

B9.02 New Mission Concepts

An overview of the future observation requirements for strategic developments in Numerical Weather Prediction

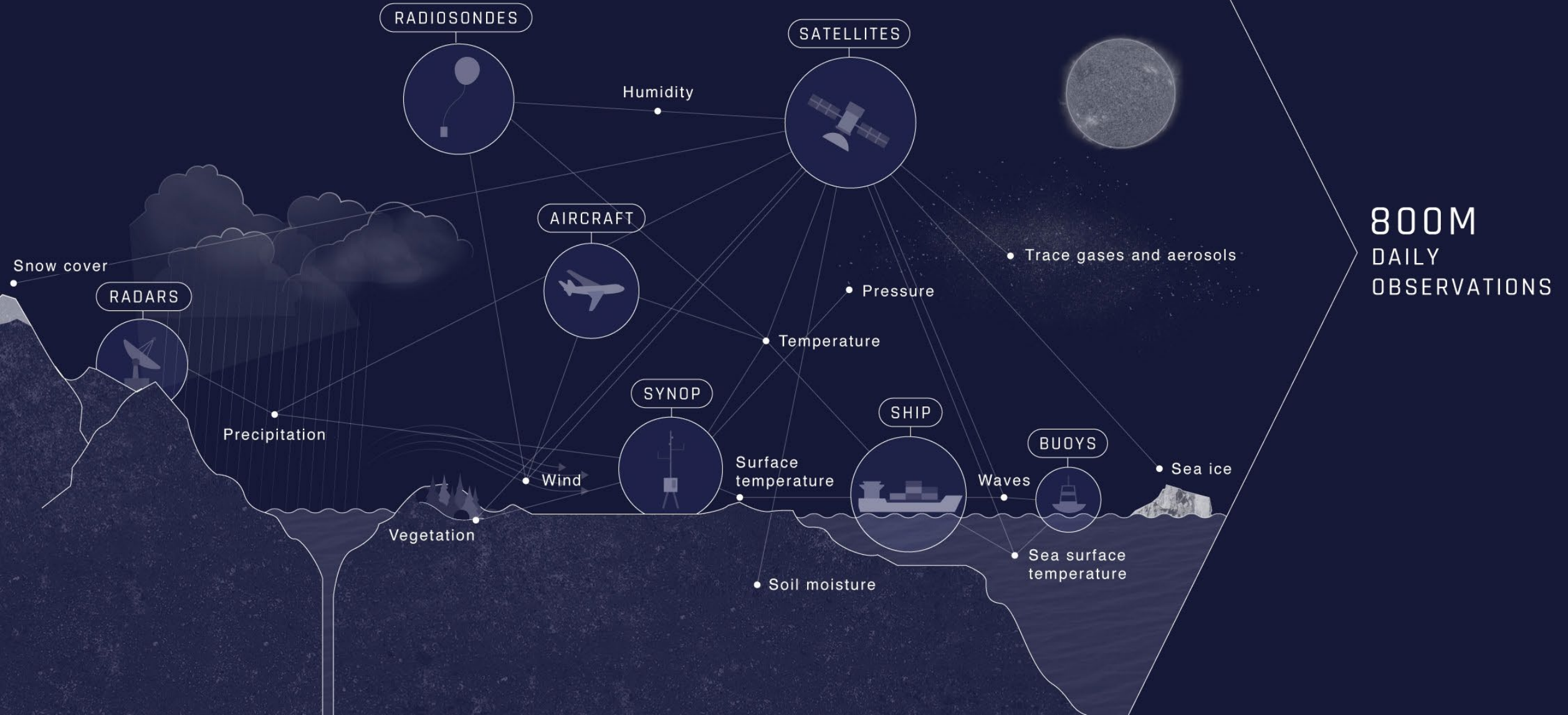
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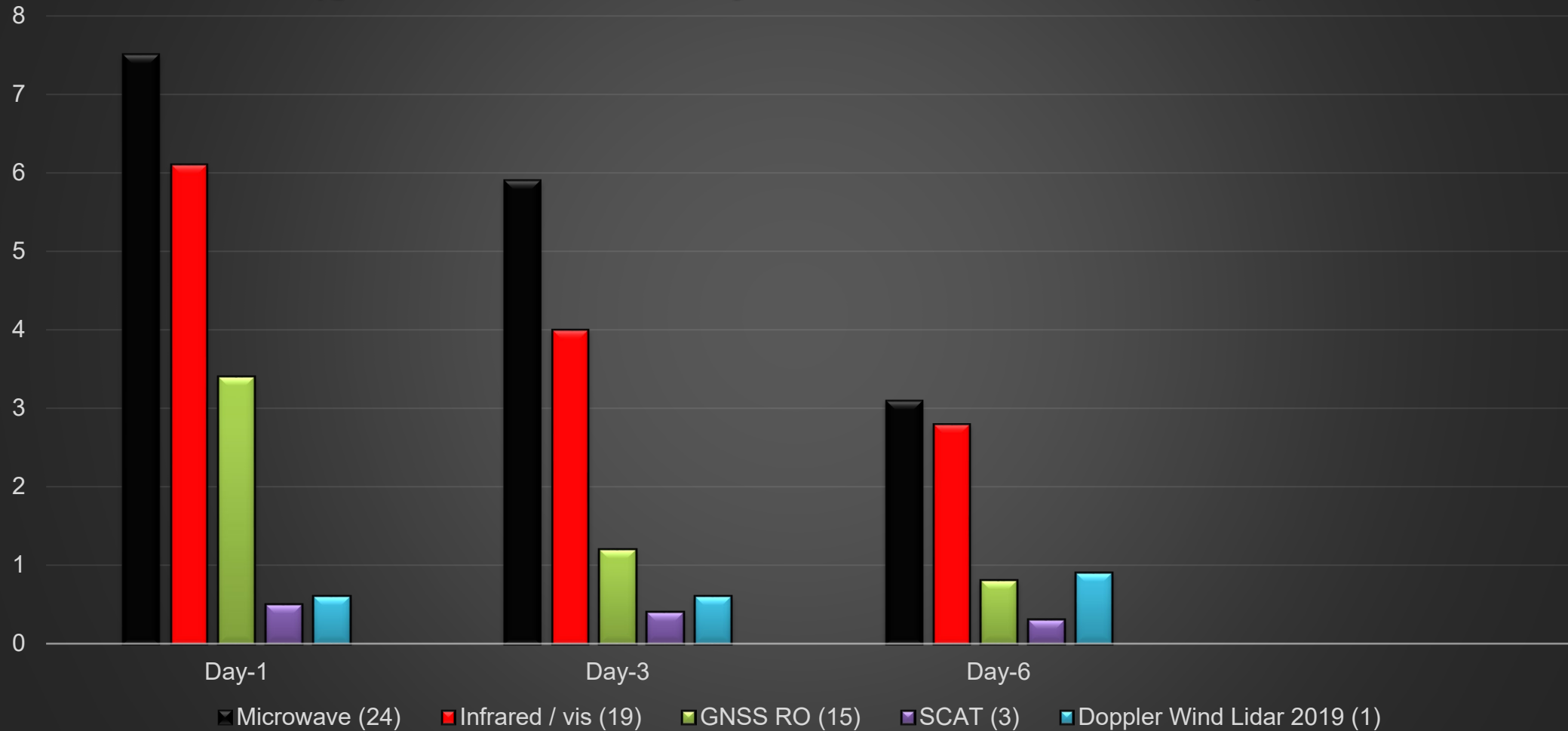
CAPTURING THE WEATHER

To predict the future, we observe the present. Every day, we absorb 800 million observations to create a detailed snapshot of Earth's weather.

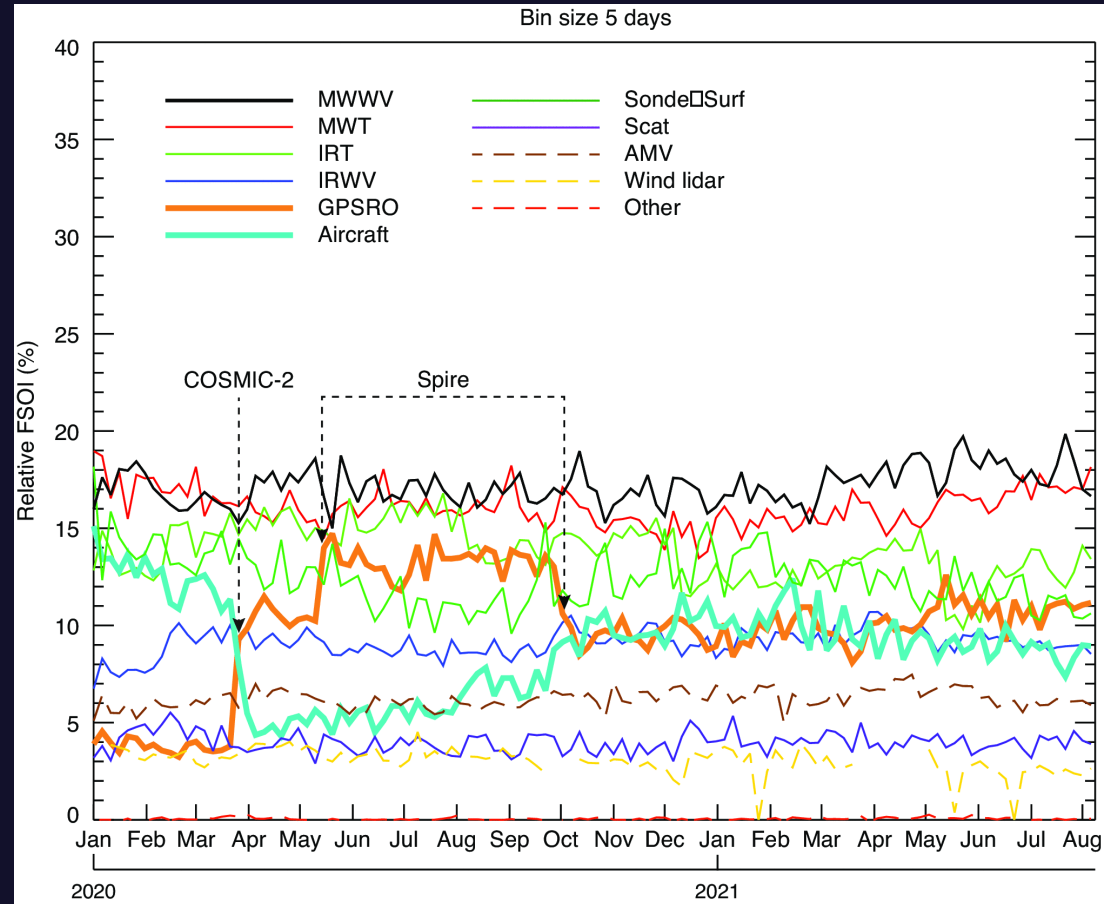


Measuring observation impact: OSE

Percentage loss of forecast skill on denial (global z500 anomaly correlation – SON 2020)

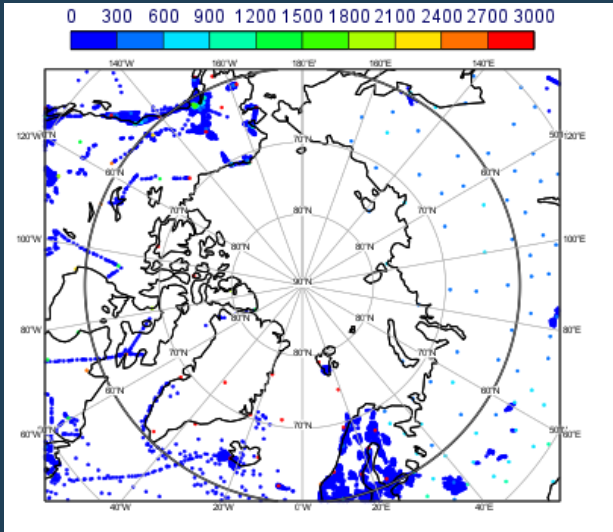


Measuring observation impact: FSOI

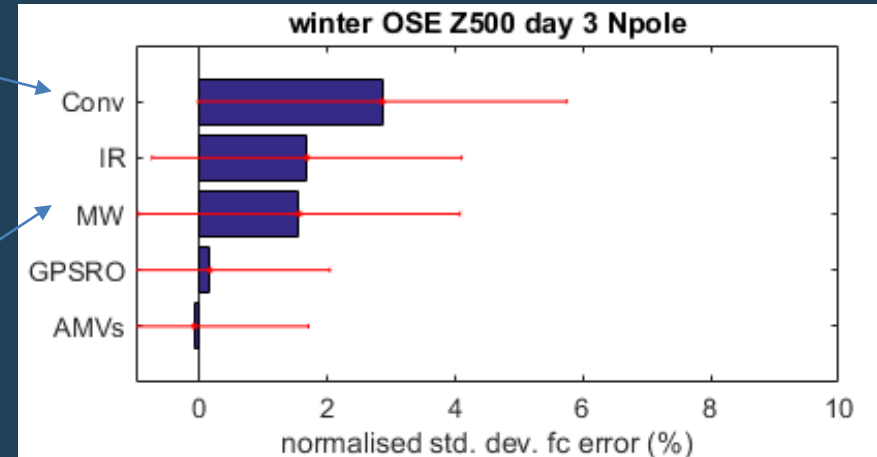
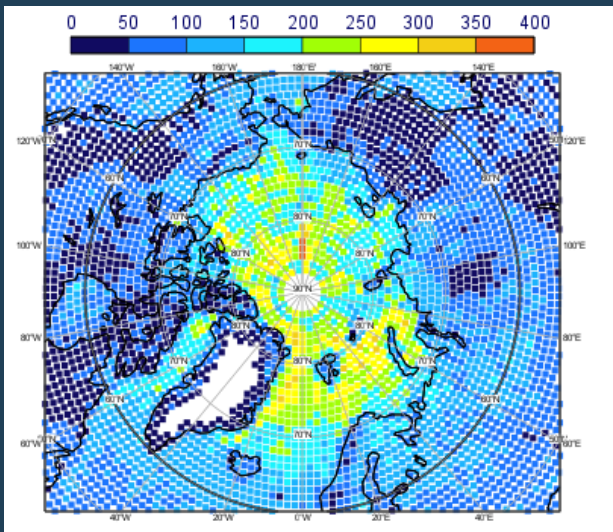


Gaps depend on science maturity not just hardware

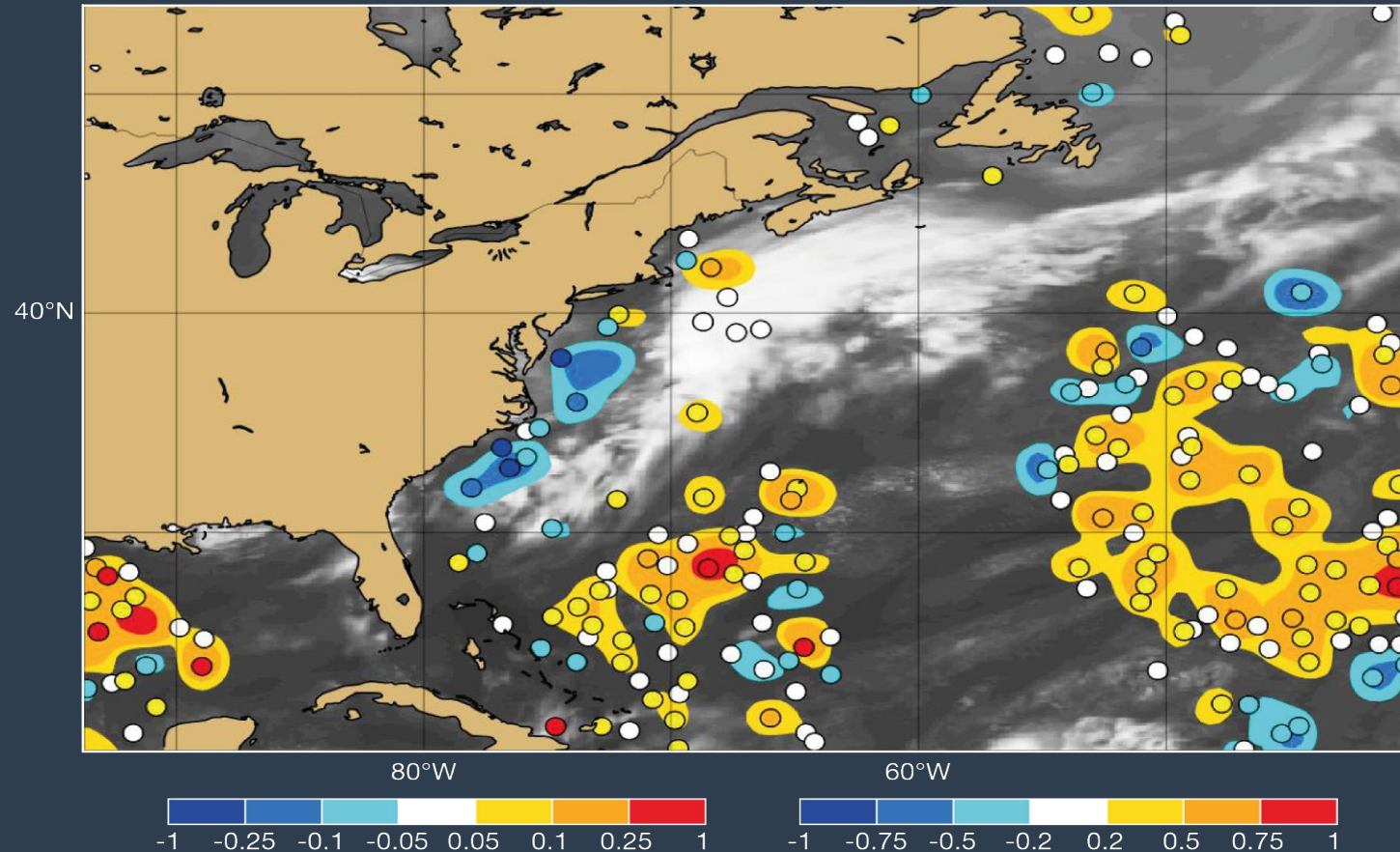
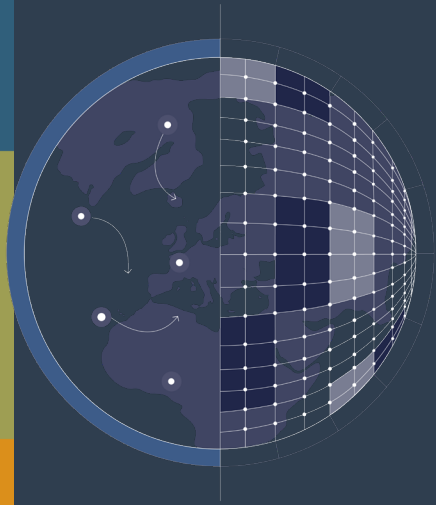
Number of
temperature
obs 400-600
hPa



Number of
satellite obs
(AMSU-A)



Developments in coupled Earth system data assimilation

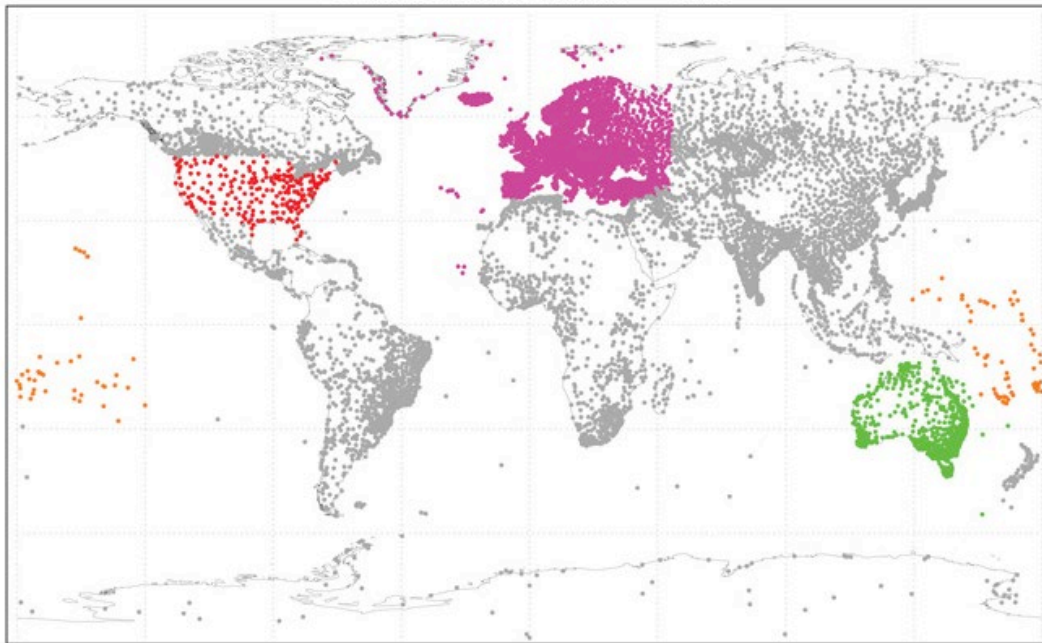


Ocean skin temperature increments (contoured colours) resulting from skin temperature departures (circles) analysed in 4D-Var from Metop-C IASI, overlaid on top of model estimated cloud cover

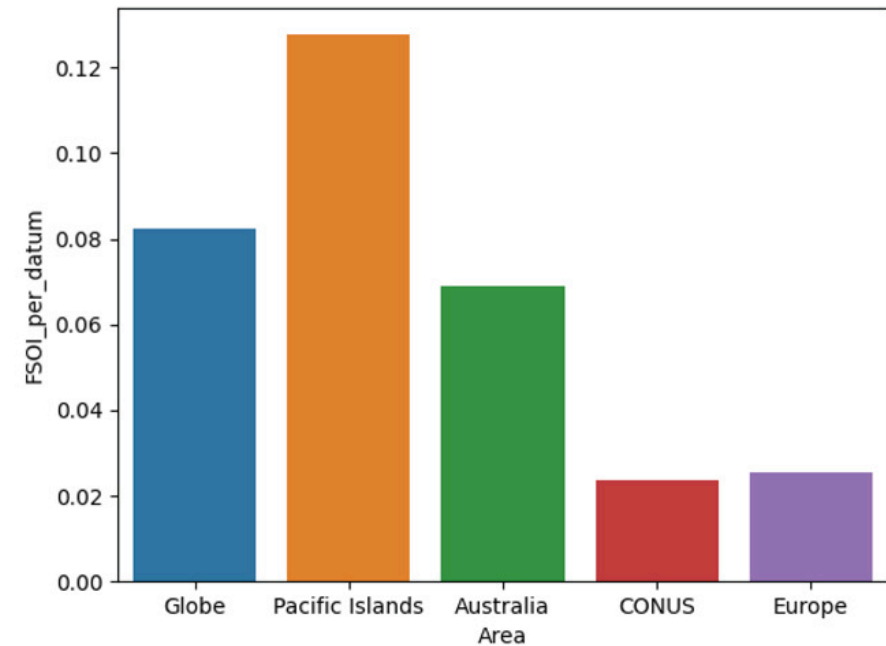
SOFF : Systematic Observation Financing Facility

FSOI can guide investments in observations such as SOFF

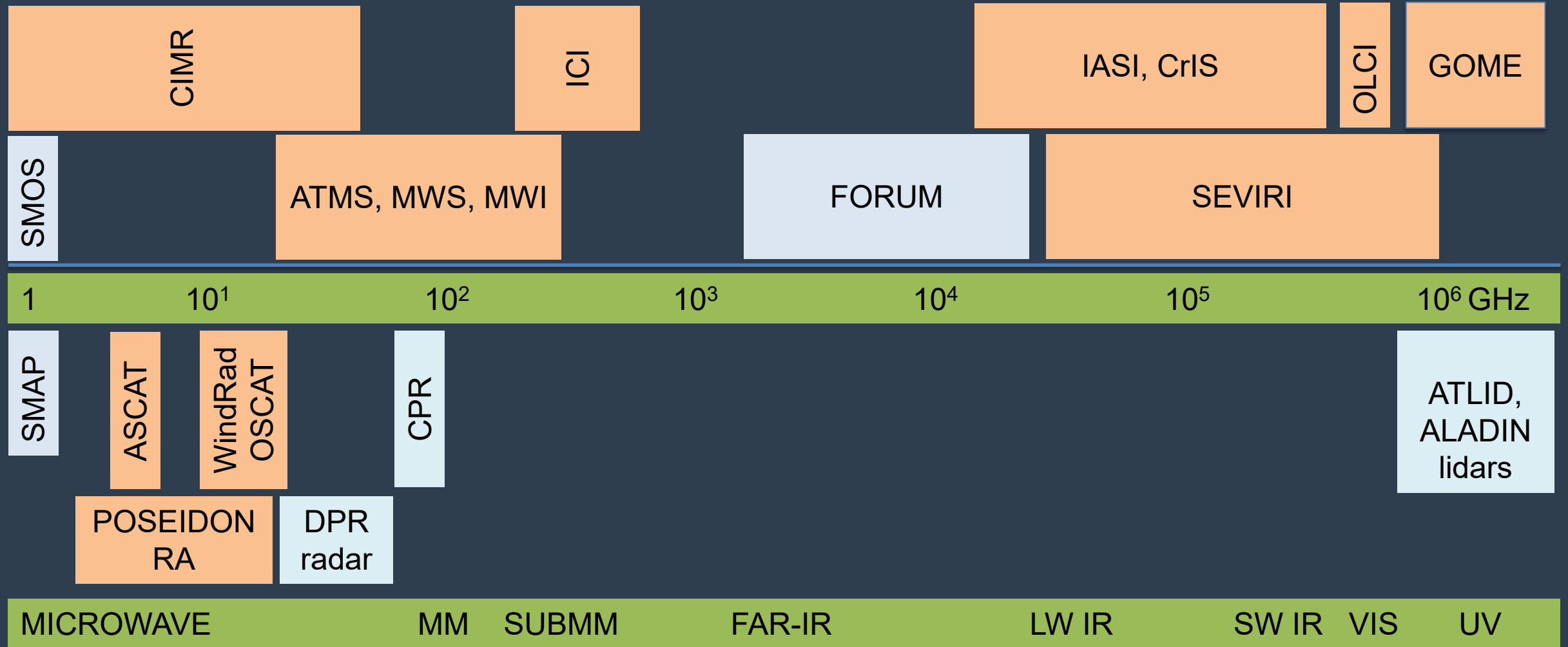
December 2020: Synop stations 10482



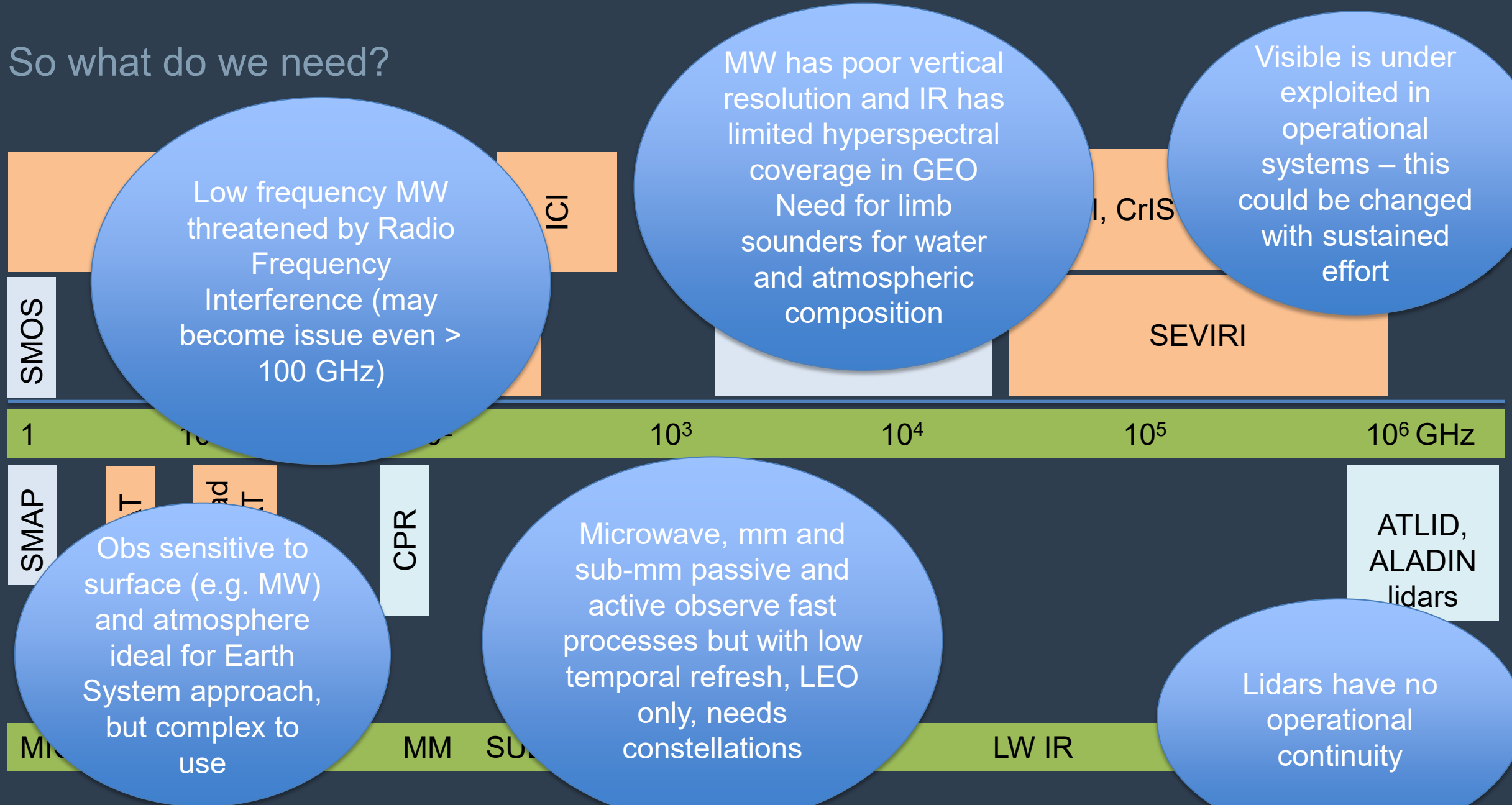
Synops: FSOI per datum, 2020



So what do we have?

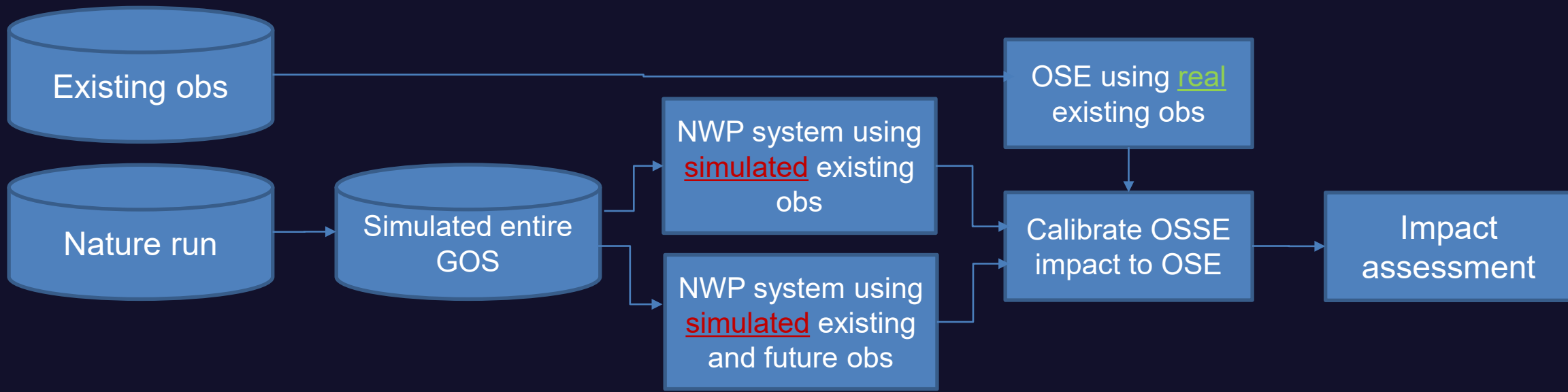


So what do we need?

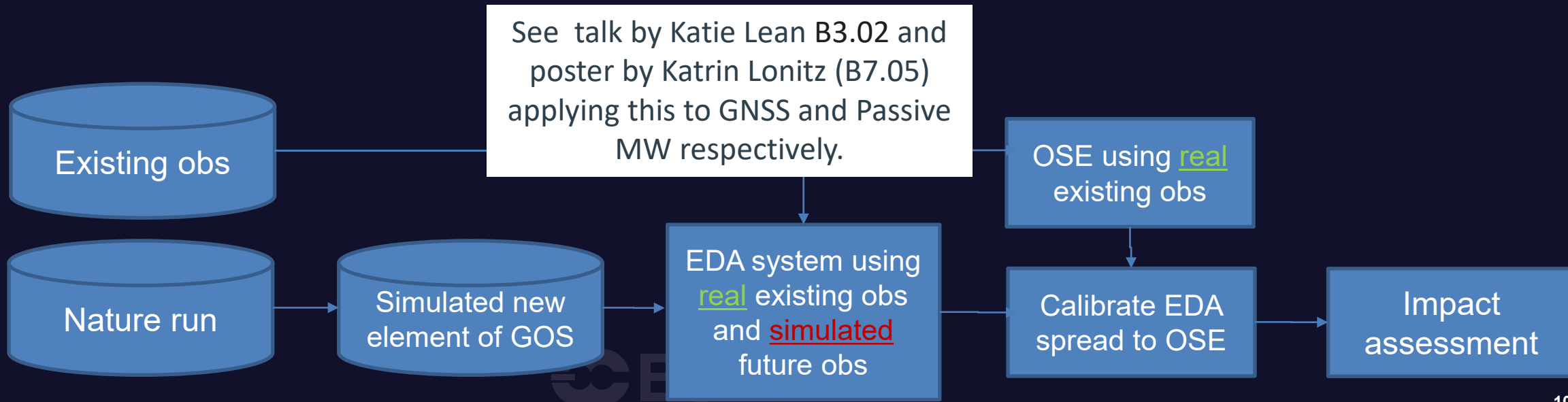


Future system assessment

OSSE



EDA



What is needed?

- Interface observations (interface between Earth System domains)
 - Supporting Coupled DA: tools like FSOI, OSE, OSSE and EDA struggle to show benefit because science maturity is lacking
 - e.g. ASCAT underperforms in these metrics but may be a key observation in the future
 - CIMR is important in this context
 - Atmospheric composition – meteorology interactions
- Vertical resolution
 - Radiance currently dominate, with NWP models resolving scales of tens of kms.
 - What will dominate as NWP aims to resolve km scales?
 - Will we have the observations to support this?
 - Radar/lidar (EarthCARE like); Limb sounders (MLS, MIPAS, GNSS)
- Dynamics
 - Lack of wind observations is a concern: Aeolus showed the importance of wind observations to NWP
 - But all-sky radiance use and GNSS are also driving wind increments



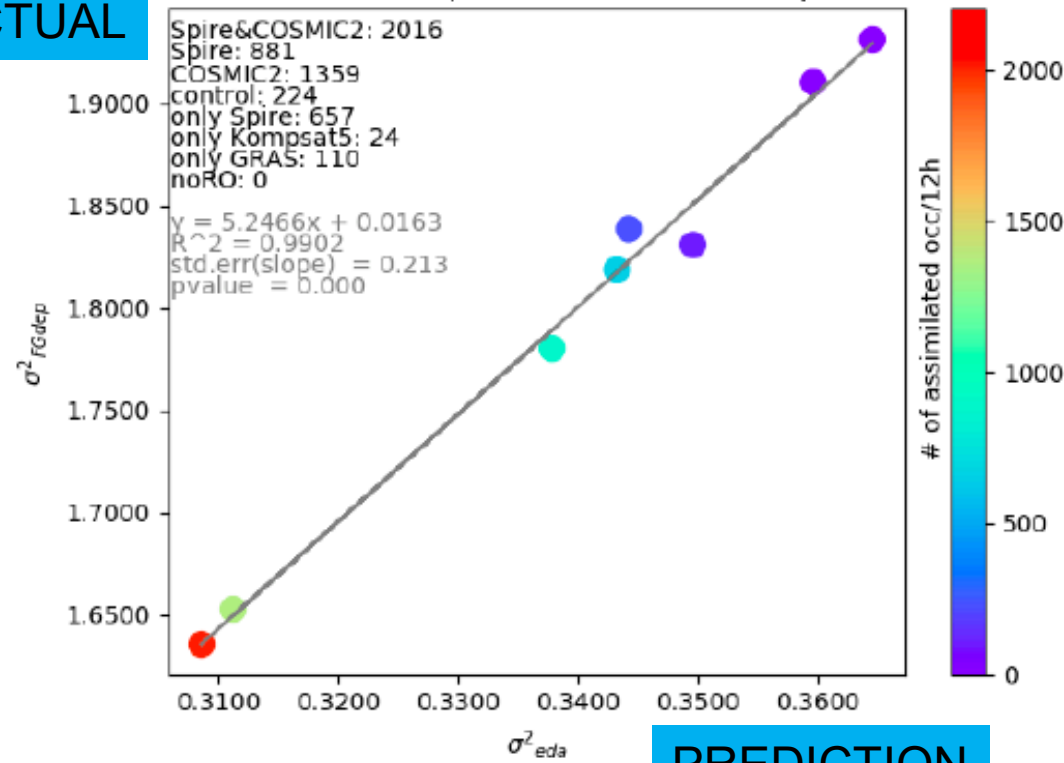
Questions



EDA assessment of GNSS

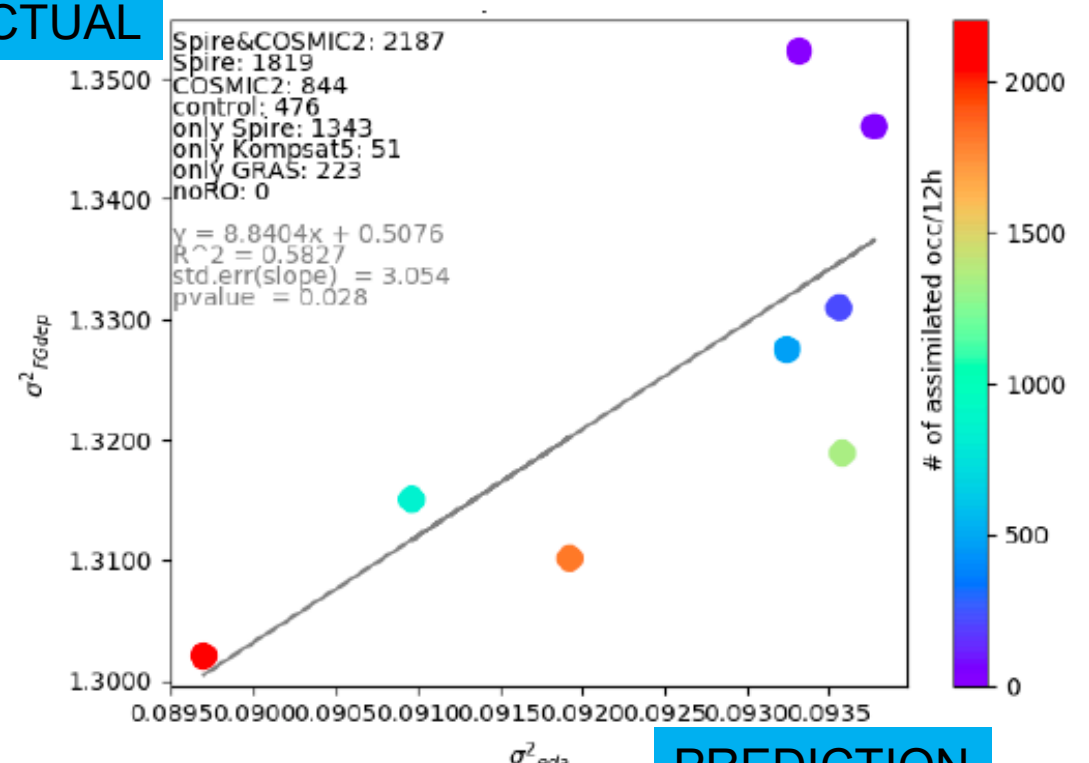
FGdep (First guess departure from observations) is against radiosonde observations

ACTUAL



(c) Tropics, 100 hPa

ACTUAL



(e) Northern Hemisphere, 100 hPa

