

# The WMO Global Basic Observing Network (GBON)

*A WIGOS approach to securing observational data for critical global weather and climate applications*

***Presenter: Luis Nunes***

Authors:

Lars Peter Riishojgaard, Robert Varley, WMO Secretariat,  
Anthony Rea, Bureau of Meteorology Australia



**WMO OMM**

World Meteorological Organization

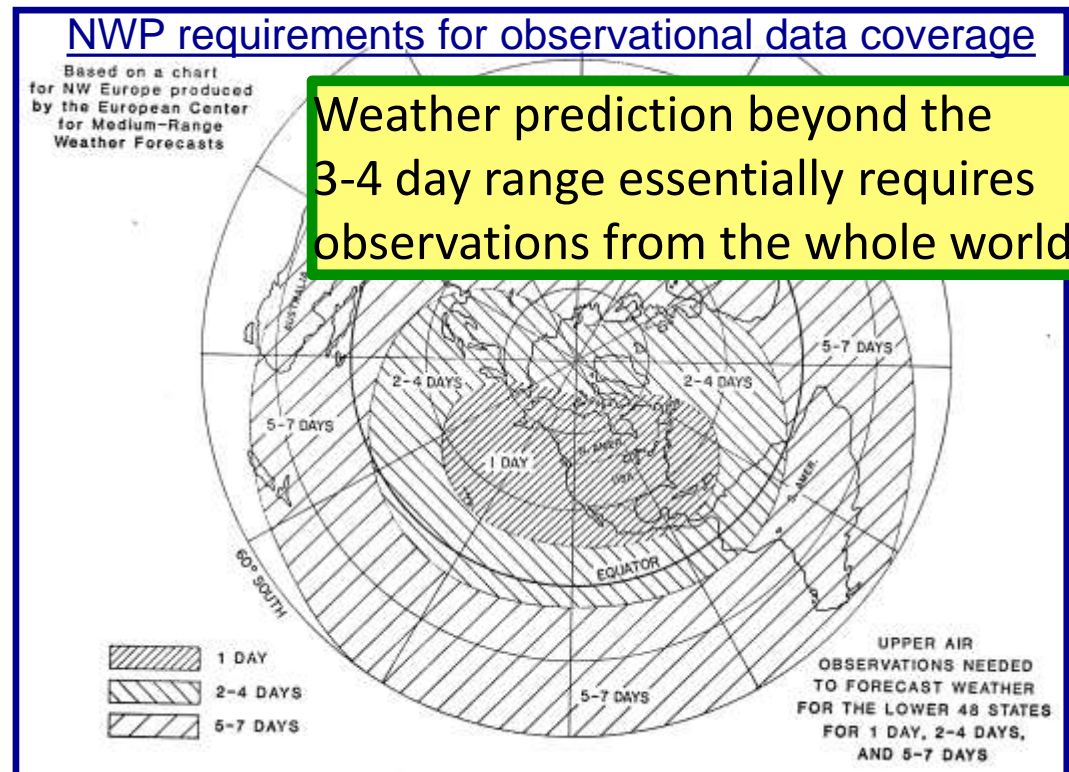
Organisation météorologique mondiale

# Overview

1. Why is it important to have weather and climate observations everywhere on the globe?
2. Where are we currently missing observations?
3. Why is it urgent to strengthen the observational basis for Global NWP?
4. What is WMO doing about this problem ?
5. Economics of observational data exchange.
6. What is the expected impact of GBON on WMO Members?
7. Summary and conclusions

# 1.1 Why is it important to have observations everywhere?

- Generally, any **lack of observations over one area** of the globe will **limit our ability to understand and predict** weather and climate patterns everywhere else.
  - **“In meteorology, ignorance knows no boundaries”**
- Global Numerical Weather Prediction is a **foundational capability** for all weather prediction and most climate monitoring activities;
- Global Numerical Weather Prediction **depends on availability of global coverage of observations**;

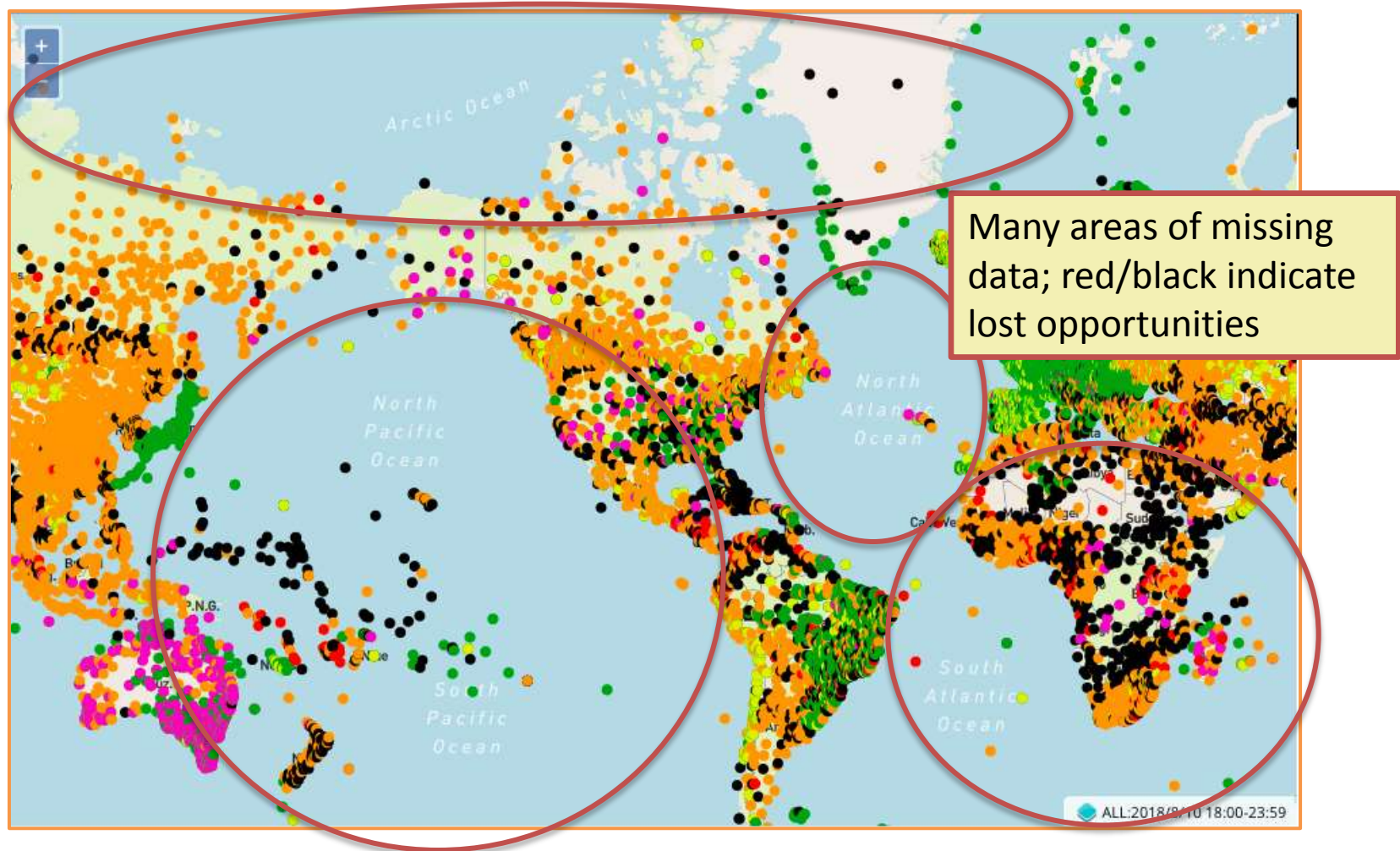


## 1.2 WMO Application Areas listed in the RRR

(October 2018)

- 1. Global numerical weather prediction**
2. High-resolution numerical weather prediction
3. Nowcasting and very short range forecasting
4. Seasonal and inter-annual forecasting
5. Aeronautical meteorology
6. Forecasting atmospheric composition
7. Monitoring atmospheric composition
8. Atmospheric composition for urban applications
9. Ocean applications
10. Agricultural meteorology
11. Hydrology
12. Climate monitoring *(currently under revision by GCOS and WCRP)*
13. Climate applications *(currently under revision by GCOS and WCRP)*
14. Space weather

## 2. Where are we currently missing observations?



*Current availability of critical data for global NWP (example: Surface pressure observations received by global NWP Centers on August 10 2018, 18Z)*



### 3. Why is it urgent to strengthen the observational basis for Global NWP?

- Current data exchange practice is largely based on WMO Publication 540 (**Manual on the Global Observing System**) and on WMO **Resolution 40** (Cg-11);
- Resolution 40 was adopted in **1995**; **NWP has made immense progress since that time** and current requirements are vastly different;
- Congress resolutions define policy and do not contain sufficient technical detail to allow for consistent implementation by all Members;
- Additional material is available in guidance documents such as CBS recommendations, implementation plans, etc.; many Members will, as a matter of principle, base their **practice only on regulatory material**;
- Current WIGOS monitoring data show **unacceptable gaps in data coverage over many areas** (previous slide);
  - In many cases **additional observations are being made, but not currently exchanged**, due to a lack of clarity from WMO regarding the obligation of the Members.

## 4.1 Draft GBON provisions for the new Manual on WIGOS; Surface Observations

*(to be submitted to Cg-18 for approval)*

- 3.2.2.4 Members **shall** operate a set of surface land observing stations/platforms that observe atmospheric pressure, air temperature, humidity, horizontal wind, precipitation and snow depth, located such that the GBON has a **horizontal resolution of 500 kilometres or higher** for all of these variables, with an **hourly frequency**.
- *Notes:*
  1. *Many manual stations achieve a frequency less than hourly; these nevertheless provide a valuable contribution to the GBON.*
  2. {...}
- 3.2.2.5 Members **should** make available additional surface land observations of atmospheric pressure, air temperature, humidity, horizontal wind, precipitation and snow depth that enable GBON to have a **horizontal resolution of 100 kilometres or higher** for all of these variables, with an **hourly frequency**.

## 4.2 Draft GBON provisions for the new Manual on WIGOS; Upper Air

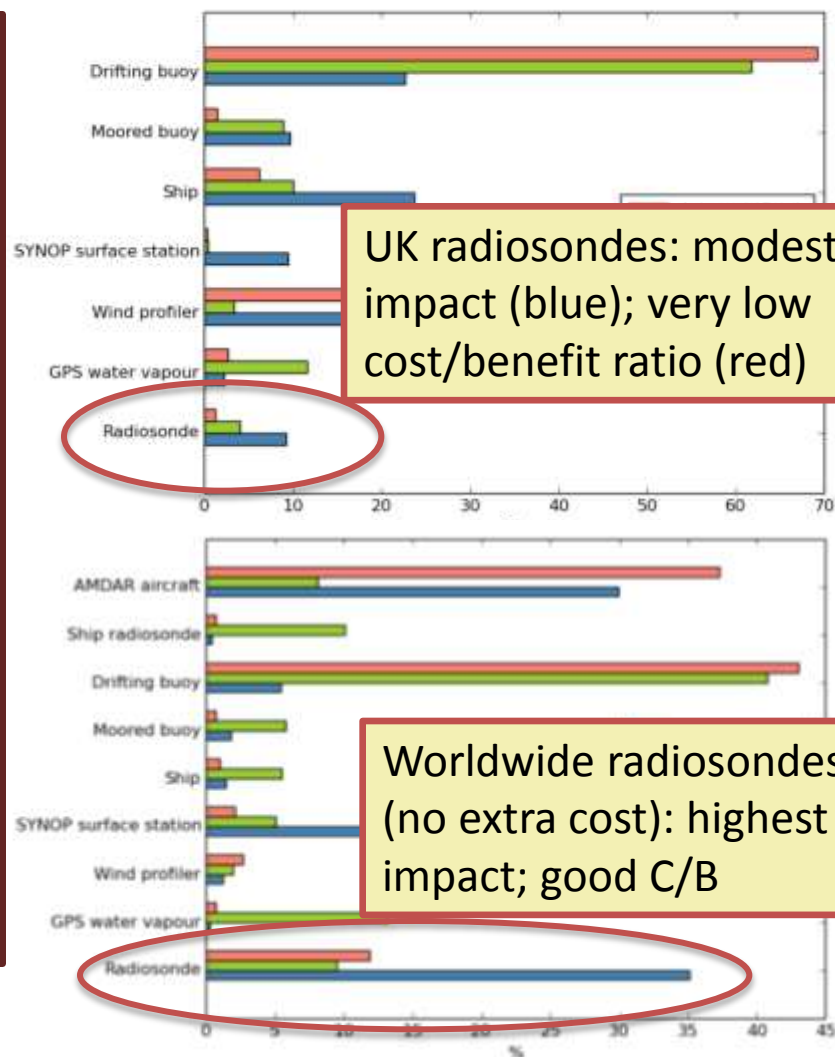
*(to be submitted to Cg-18 for approval)*

- 3.2.2.7 Members **shall** operate a set of upper air stations over land that observe temperature, humidity and horizontal wind profiles, with a vertical resolution of 100 m or higher, **twice a day** or better, up to a level of 30 hPa or higher, located such that GBON has a **horizontal resolution of 500 kilometres or higher** for these observations.
- *Notes:*
  - 1. *Radiosonde systems currently provide the means for collecting such observations.*
  - 2. *Upper air observations obtained over remote/isolated islands have particularly high impact on Global NWP skill, and continued operation of these stations are of high priority for GBON.*
- 3.2.2.8 Members **should** operate a subset of the selected GBON upper air observing stations that observe temperature, humidity and horizontal wind profiles up to 10 hPa or higher, at least once per day, located such that, where geographical constraints allow, GBON has a horizontal resolution of 1000 kilometres or higher, for these observations.

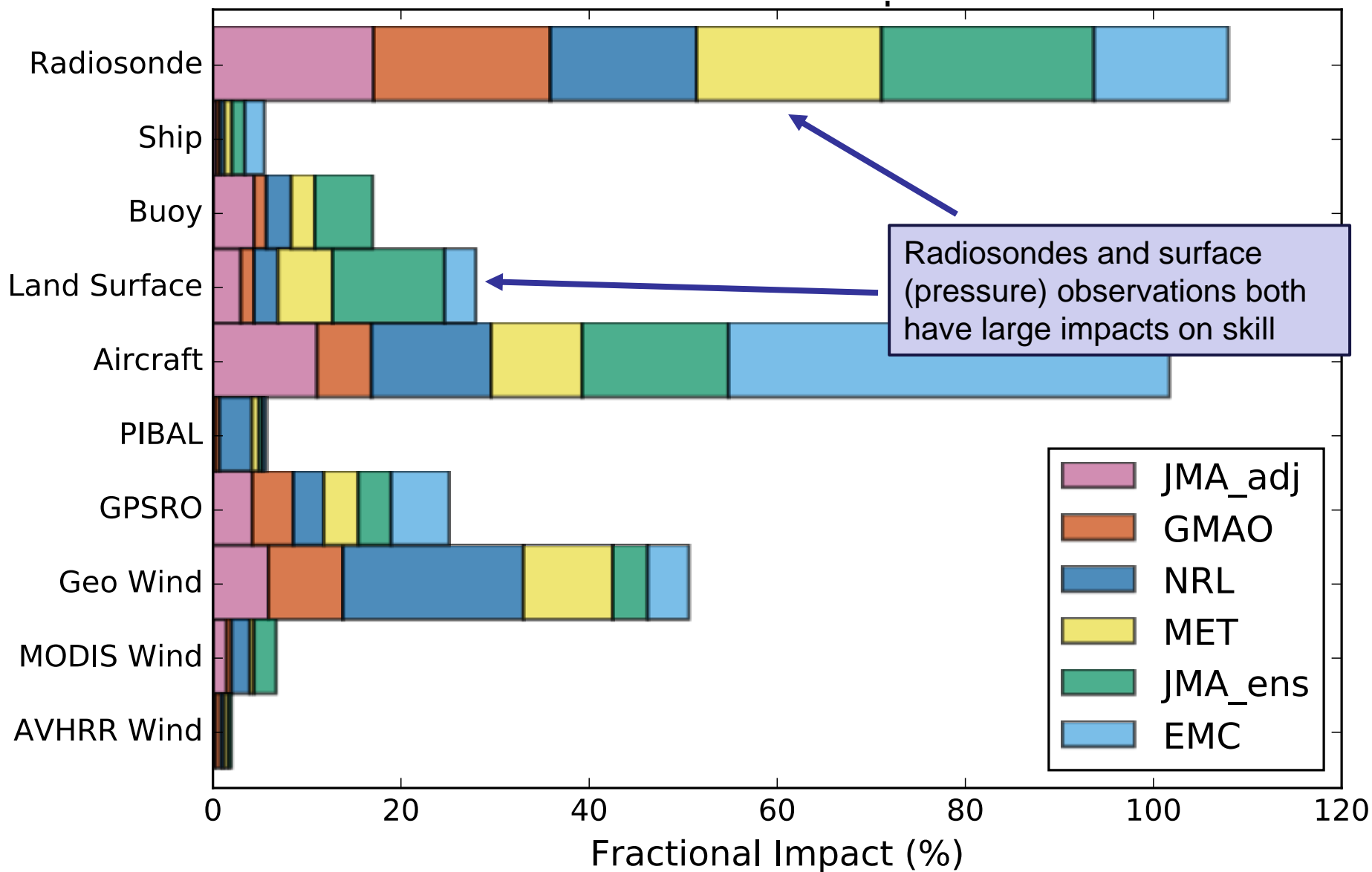


## 5. Data exchange and economic return on investment

- Observations are essential for predicting weather and climate, **but**;
  - **Single observations have no value** on their own; international exchange of observations is what makes them valuable;
  - Jigsaw puzzle analogy: Full potential realized only if all the pieces are available;
- **UK example**; national analysis of investment in observing systems;
  - Example shows that data exchange is a highly effective multiplier for economic return on investment in observations!



# Fractional Impact at 00UTC: **Other Observations**



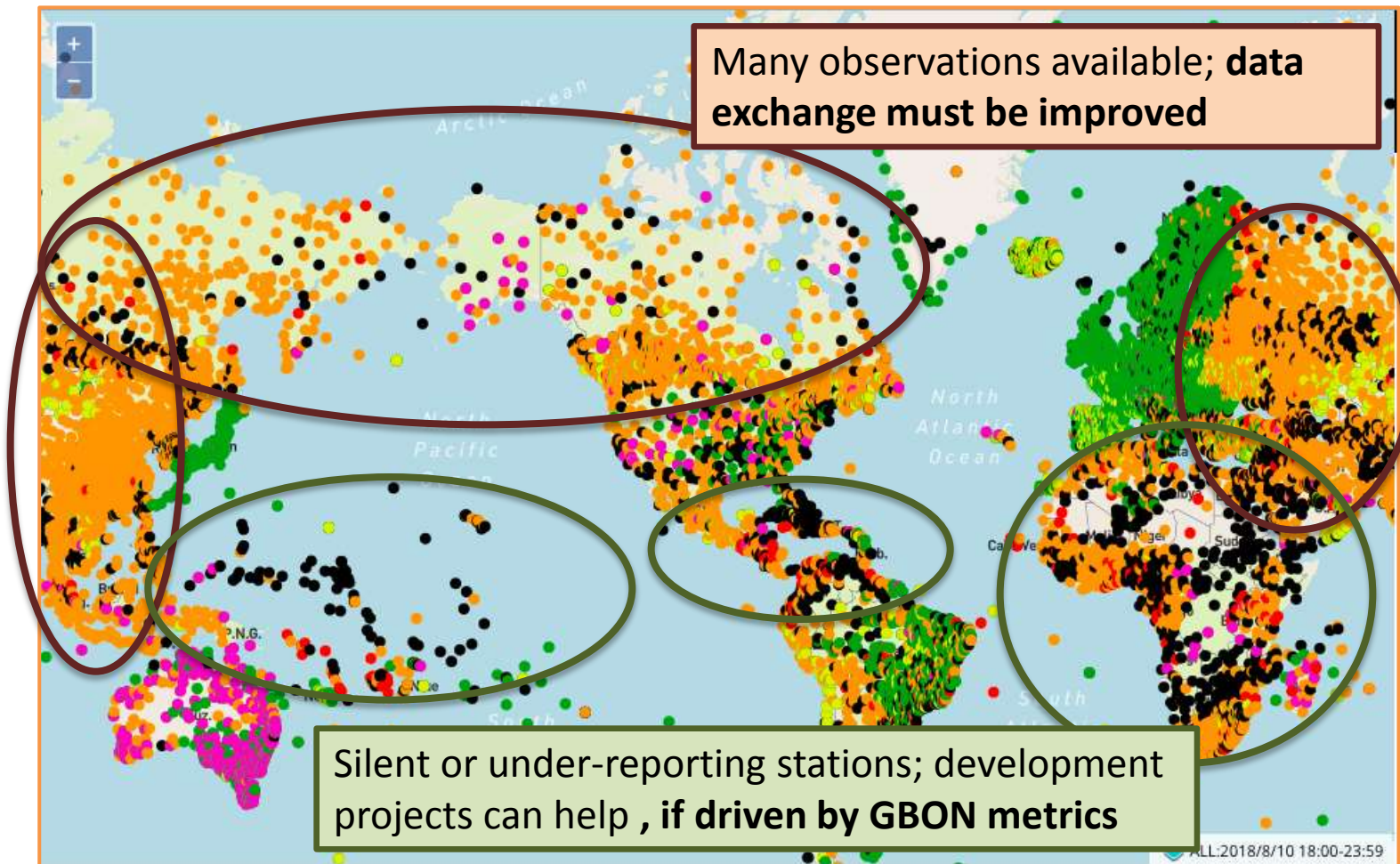
## 6.1 What is the expected impact to WMO Members of GBON?

- **First of all: Access to better NWP model guidance and climate analysis products for all WMO Members**
- **Implementation requirements depend** on where you are in the world; four broad categories (levels of difficulty of implementation) can be identified:
  1. GBON-compliant observations are already made and exchanged internationally;
  2. GBON-compliant observations are currently made, but not all required observations are exchanged;
  3. GBON-compliant observations are not made, but could conceivably be made if adequate resources were available;
  4. Achieving GBON compliance is unrealistic with currently available technology

## 6.2 Expected impact of GBON (II)

- Four categories of implementation (examples):
  1. Members already complying with the GBON provisions (e.g. Japan, Western Europe); no further action is needed;
  2. Observations complying with the GBON requirements are made, but not currently exchanged (e.g. USA, China); **new data exchange practices need to be adopted**;
  3. Insufficient local (national) resources available to meet GBON requirements (e.g. Africa, South Pacific); **use GBON provisions to help steer internationally funded development projects**;
  4. GBON requirements currently not met due to geographic constraints (e.g. Indian Ocean, North Pacific); clear role for new or emerging technologies, space-based remote sensing.

## 6.3 Expected impact of GBON (III)



*Current availability of critical data for global NWP (example: Surface pressure observations received by global NWP Centers on August 10 2018, 18Z)*



## 7. Summary and Conclusions

- Ensuring a **continuous real-time supply of observational data from all areas of the globe** to critical global NWP and climate analysis systems is **vital to product generation** and service delivery capabilities of all WMO Members;
- The **current availability** of observational data falls well short of agreed requirements, this **limits the ability of all WMO Members** to predict and understand the atmosphere **at all time-scales**;
- The **GBON provisions in the Manual on WIGOS will clarify the obligations** of the WMO Members in this regard, and can **help** guide both **national WIGOS implementation and internationally funded development projects.**

# Thank you

[www.wmo.int/wigos](http://www.wmo.int/wigos)



**WMO OMM**

World Meteorological Organization

Organisation météorologique mondiale