciated and contain mainly ice crystals, while warmer is too warm for ice.*







How the Satellite Community Can Help Collaborate on Future Interests

- *Any increase in resolution or scans would be helpful.*
- *Use improvements when it comes to latency with getting scans into our workstations.*
  - *There is typically a 4-5 minute delay with getting the data, which has an impact at issuance time if additional areas of convection develop.*
- *One of the problems is when you have multiple cloud layers*
  - *Only getting cloud top temperatures from the top layer. Could have an icing layer being obscured.*
  - *Having a way to view cloud top temperatures for multiple layers.*

Possible Future Collaborative Forecast Process Steps:

- *AWC would derive first guess grids of Primary, Secondary, and Tertiary cloud base and corresponding sky cover*
- *These grids would be edited by local WFOs through the DAS paradigm to derive a TAF that can include up to three cloud layers*
- *The final edited grids would be used to derive needed cloud variables for the GFA (cloud bases, tops, coverage, presence of layers, cirrus) at AWC*
- *This would allow for a consistent depiction of clouds across all levels; from local to national.*

Product and Application Development in Support of Aviation

Michael Pavolonis (NOAA/NESDIS)

UW-CIMSS: Corey Calvert, John Cintineo, Dave Hyman, and Justin Sieglaff

NOAA/OAR: Alice Crawford, Allison Ring, and Barbara Stunder

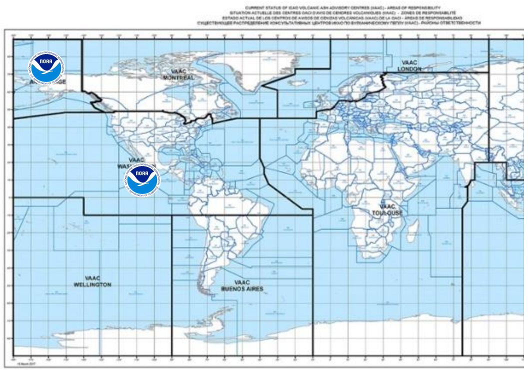
2020 JPSS/GOES-R Proving Ground/Risk Reduction Summit

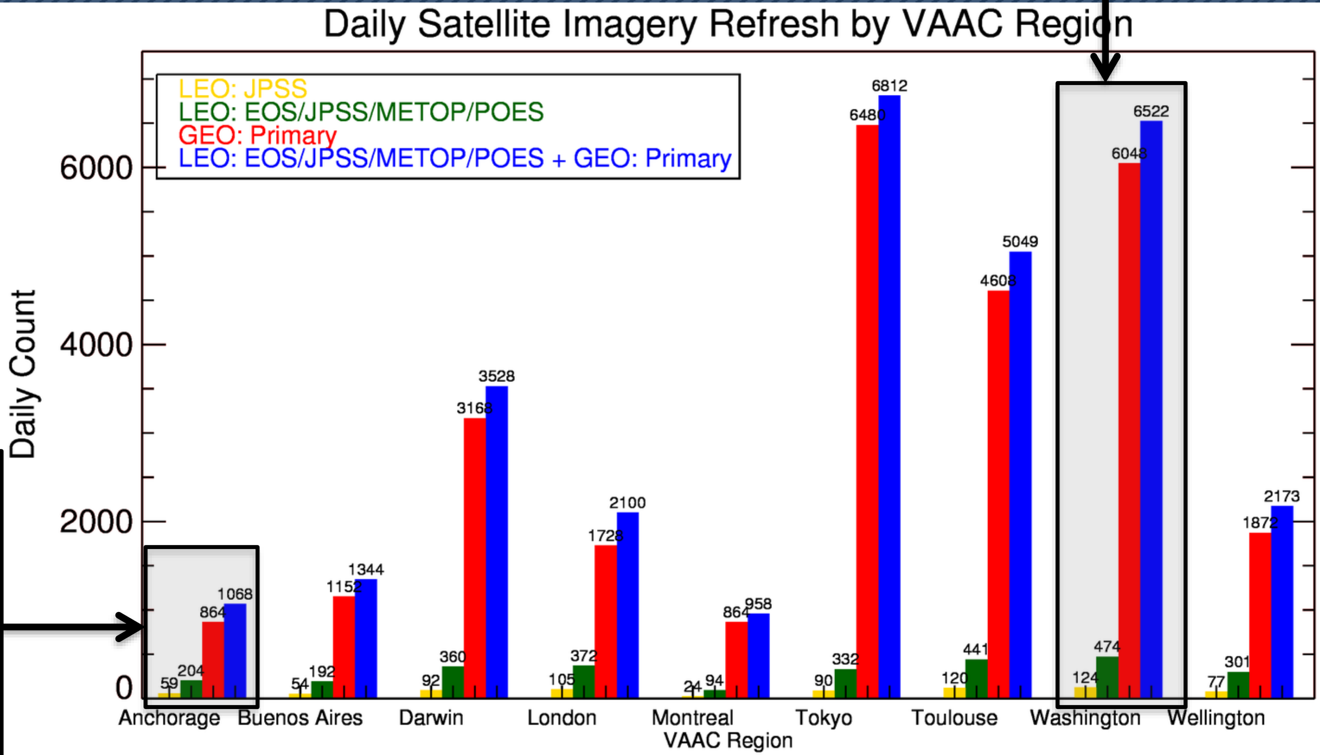
Volcanic Clouds

Overarching Challenges:

1. Data overload
2. Changing ICAO requirements

Minimum human work load (@W-VAAC) for "complete" monitoring: 1 satellite image every 15 seconds





Minimum human work load (@A-VAAC) for "complete" monitoring: 1 satellite image every 1 minute

Last updated: 15:52:43 UTC

NOAA/CIMSS VOLCAT Event Dashboard

Chillan, Nevados de	Country: Chile	VAAC Buenos Aires	Most Recent: 1 hour, 34 minutes ago
Event Age: 1 hour, 34 minutes ago	Event Type: Volcano Radiative Power Spike	Alert Detail / Imagery	Thermal Dashboard
Event Age: 3 hours, 24 minutes ago	Event Type: Volcano Radiative Power Spike	Alert Detail / Imagery	Thermal Dashboard
Event Age: 4 hours, 15 minutes ago	Event Type: Potential Ash Emission	Alert Detail / Imagery	Thermal Dashboard
Dukono	Country: Indonesia	VAAC Darwin	Most Recent: 1 day, 7 hours ago
Fuego	Country: Guatemala	VAAC Washington	Most Recent: 24 minutes ago
Ibu	Country: Indonesia	VAAC Darwin	Most Recent: 15 hours, 37 minutes ago
Masaya	Country: Nicaragua	VAAC Washington	Most Recent: 21 hours, 54 minutes ago
Pacaya	Country: Guatemala	VAAC Washington	Most Recent: 22 hours, 44 minutes ago
Popocatepetl	Country: Mexico	VAAC Washington	Most Recent: 8 minutes ago
Reventador	Country: Ecuador	VAAC Washington	Most Recent: 2 hours, 53 minutes ago
Sabancaya	Country: Peru	VAAC Buenos Aires	Most Recent: 10 hours, 54 minutes ago
Sangay	Country: Ecuador	VAAC Washington	Most Recent: 24 minutes ago
Sangeang Api	Country: Indonesia	VAAC Darwin	Most Recent: 13 hours, 45 minutes ago

VOLCAT event dashboard – automatically captures new volcanic events in NRT

Automated Urgency Ranking- Warning: Automated urgency ranking may differ from human expert assessment and events should first be verified.

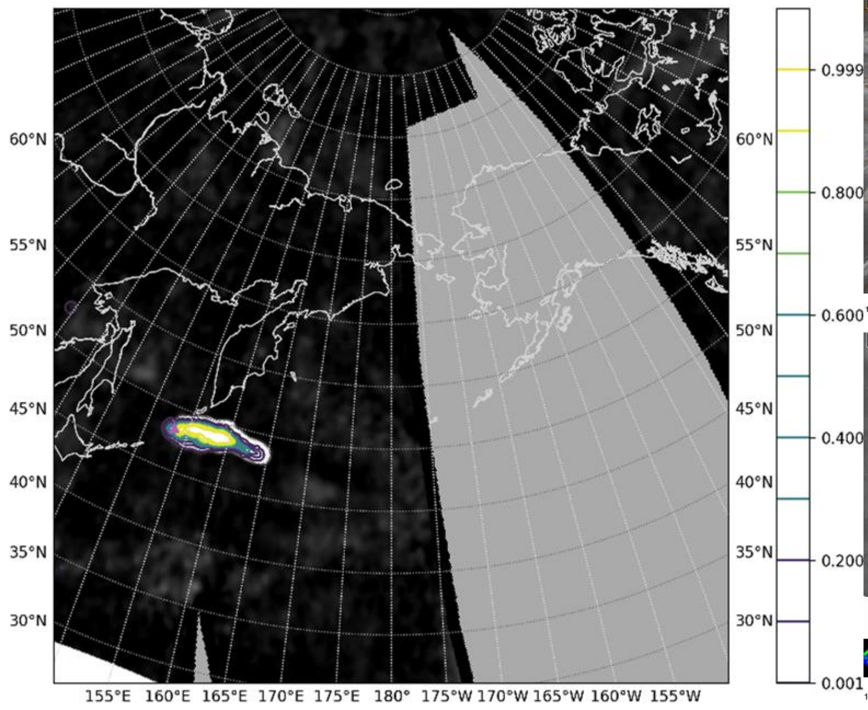
Rank 1 ? Rank 2 ? Rank 3 ?

Volcanic Clouds

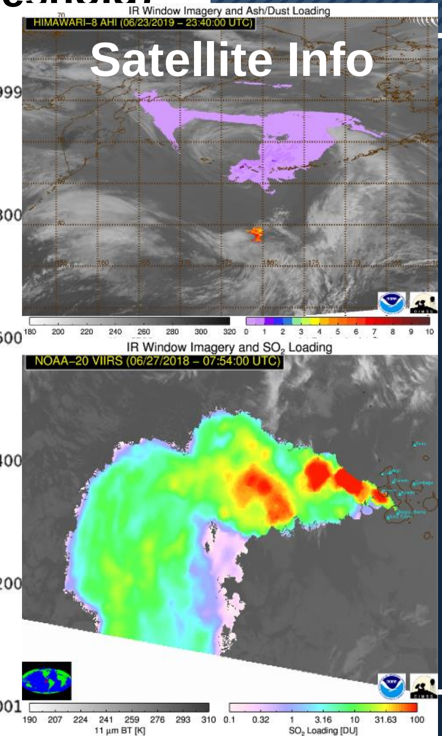
Overarching Challenges:

1. Data overload
2. Changing ICAO requirements → quantitative ash forecasts; SO_2 health hazard

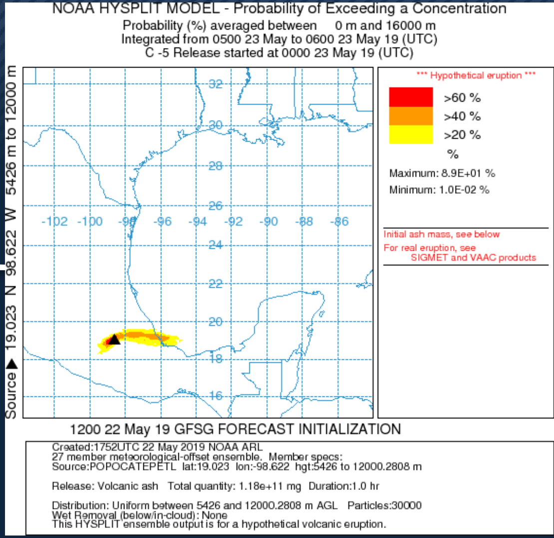
P(SO_2 > World Health Organization Threshold)



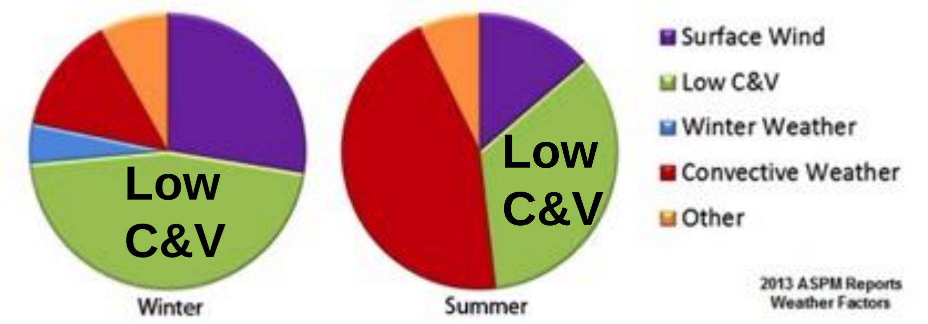
Satellite Info

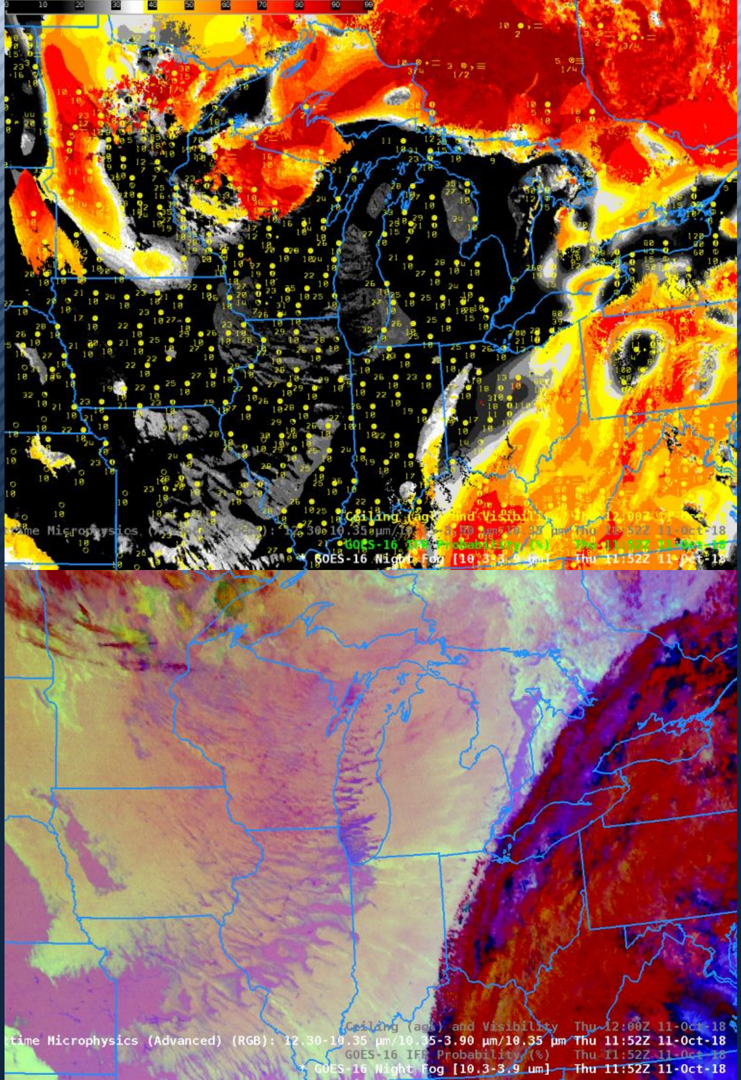


HYSPLIT - Forecasts



Low Ceiling and Visibility



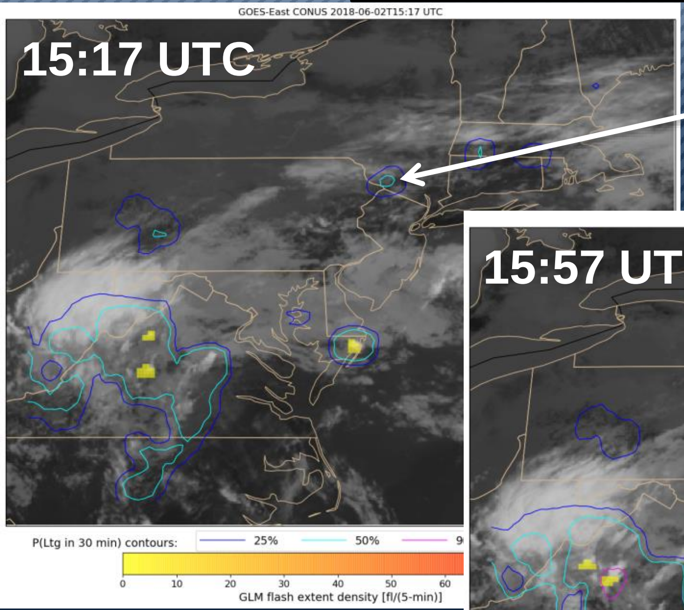


Current value: more efficient air traffic management

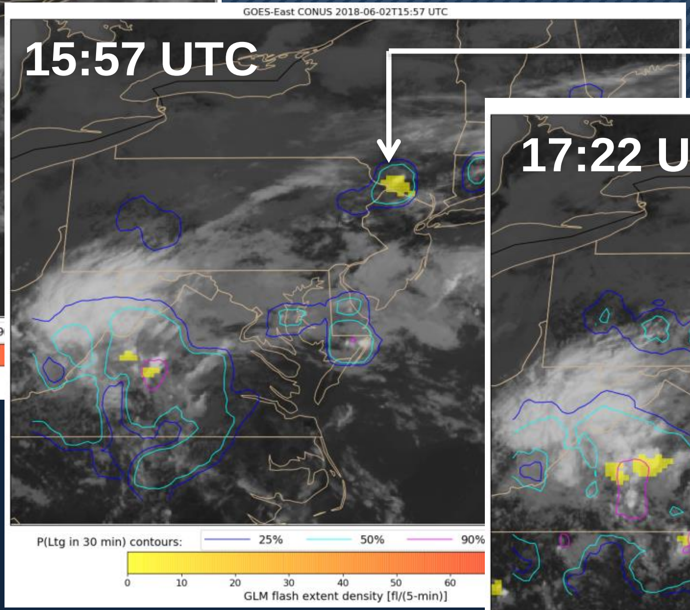
Future possibilities: AI-based super res and fog/low stratus nowcasting tools for improved resiliency to ceiling/visibility related disruptions

Convection Nowcasting – ProbSevere AI Tools

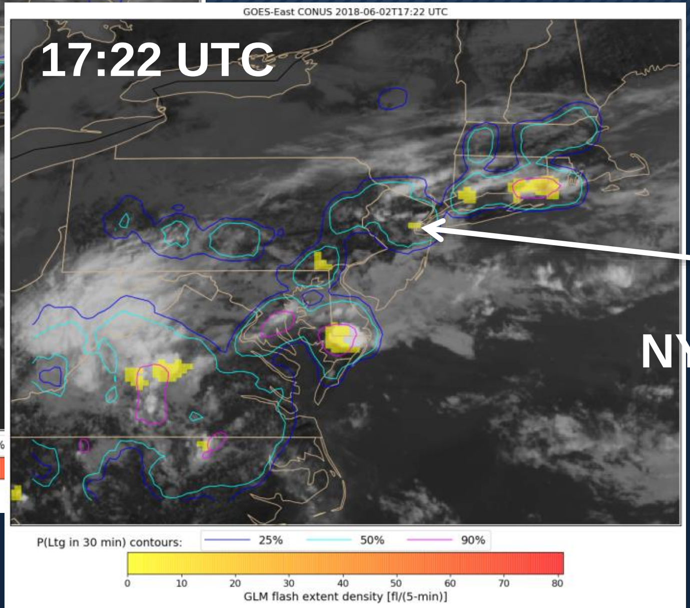
Probability of Lightning (10-60 min nowcast)



Enhanced probability of lightning initiation upstream of NYC @ 15:17 UTC



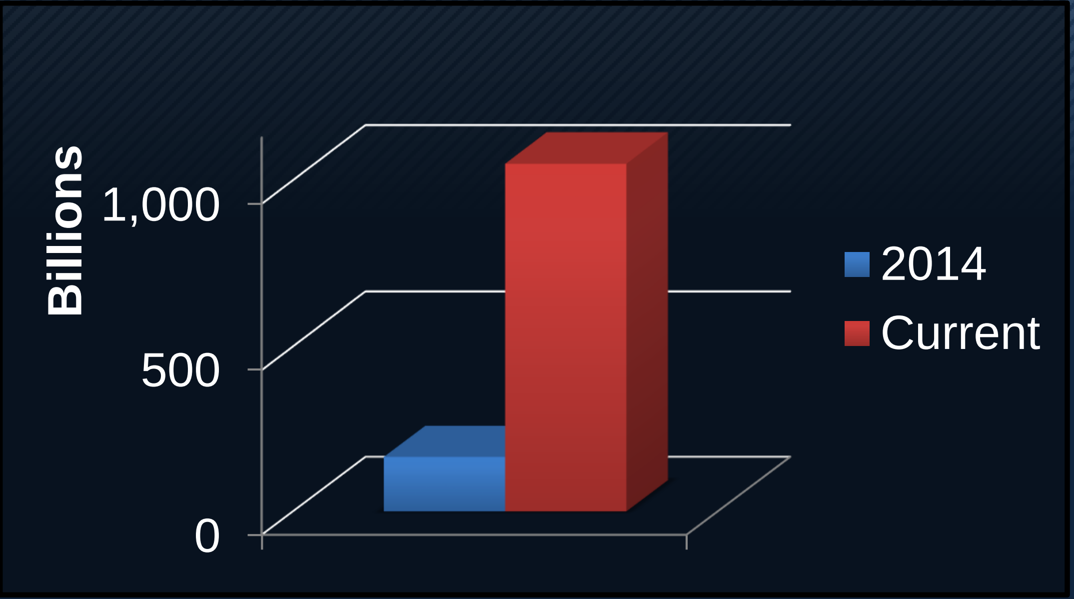
Lightning initiation (40 min later)



Lightning observed in NYC region @ 17:22 UTC

Aviation: Overarching Emerging Needs

Data Overload and Information Demand



Aviation Trends

International Air Transport Association: near doubling of passengers to 8.2 billion by 2037

Increased need for efficiency (environmental and business model sustainability)

Satellite Products for Aviation

Remote Sensing Needs in the High Latitudes

JPSS/GOES-R PG/RR Summit

Carl Dierking

UAF/GINA

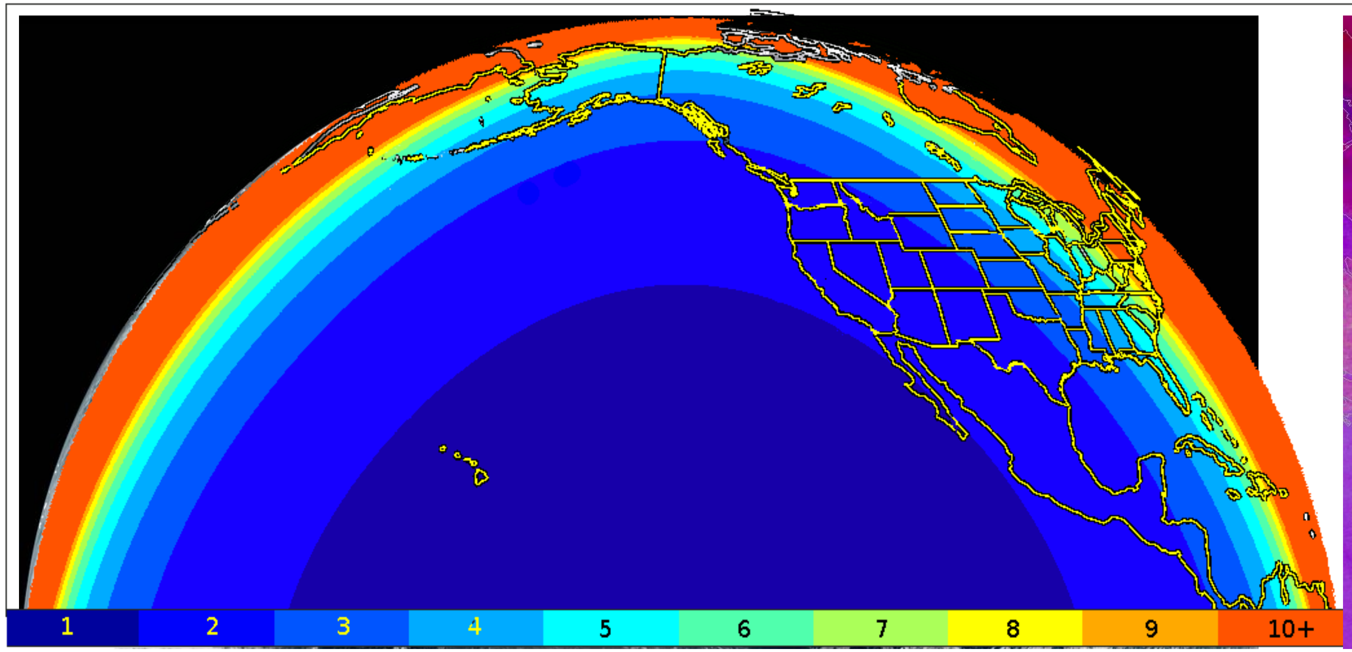
Beyond METARs

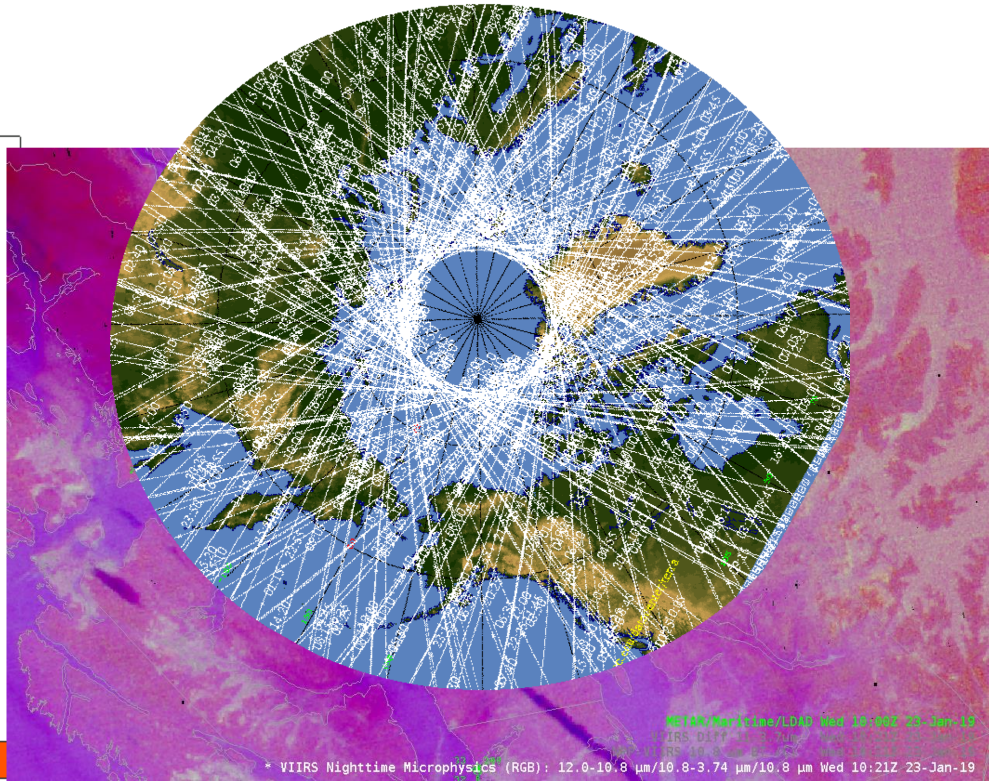
- Needs vary with equipment:
  - Commercial vs Private
  - IFR vs VFR
  - Floats, skis, wheels, helipads, etc.

- Common Data expectations:
  - Extremely timely and highly detailed
  - Life threatening impacts
  - Observations preferred
  - Information enroute not always available.

Northern Latitudes need LEO and GEO

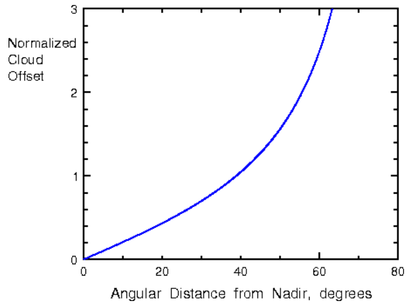
Approximate Pixel Area (Nominally 1km at Nadir) from -137.0 West





GEO – Pacific Circulations/Systems

- Good resolution in mid latitudes
- Exponential parallax displacement
- High frequency updates
- One satellite for hemisphere



LEO - Polar Circulations/Systems

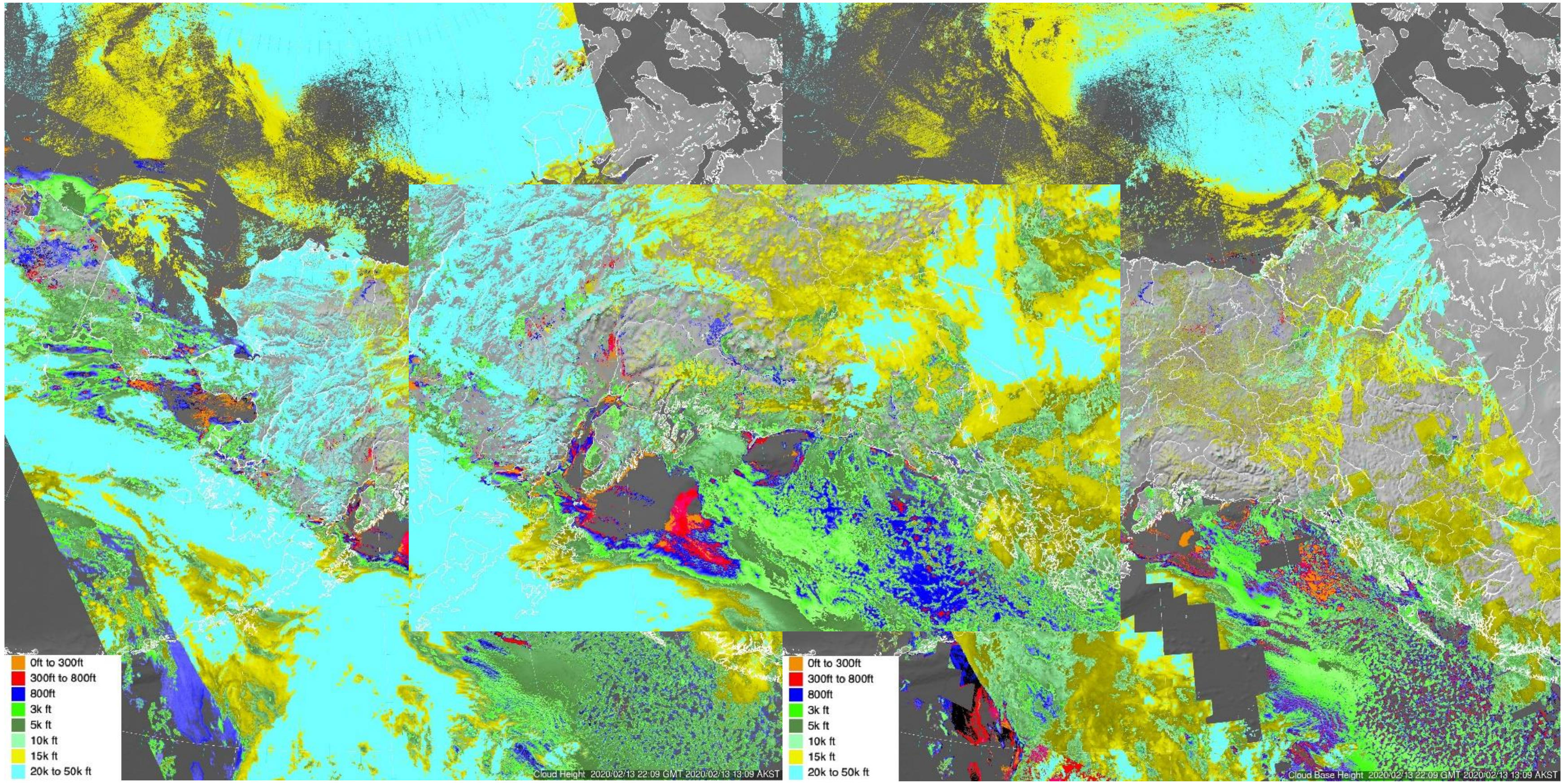
- Very high resolution (375m – 1km)
- Minimal parallax
- Frequent updates near poles (~ hourly)
- Multiple polar-orbiting satellites

Strong Interest in Cloud Products (GEO & LEO)

CLAVR-x Products

- Cloud Top Height
- Cloud Base Height
- Cloud Phase
- Cloud Type
- Cloud Top Temperature

How much "interpretation" should be expected of pilots?

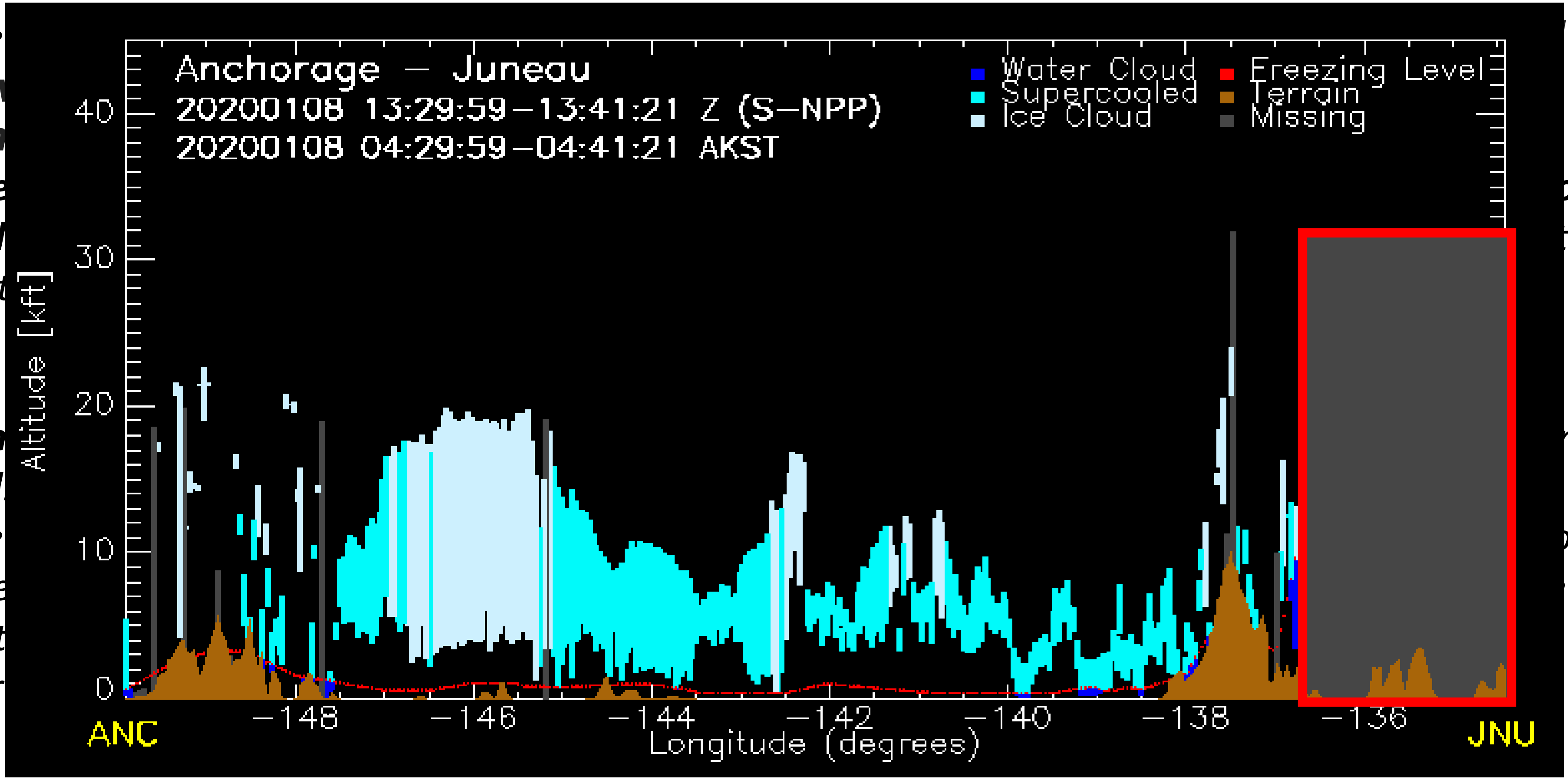


Cloud Top Height   Cloud Phase (CIRA Slider)   Cloud Base Height

Aircraft Operator Feedback

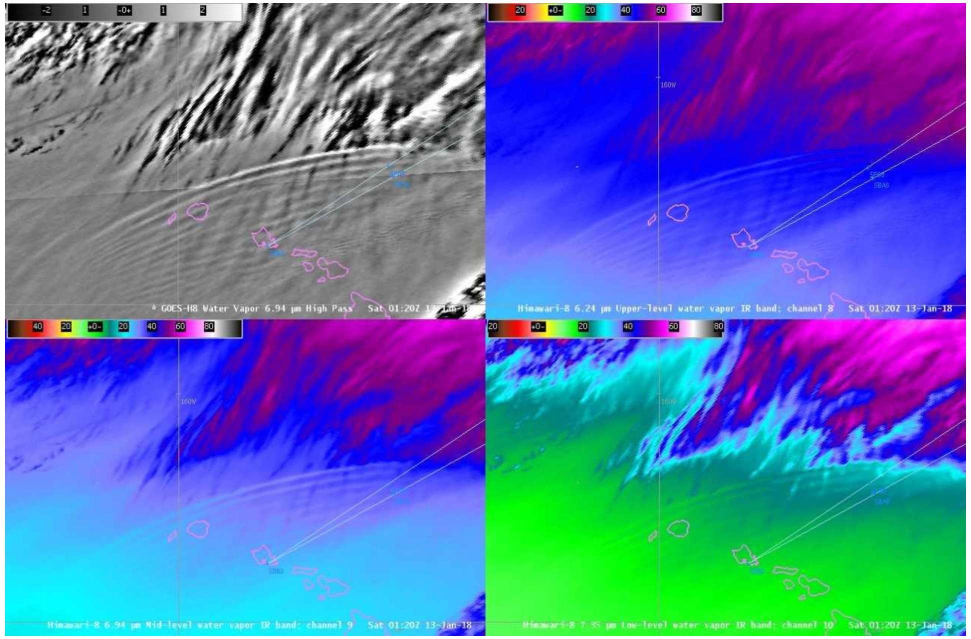
“The ... ***to craft***
the w
com
“One ... ***orbiting***
satel ... *try*
flight
Tom

“Ban ... *mproved*
satel
“The ... *need*
more ... *ve*
weat
Andr



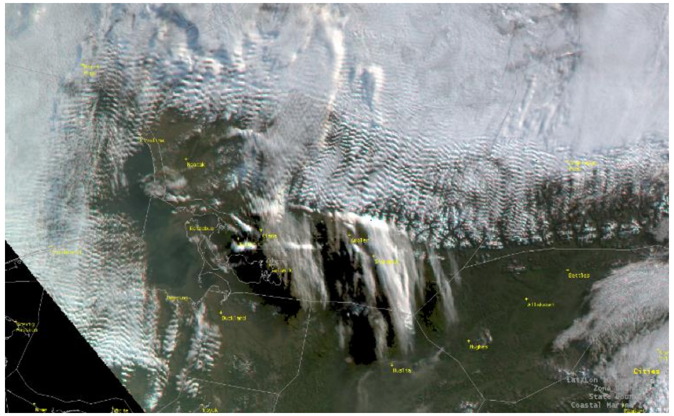
Cloud Cross-section ANC-JNU (Yoo-Jeong Noh - CIRA)

Gravity Waves and Turbulence

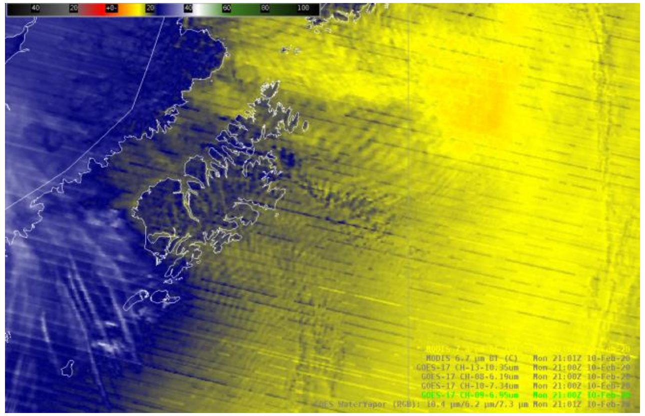


Severe Turbulence over Hawaii (Scott Bachmeier – Jan 12, 2018)
https://cimss.ssec.wisc.edu/satellite-blog/archives/26745

“We're still figuring out which filters (we have 4), which of the 3 bands to use (though generally the top), and what signatures are turbulent. However, Tony (Wimmers) is using AI to find the patterns and suggests it's quite good at doing so.”   - Nate Eckstein, NWS

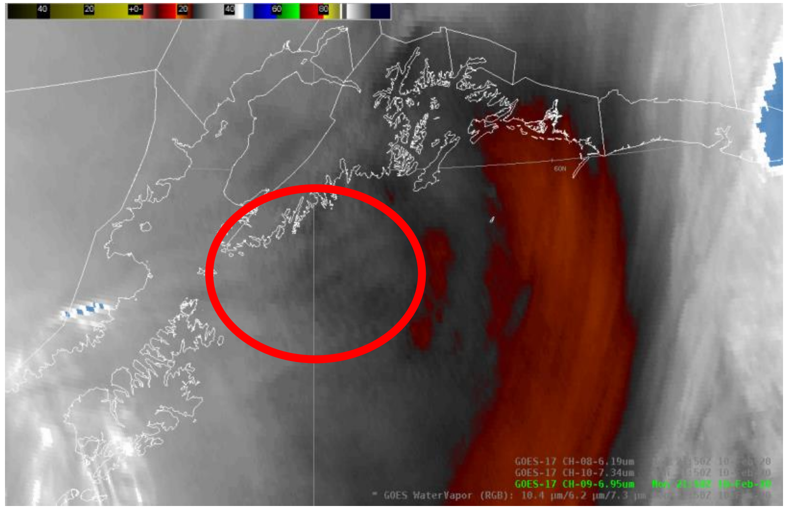


VIIRS True Color (Nrn AK)



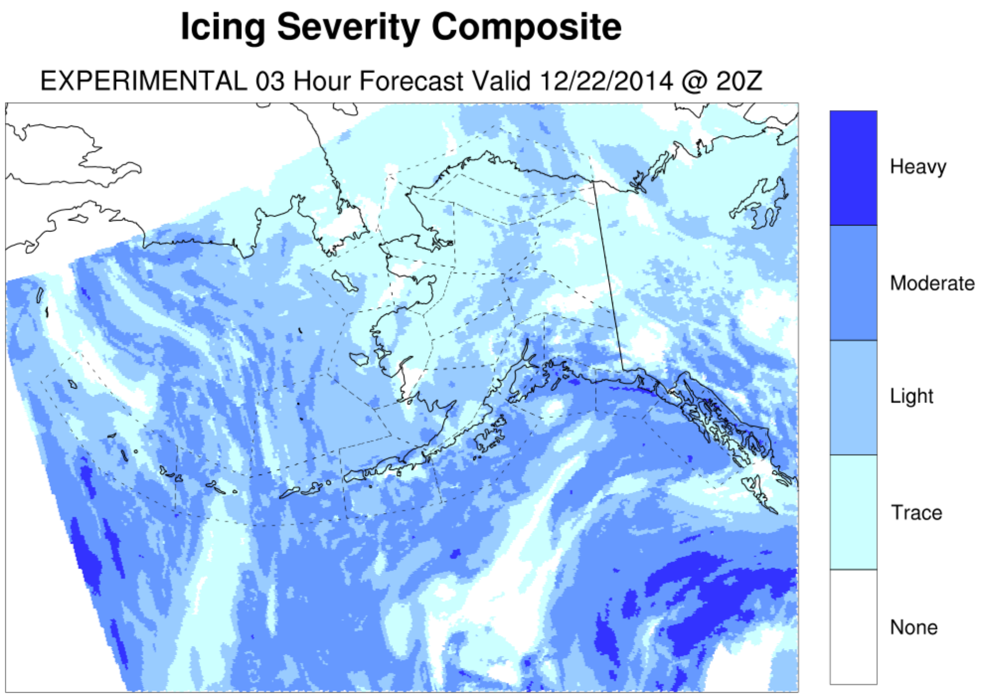
MODIS 7.3 um WV

- Best High Pass Filters?
- How do impacts vary with Aircraft Type?
- How can machine learning techniques assist?

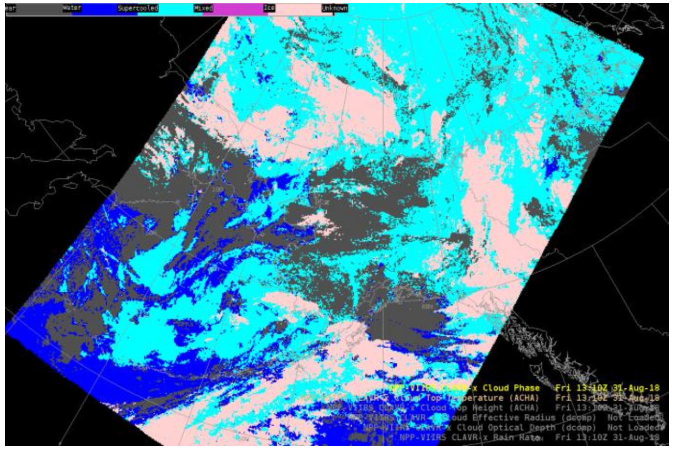


GOES 17 – 6.95um WV

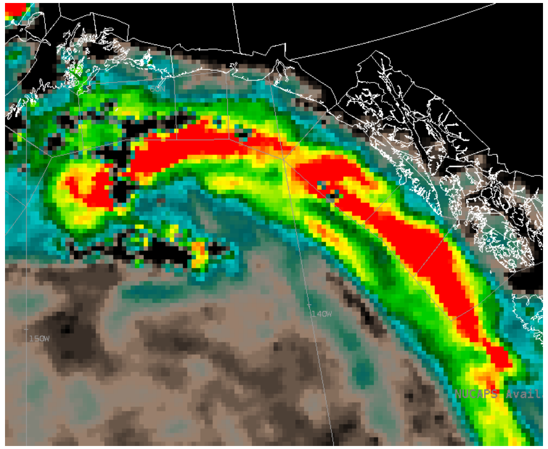
Experimental Icing Products



Icing Product Alaska (NCAR)



CLAVR-x Cloud Phase



MIRS Cloud Liquid Water

We're mainly using Icing Product Alaska (IPA), developed by NCAR through FAA- AWRP (Avn Wx Research Program). We supplement that guidance with BUFKIT, but over the whole state that's a lot to sort through all the soundings. NUCAPS or Gridded NUCAPS might assist with an analysis, but we also use satellite imagery to look at the cloud top phase, temperature. – Nate Eckstein (AAWU)

Challenges and Questions…

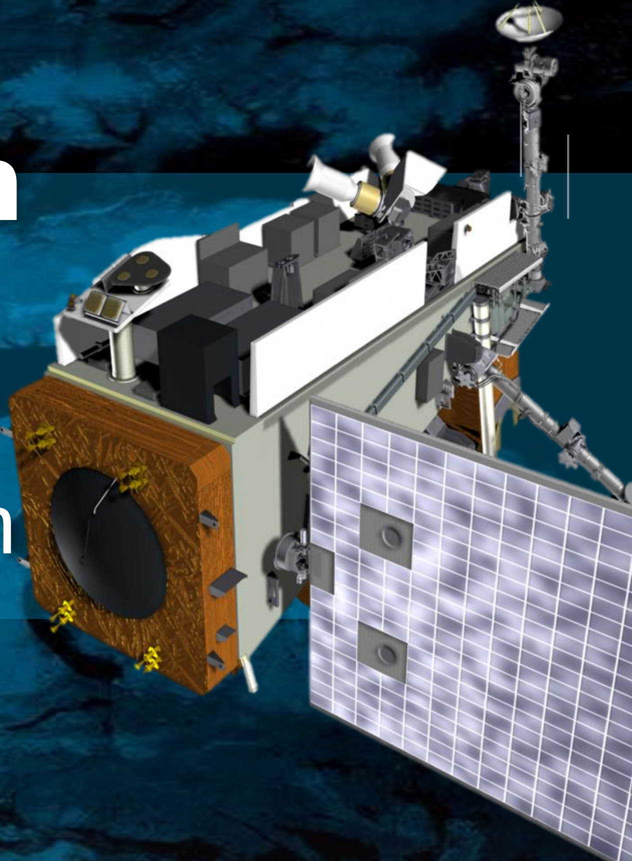
- How can GEO and LEO perspectives for aviation products be merged to take advantage of the strengths of each?
- How should the impact of aviation hazards identified by satellite (such as gravity waves) be calibrated for aircraft size, speed, and direction?
- How can objective methods be developed (such as AI) to alert on aviation hazards turbulence, icing, volcanic ash, etc?

Aviation Initiative and Aviation Applications

JPSS/GOES-R Proving Ground/Risk Reduction Summit

February 26, 2020

Jeffrey Weinrich, Science and Technology Corporation (STC)



GLOBAL **DATA.**
LOCAL **WEATHER.**

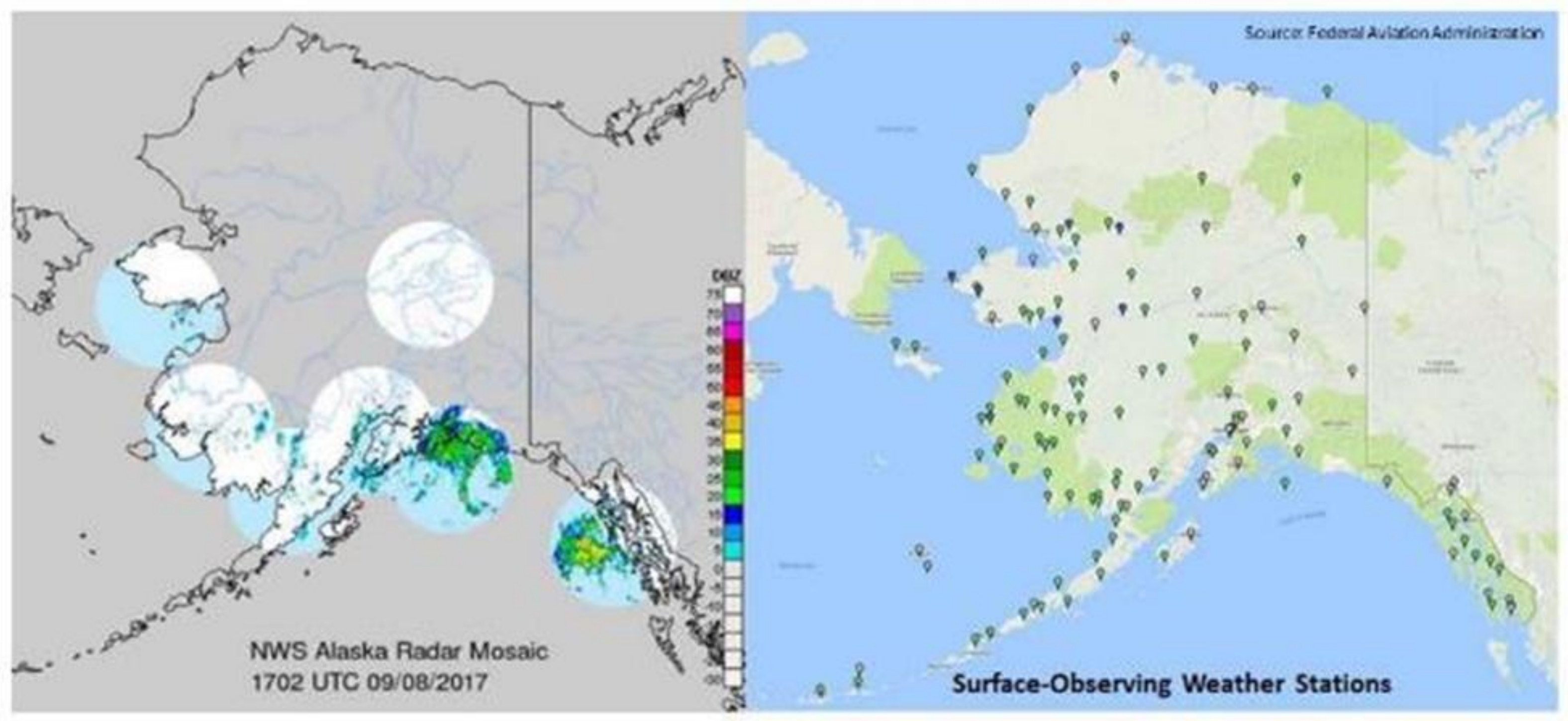
JPSS Aviation Initiative

- Started in 2018 with the Alaska aviation community
  - There is more general aviation than any other state in the nation. The only way to travel in some cases is general aviation (mail, hospital, food delivery)
- Focused on Alaska at first due to limited conventional observational data sources
- Demonstrated how polar satellite data improves diagnosis and forecast of aviation hazards
- Expanded utility in the CONUS and international users
- Showcased experimental products for future applications
- ALL of the work you have seen today has been essential to the success of the initiative

JPSS Aviation Initiative Users and Participants

Federal Aviation Administration	International	National Weather Service	Pilots/Others
FAA Headquarters	*German Weather Service*	*Alaska Aviation Weather Unit*	*Alaska Airmen's Association*
FAA Command Center	*Iceland Weather Service*	*NWS Anchorage*	*Aircraft Owners and Pilots Association*
FAA Air Traffic Control Center – Anchorage, Kansas City, Houston	*Environment Canada*	*NWS Juneau*	*National Transportation Safety Board (NTSB)*
FAA Flight Service		*NWS Phoenix*	*Southwest Airlines*
		Aviation Weather Center	*National Center for Atmospheric Research (NCAR)*

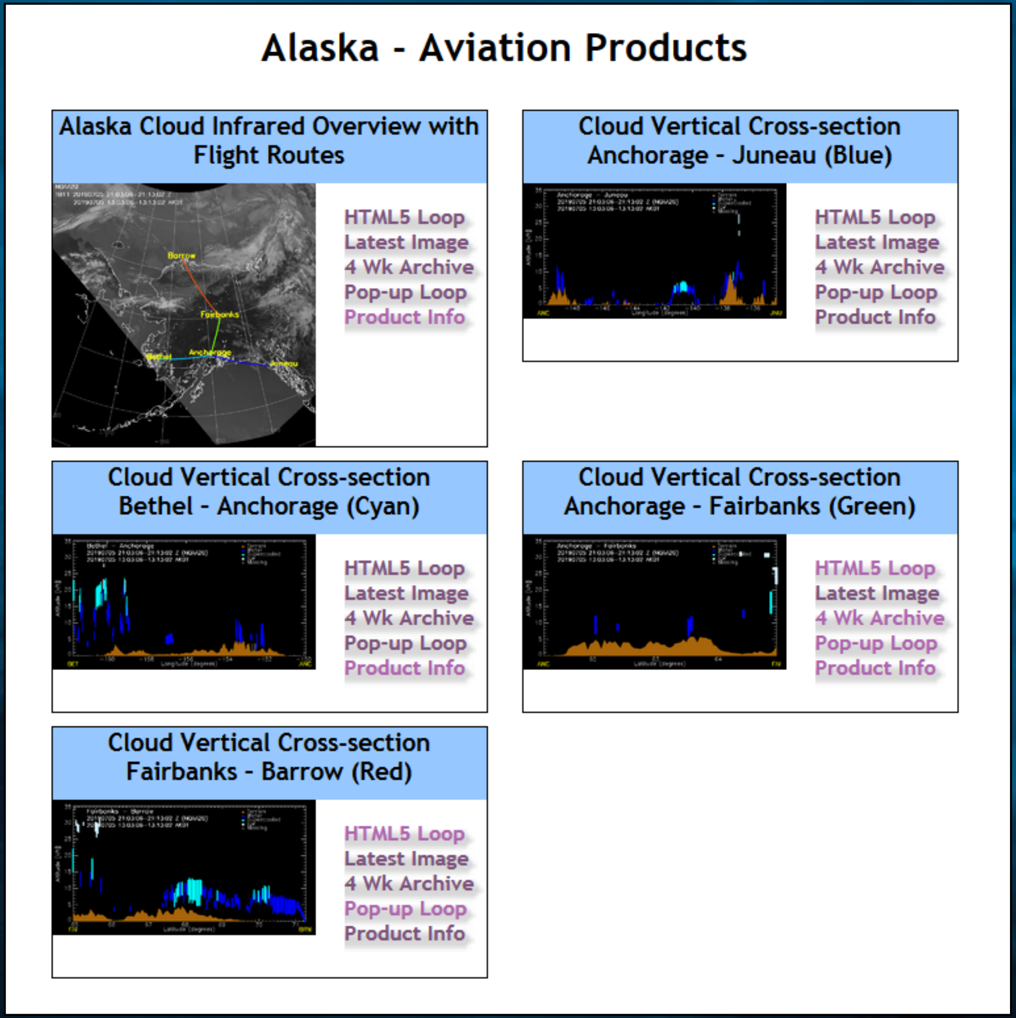
Limited Data in Alaska



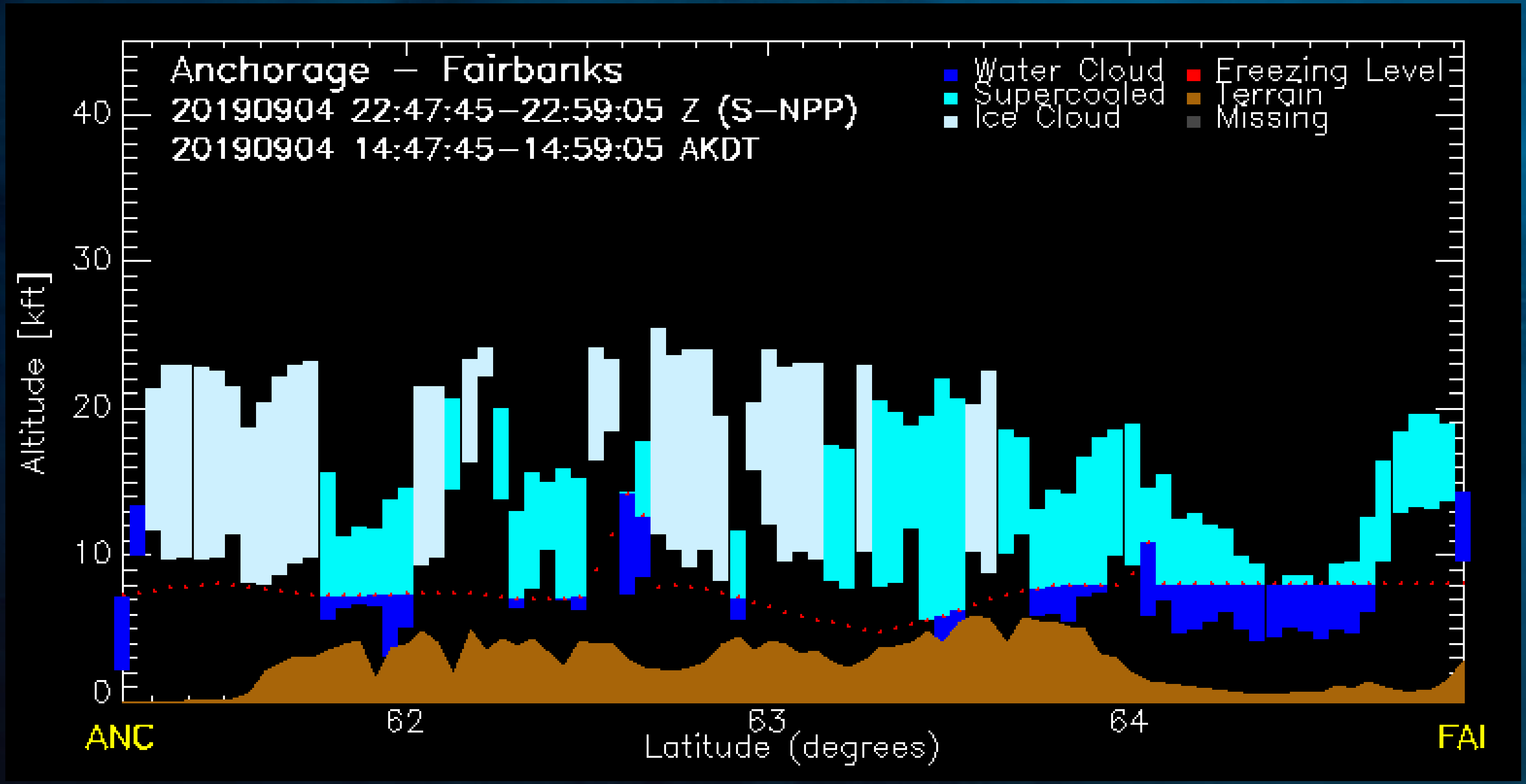
Hope, Alaska Airport

VIIRS Cloud Vertical Cross-section products over Alaska

- Experimental products for aviation users
- Cloud Vertical Cross-sections (CVC) along flight routes over AK are obtained by connecting Cloud Top and Base Heights derived from S-NPP and NOAA-20 VIIRS data
- Colors corresponding to Cloud Top Phase
- Improved display based on user feedback
- Ongoing efforts for improved nighttime and multilayer clouds due to degraded cloud retrieval products



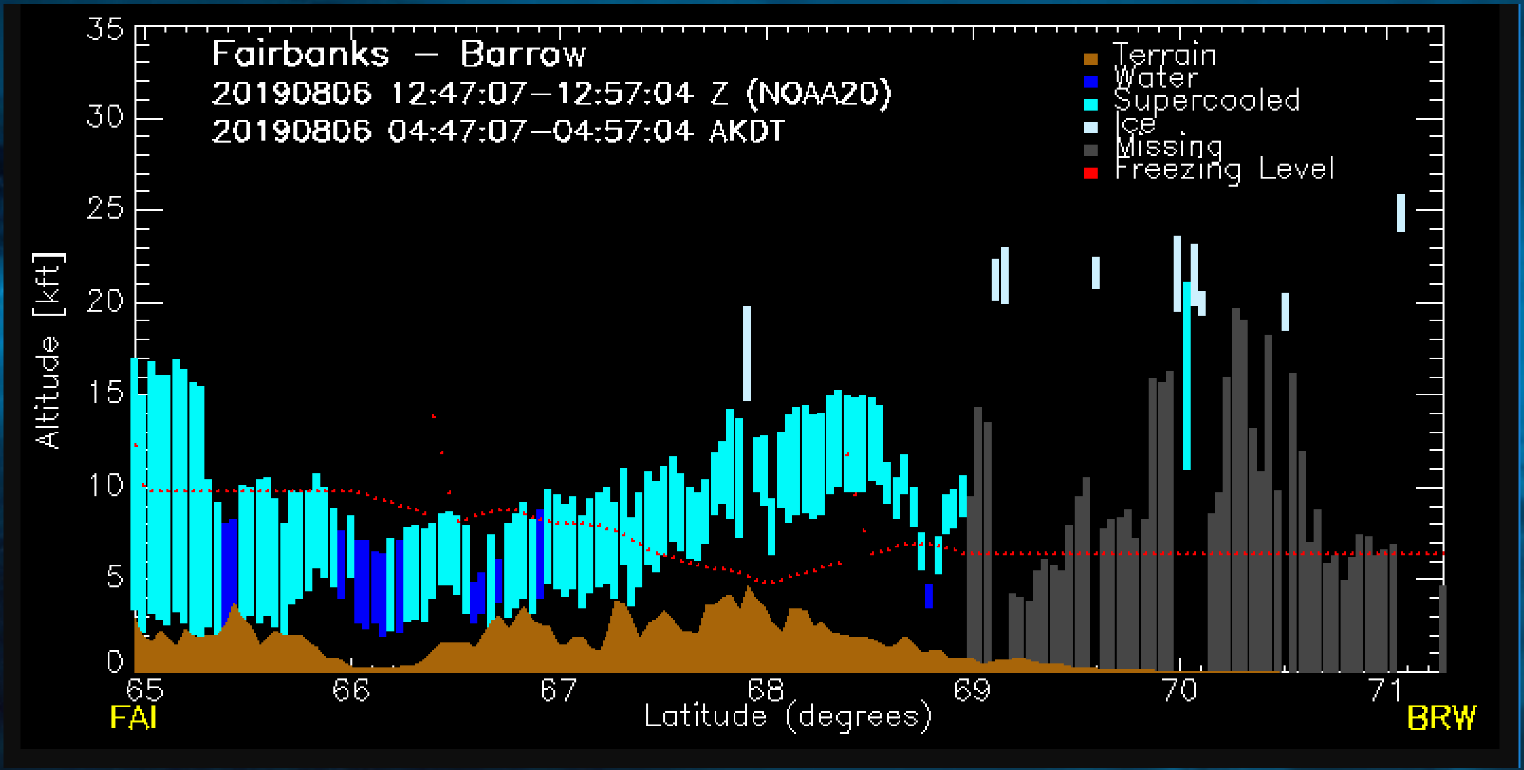
JPSS Cloud Cross Sections



Real Life Operational Meteorologist Example

FAI UA /OV FAI320050/TM 1746/FL100/TP C208/TA M2/IC MDT RIME/RM ZAN=

FAI = Fairbanks
UA = Routine
OV = Location of the PIREP
TM = 1746 Greenwich Mean Time
FL 100 = Flight Level 10,000 ft
TP C208/TA = Aircraft Type, Cessna 208 Caravan.
TA M02 = Temperature -02 Celsius
IC MOD RIME = Moderate Rime Ice
RM ZAN = Remarks, Anchorage



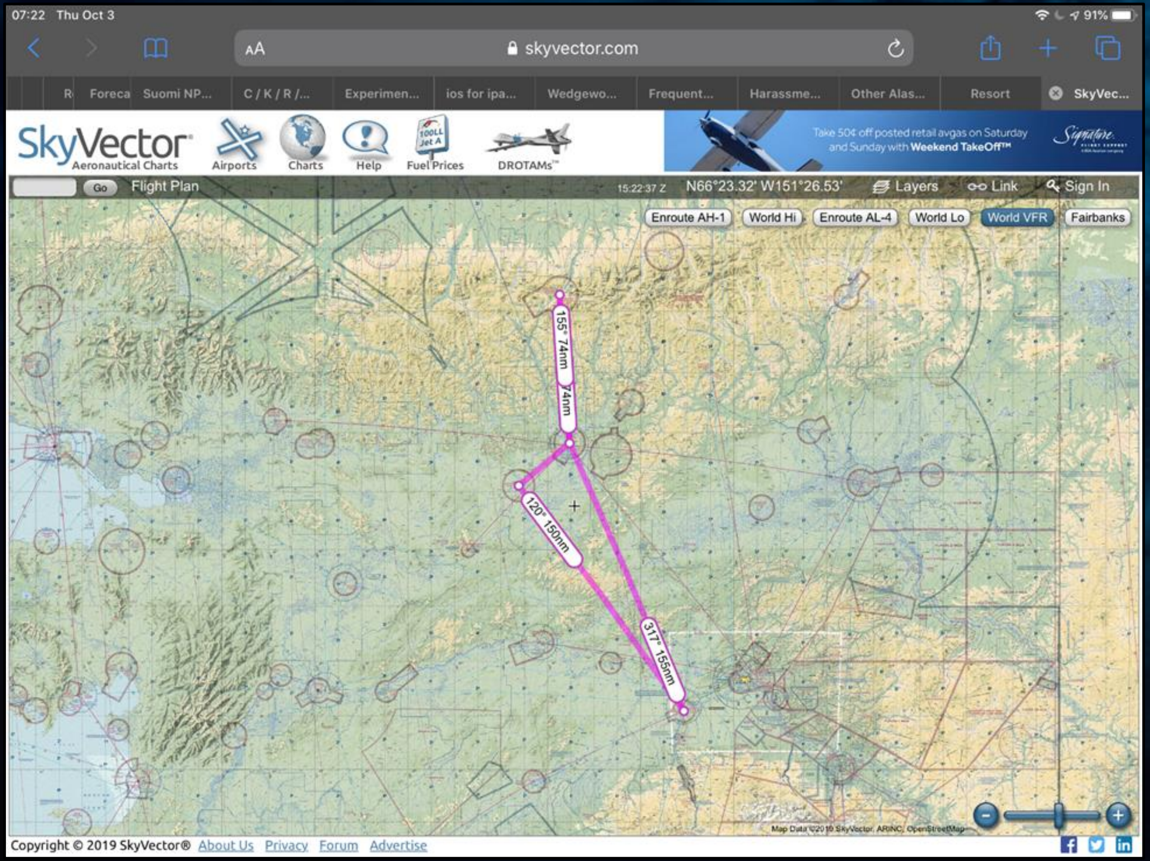
"We had an icing PIREP this morning south of FAI that matched up nicely with your cloud product." Gail Weaver, Center Weather Service Unit Anchorage"

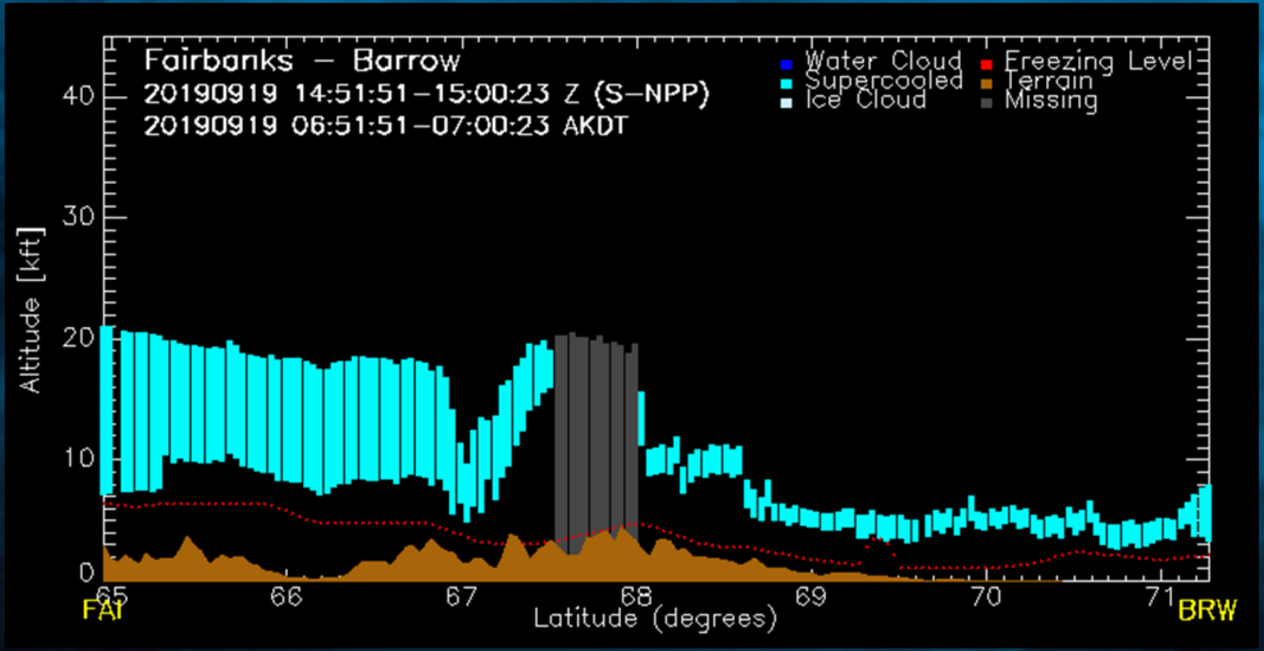
Real Life Operational Pilot Example

- Adam White, Alaska Airmens Association, Example of real life use of JPSS Cloud Cross Section.

"While there is some weather reporting at these airports and a weather observer at Bettles there is still a lot of distance between these locations with no data and very hostile terrain features."

"The test product was helpful to get an idea what I might encounter, especially in the PABT-PAKP-PFAL section of the trip as I was in the Brooks Range."





Summary

- Accomplishments:
  - 17 new user groups added that did not use JPSS Cloud Products before
  - Creation of JPSS Cloud Cross Sections
  - Changes in overall display of Cloud Products to indicate more levels at the lower layers for general aviation pilots
  - Supercoiled liquid water added
  - Global Forecast Model (GFS) Freezing Level Temperature added

- Coming up in 2020:
  - Additional demonstration of JPSS Cloud Product Demonstrations
  - Dynamic global cross section capability where a user can point and click and get a cross section created on demand.
  - Will be adding -5 and -20 temperature line based on feedback so forecasters can identify icing
  - Adding Pilot Reports to the cross sections
  - Will be adding satellite measurement of temperature based on feedback instead of GFS temperature
  - Collaborate with GOES-R program to incorporate those capabilities

Acknowledgements

Andy Heidinger, YJ Noa, and the Cloud Team

Gail Weaver (NWS), Emily Berndt (NASA/SPoRT), Kris White (NWS, and NASA/SPoRT), Jack Dostalek (CIRA), Brad Zavodskey (NASA/SPoRT) and Nadia Smith (STC), Carl Dierking (GINA), Carrie Haisley (CWSU), Tom George (AOPA), Arron Layns (JPSS), Becca Mazur (Arctic Test Bed), Andrew McClure (FAA), Jeff Osiensky (AAWU), Bonnie Reed (JPSS/STC), Jorel Torres, Adam White, CIRA and all the users for their help!

See my poster this evening if you would like more one on one information! Poster 36

Thanks to Dr Mitch Goldberg for all his support of the Aviation Initiative!

THANK YOU!

For more information visit: **www.jpss.noaa.gov**

Please contact me to get involved! Jeffrey.weinrich@noaa.gov

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