



WMO Aircraft-based Observations Programme

Programa de Observaciones a bordo de aeronaves de OMM

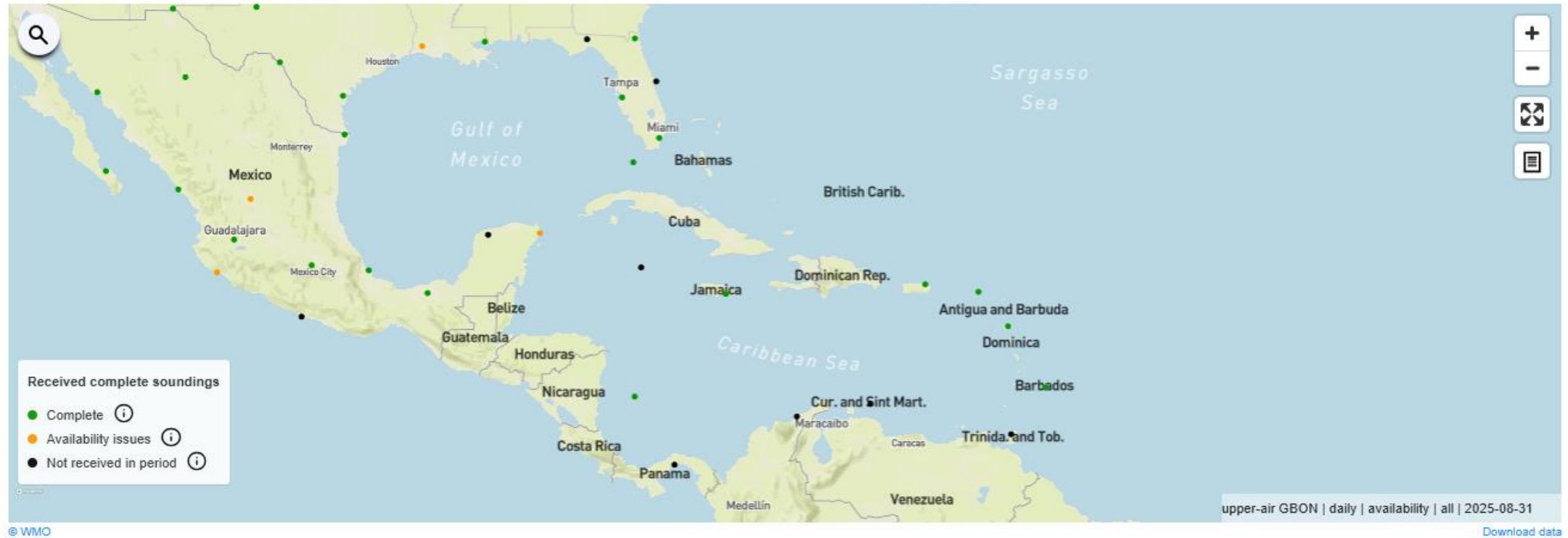
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Content

- Why is important ABO
- What is ABO
- Benefits to airlines
- RA IV current and past experiences and US-LATAM Programme impact

Why is so important AMDAR in Central America?



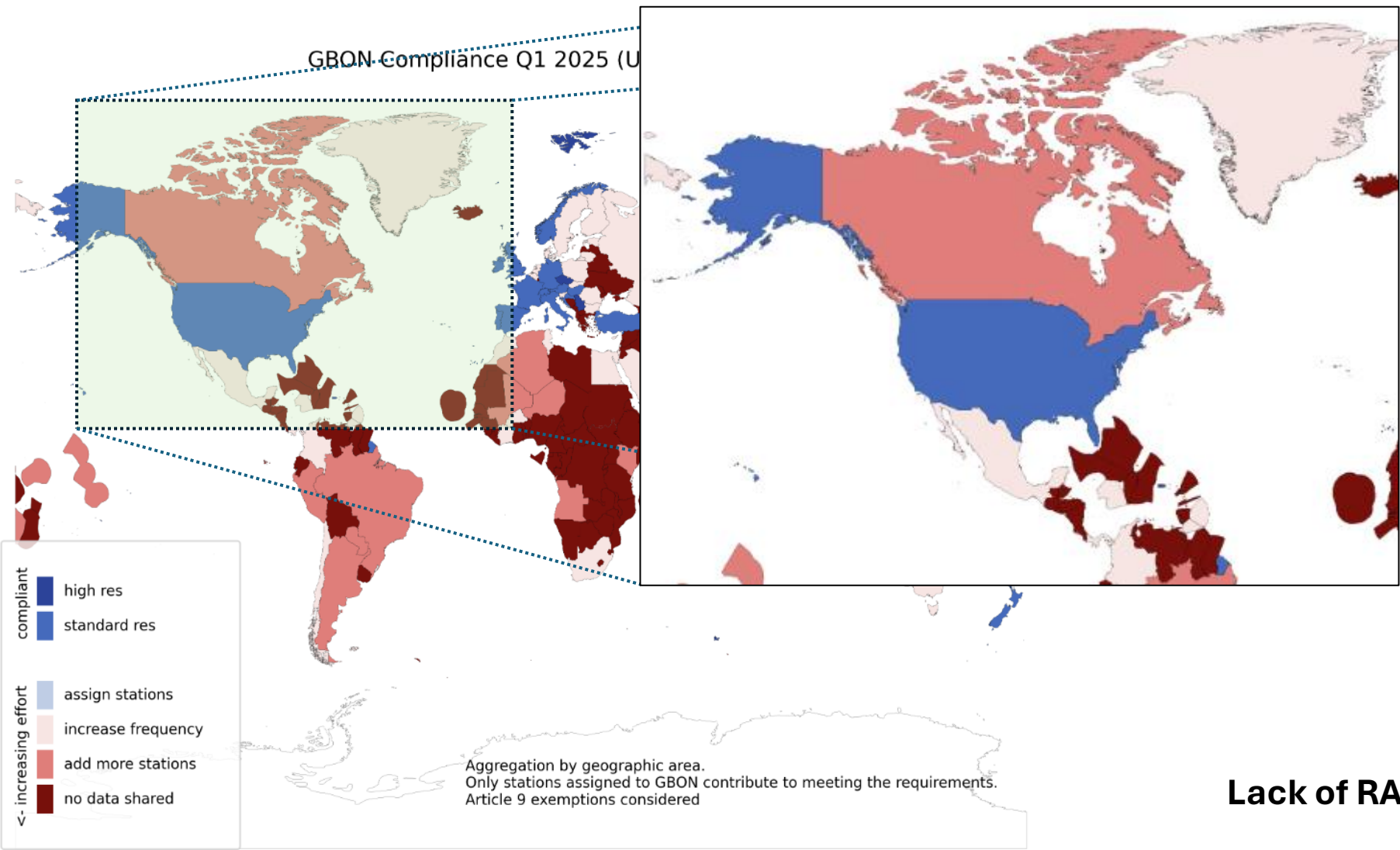
Because **lack of upper-air observations**: there are very few places where they are releasing radiosoundings balloon in time (green dots)

Because the **impact of ABO is well known due to the big amount of data**

Because it is **cheap** and helps aviation and general communities

Because it is **not necessary install any additional hardware** into the aircraft





Lack of RAOB (except US)

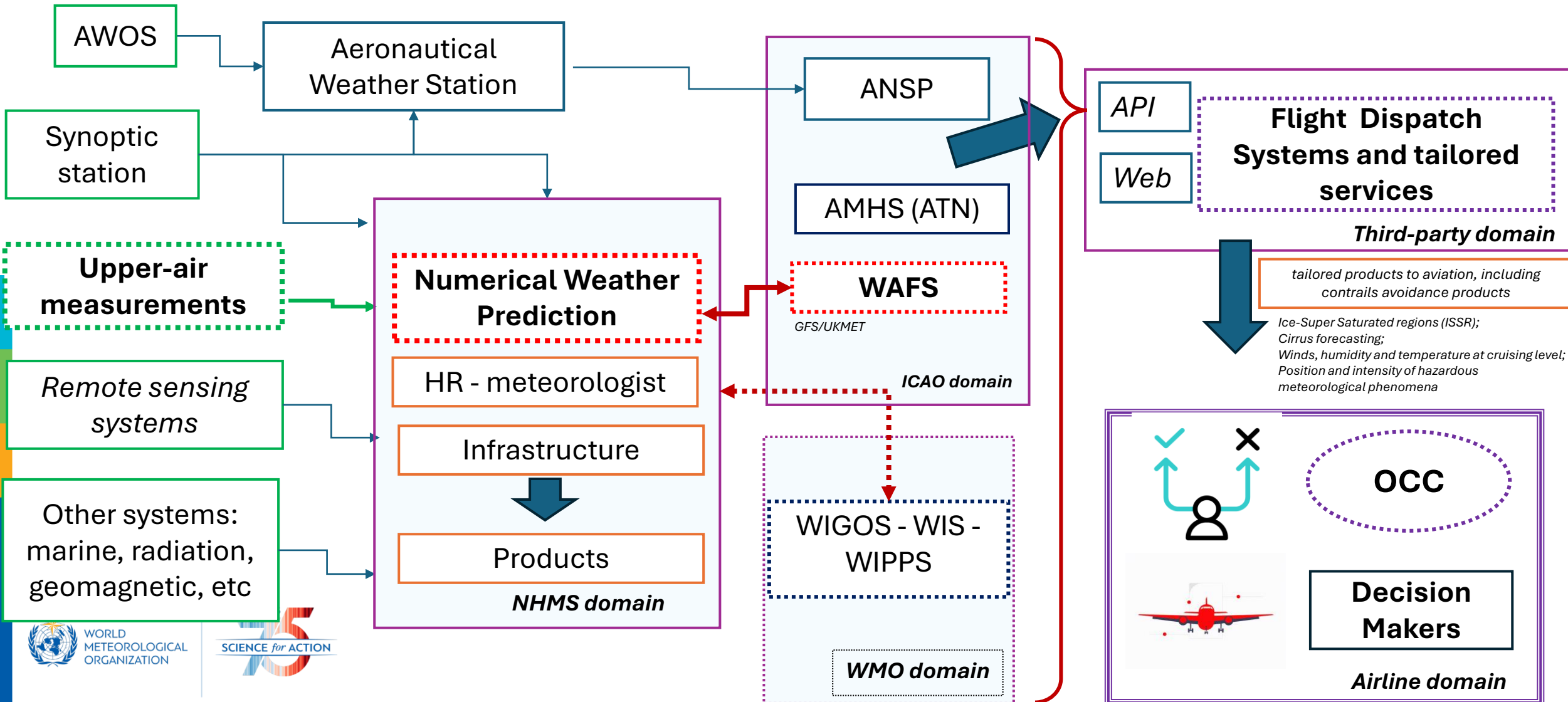
**Global Basic Observing Network
Compliance for upper-air data**

Note:
Number of compliant Members: 18 (54/21)
Gap surface stations: 2382
Gap upper-air stations: 467



Why is so important Aircraft-based Observation for aviation?

The importance of NMHS to the aviation industry



What is an ABO program?

ABO – *Aircraft Based Observations* - is a type of source of upper air data obtained by a program with collaboration of aviation industry using **aircraft systems**. They supplement data for **WMO GBON**

Advantages:

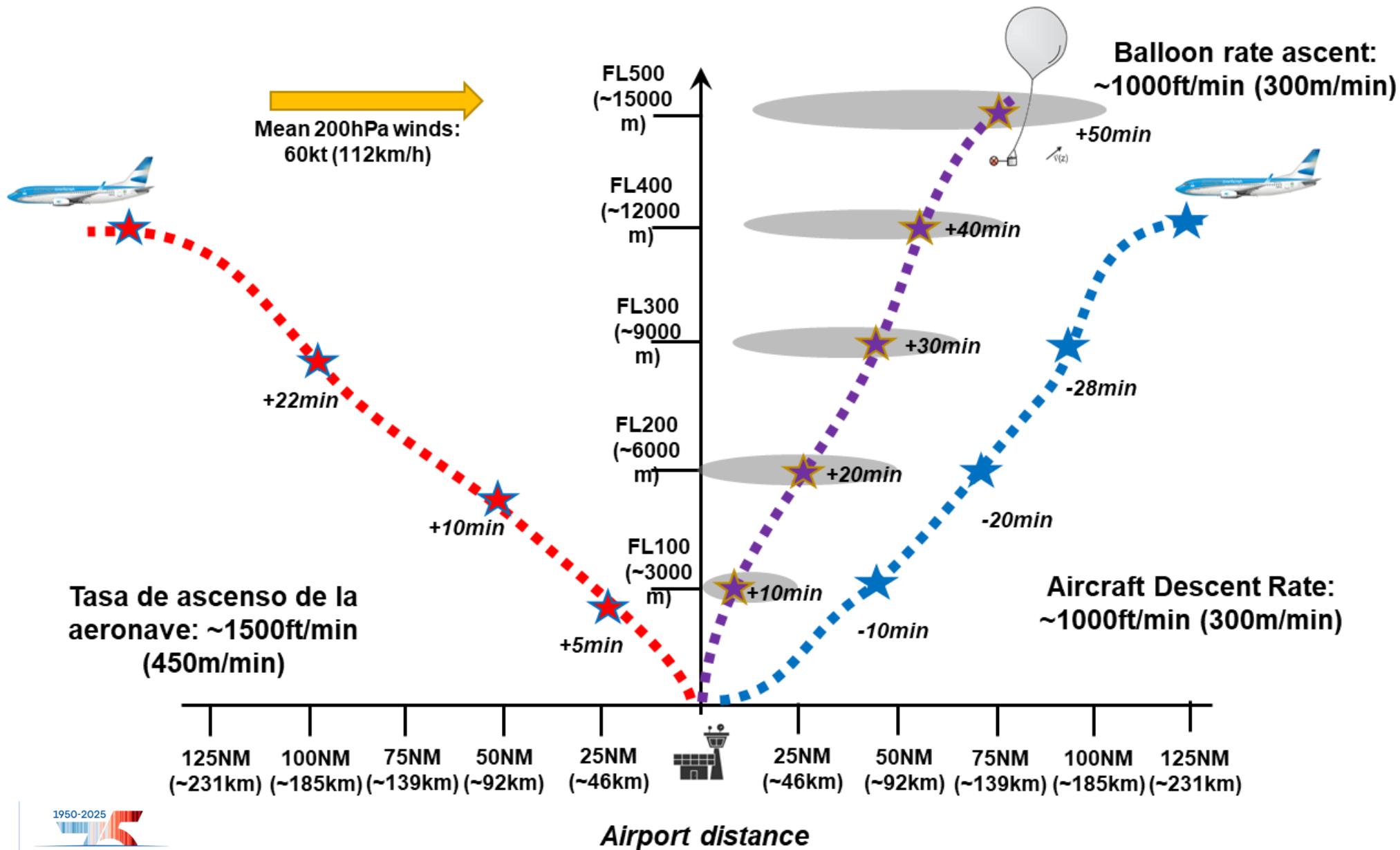
- **Accurate and very reliable**
- **Already** sampling
- Available always when aircraft is **flying**
- **High frequency** of observations in major hubs
- **No extra equipment** for temperature and wind



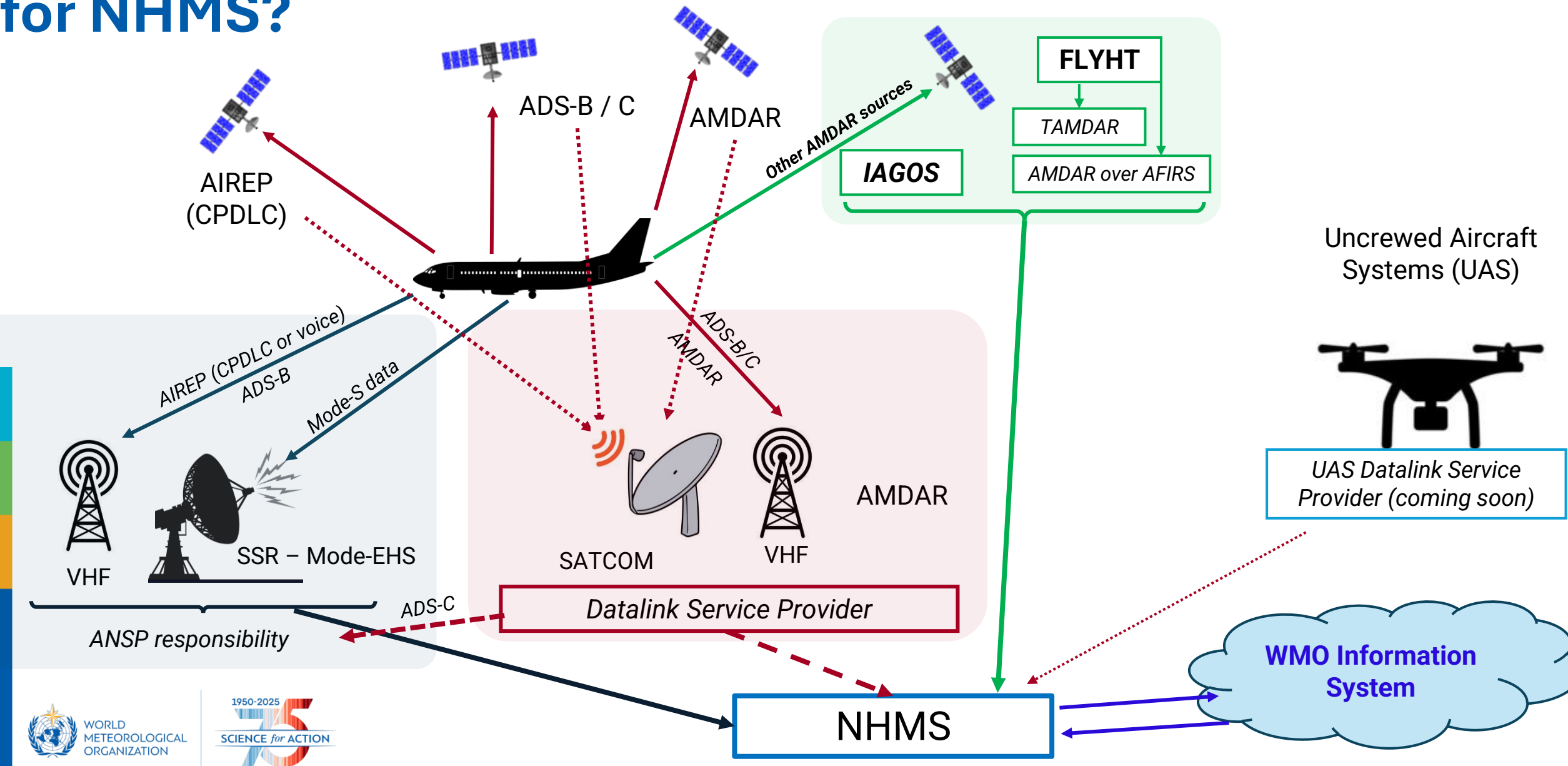
An ABO program requires a public policy from NHMS authorities

However, it should be considered:

- **DSP** - Data Communications System (comms. aircraft-ground and airline-NHMS)
- Aircraft is **not flying** everytime and everywhere – airlines are the owner of the data.
- **New methods** of quality monitoring at NHMS
- **New systems** for operations and communications between aviation stakeholders/entities and NHMS.
- **Business case** for airlines.

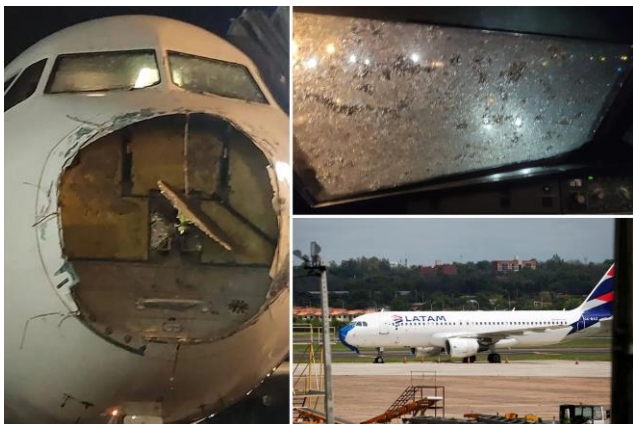


What kind of Aircraft-based Observations are available for NHMS?



Overview of Aircraft-based Observations

System / Type	Regulator / Provider	Auto/Manual	Sensors	Communications	Meteorological Information	Air-ground format	Responsible for ground reception	Responsible for Meteorological processing and WIS Provision	Preferred WIS format
AIREP	ICAO	Auto and Manual	Innate to aircraft and pilot (from cockpit display and subjective opinion)	ACARS/VHF radio	Always	ICAO Aircraft Report-AIREP	ANSP	Currently NMHS	FM94 BUFR
PIREP	FAA	Manual	Innate to aircraft and pilot (from cockpit display and subjective)	ACARS/VHF radio	Always	PIREP	NCAA	Currently NMHS	FM94 BUFR
ADS-C	ICAO	Auto	Innate to aircraft	ACARS	Optional	ICAO Aircraft Report	ANSP	Currently NMHS	FM94 BUFR
ADS-B	ICAO	Auto	Innate to aircraft	ACARS	Optional	ICAO Aircraft Report	ANSP	Currently NMHS	FM94 BUFR
SSR - Mode S	ICAO	Auto	Innate to aircraft	L-Band (SSR)	Derived	ICAO Aircraft Report	ANSP / EMADDC	Currently NMHS	FM94 BUFR
AMDAR	WMO	Auto	Innate to aircraft + water vapour sensor in WVM programme	ACARS	Always	AMDAR	NMHS	NMHS	FM94 BUFR
TAMDAR	FLYHT	Auto	Additional sensors	Satellite	Always	TAMDAR	FLYHT	NMHS	FM94 BUFR
IAGOS	IAGOS-AISBL	Auto	Additional sensors	Satellite	Atmospheric chemistry -GHG + trace gases	Not applicable	IAGOS	NMHS	Not applicable yet - only data for research by now



Benefits to Aviation Industry

Improving Operations - Airlines

A better forecast implies that:

- **Reduction** of fuel consumption
- **Trust** of Command Crews on MET-related decisions
- Choice of **optimal** alternatives
- **Reduction of cancellation of flights** where it was operable destinations and departure of flights where arrival airport is unoperable
- Reduced of **loss due to MET**



How does aircraft-based observation benefit airlines?

- Improving of Operations
- Safety

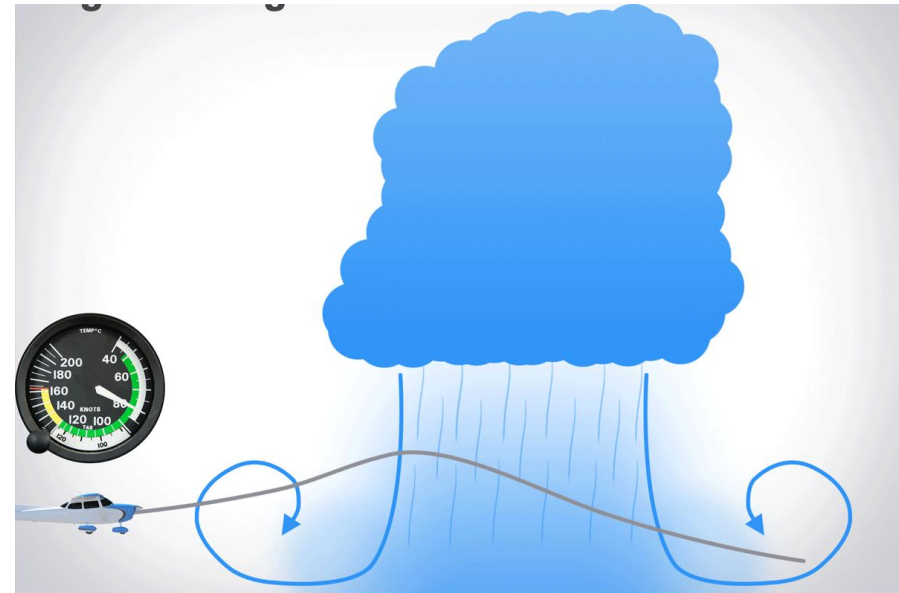
It also for

- Reducing environment impact
- Building a brand image of sustainable company



Improving Safety - Airlines

- **Reduction** of insurance premium due to reduction of MET risks on operations
- **Reduction of exposed aircrafts to hazardous weather-related phenomena**
- **Real awareness** of marginal conditions which affected past MET-incident-related flights



Environmental Aspects - Airlines

- **Reduction of fuel consumptions:** reduction of CO2 emissions due to improved operations:
 - **Reduction of soot** released by engines due to optimal operations: this reduces persistent contrails formation under favourable conditions
- **Contrail avoidance:** better NWP capabilities with better ABO data will brief products for contrail avoidance procedures.
- Contribution of ABO data will **reduce uncertainties** related to non-CO2 aviation emissions
- **Discussion about reducing carbon taxes** related to reduced CO2 emissions

Building a brand image with ABO - Airlines

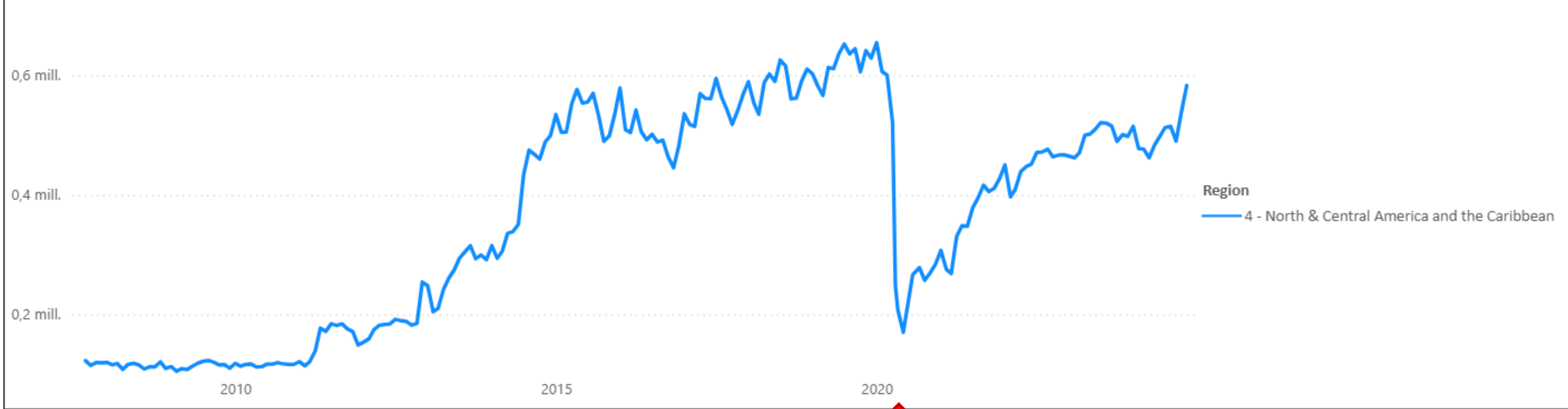
- Better operations due to **improved MET products by ABO:**
 - **Reduction of delays/cancellations** and better perception of customers
- **Building a new paradigm** on Public-Private Engagement and alliance with other stakeholders on Environment.
- Perception of **environmental-friendly and sustainable company** due to its **engagement on environmental monitoring**



Current and past experiences over RA IV - What we can learn from those experiences?

Evolution of ABO in RA IV

Aircraft-Based Observations Monthly mean observations per day on WIS - Regional Program IV



COVID-19 Pandemic outbreak

Canadian Programme

Canadian Background

- 1999: Initial Business Case developed
- Early 2000's: Canada's implementation atypical (i.e. began with Regional airlines vs national) as Air Canada was restructuring and WestJet was focused on business growth
- 2000-2002: Enrollment of Air Canada Regional Inc. (Jazz Aviation LP)
- 2005: Jazz DCH-8 disabled due to AMDAR coding issues
- 2009-2014: Attempts for expansion, addition of NAVCANADA
- 2017: New engagement strategy through the MSC Upper Air Renewal program (focus on the North)
- 2019: Unexpected expansion from Jazz
- 2019-2020: First Air and Canadian North AMDAR data flowing into MSC systems through FLYHT

Current Status of the Canadian Program

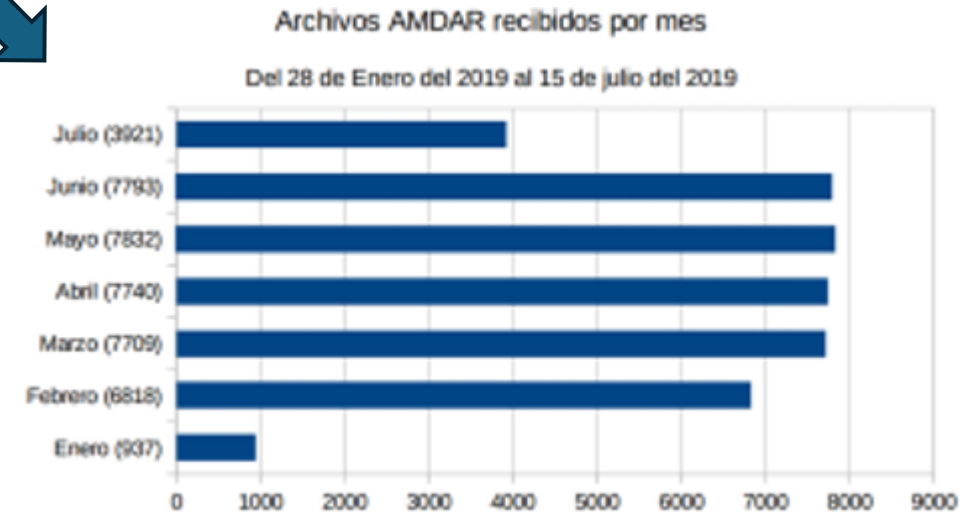
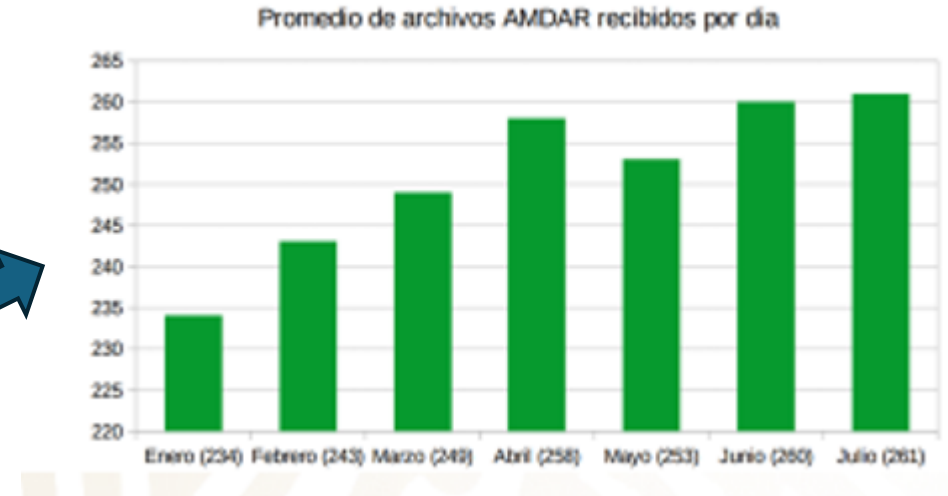
- Work ongoing for the business case to sustain Canadian program
- Jazz LP contribution to the Canadian program is declining
 - Jazz is replacing it's CRJ-200 with DHC-8/Q-400, which do not have capability to meet temperature accuracy requirements
 - Mitigation: Ongoing negotiation to include CRJ-900 fleet
- FLYHT is exploring new potential aircraft with northern routes
- Impact of FLYHT data on NWP models completed

Airlines	Aircraft type	Data aquisition	Count
Jazz LP	CRJ-200	Airline	16
Canadian North	B737	Data Provider	10
NavCanada	CRJ-200	Airline	2
First Air	B737	Data Provider	1

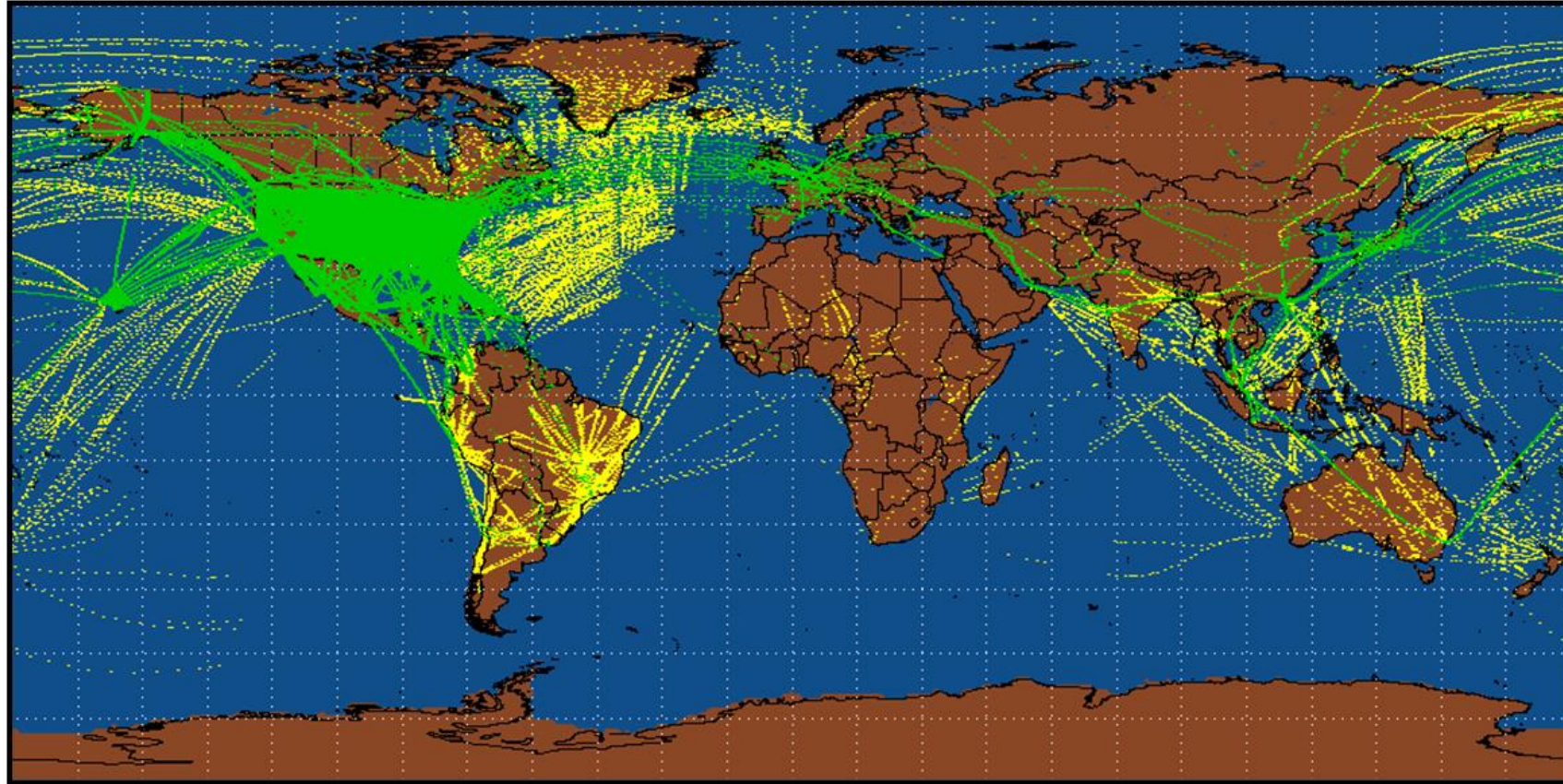
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Mexican Programme



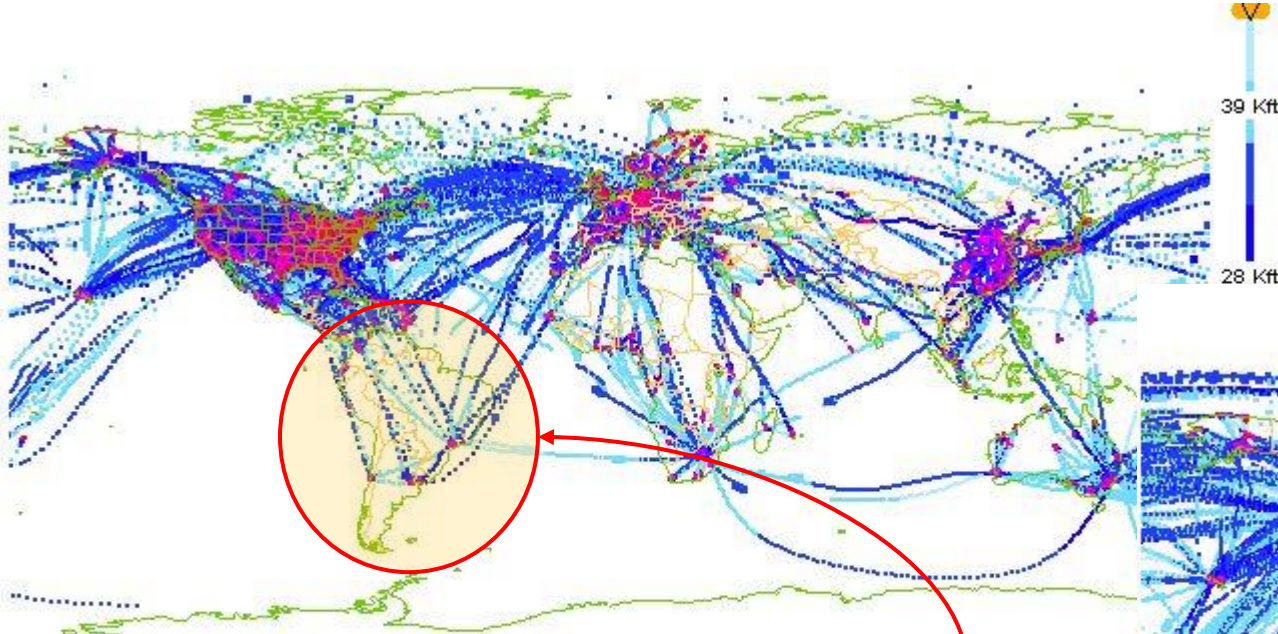
US Programme + US Latam Programme



In 2016, USA began providing LATAM over South America (up to 1000 profiles daily). These funds were intended to expire after 3 years but NOAA has managed (until 2021) to continue providing the resources.

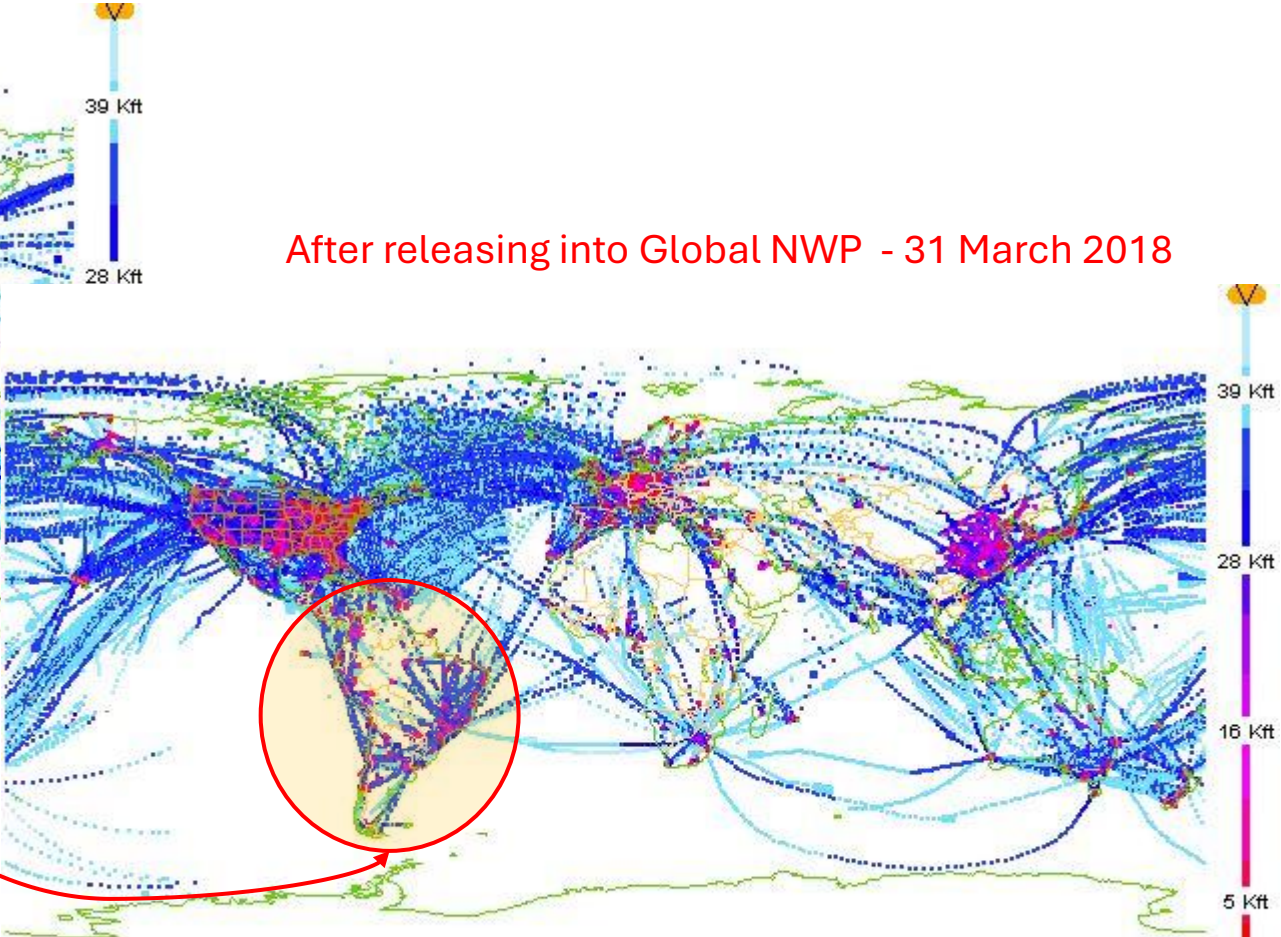
Green: US National ABO Programme; **Yellow:** US LATAM Programme

Improved upper-air data coverage due to LATAM data input



Before releasing into Global NWP - 31 March 2016

31-Mar-2016 00:00:00 -- 31-Mar-2016 23:59:58 (753170 obs loaded, 689802 in range, 21752 shown)
 NOAA / ESRL / GSD Altitude: -1000 ft. to 45000 ft. Good w and T



After releasing into Global NWP - 31 March 2018

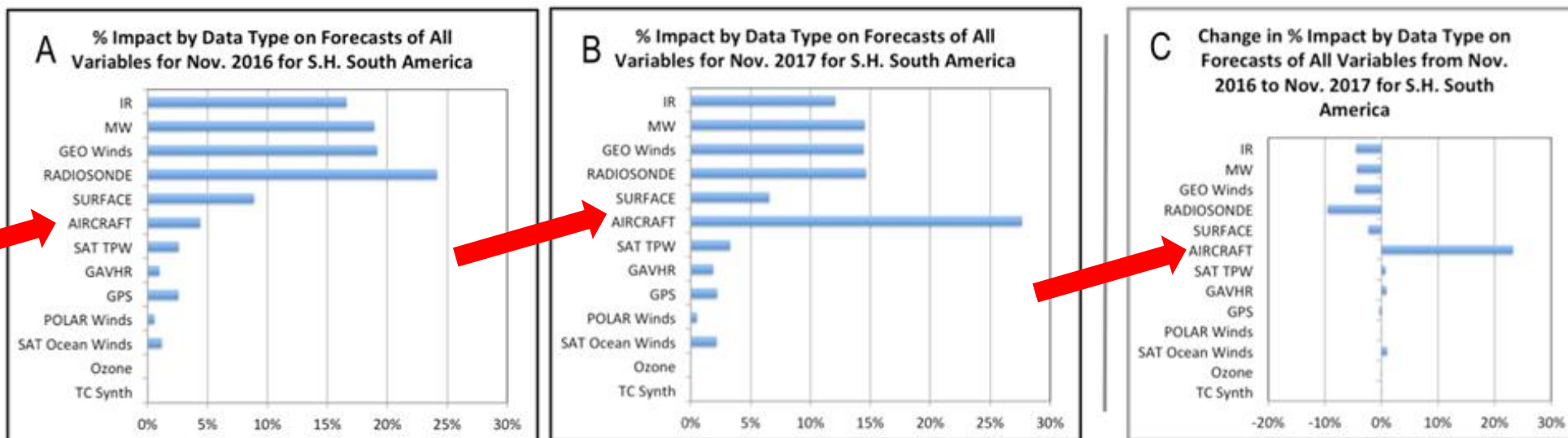
31-Mar-2018 00:00:00 -- 31-Mar-2018 23:59:59 (862938 obs loaded, 747643 in range, 34500 shown)
 NOAA / ESRL / GSD Altitude: -1000 ft. to 45000 ft. Good w and T

31 March 2018



Outcomes LATAM during 2016-2021

- LATAM contributed solely with **24% of impact on NWP** at regional level, totalizing a **28% of increased** error reduction!



Comparison of impact of 13 major types of observations from the Southern-Hemisphere South American region used in NAVGEM global forecasts during Nov. 2016 (A) and Nov. 2017 (B). Changes in impacts from 2016 to 2017 are isolated in panel C with positive %s indicating increased error reduction in short-range forecasts due to LATAM data only.

Key Messages

- Canada and USA provide ABO sources spanning much of North America
- When LATAM had been available, evidence shows substantial improvements to Global NWP
- USA positioned to continue providing current sources including cost burden and sharing with WMO Members
- ICAO data (AIREP/PIREP) provision are two orders of magnitude smaller than WMO data.
- SSR Mode-S (EHS) is a good alternative, however it require strong collaboration between ANSP and NMHS.

Muchas gracias!

Thank you!