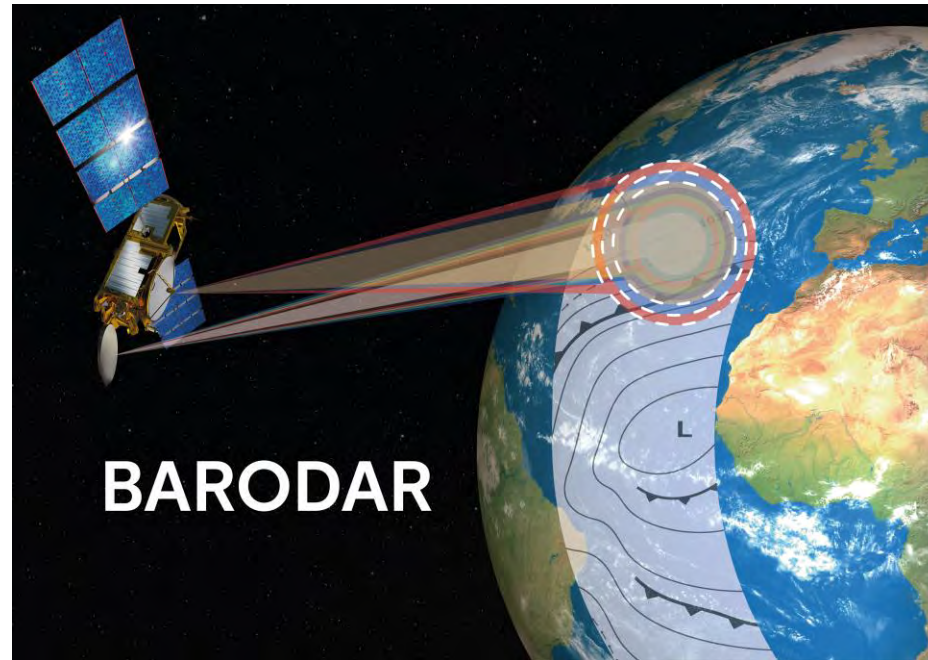


BARODAR: BAROmetric Differential Absorption Radar



Dr Emal Rumi

Peter Huggard, Richard Reeves, Alessandro Battaglia, Hui Wang, Diego Pardo, Daniel Gerber, Judith Jeffery, , Manju Henry, Kai Parow-Souchong, John Bradford, James Henderson, Arthur Cunningham, Brett Candy, Christine Gommenginger, Salvatore DAddio, Ishuwa Sikaneta, Mike Trethewey, Ted Brooke, Ediz Tunarli.

March 2024



Outline

- Introduction
- Justification
- Demonstrators
- ESA EE-12 Proposal
- Mission predicted impact
- Summary and future work

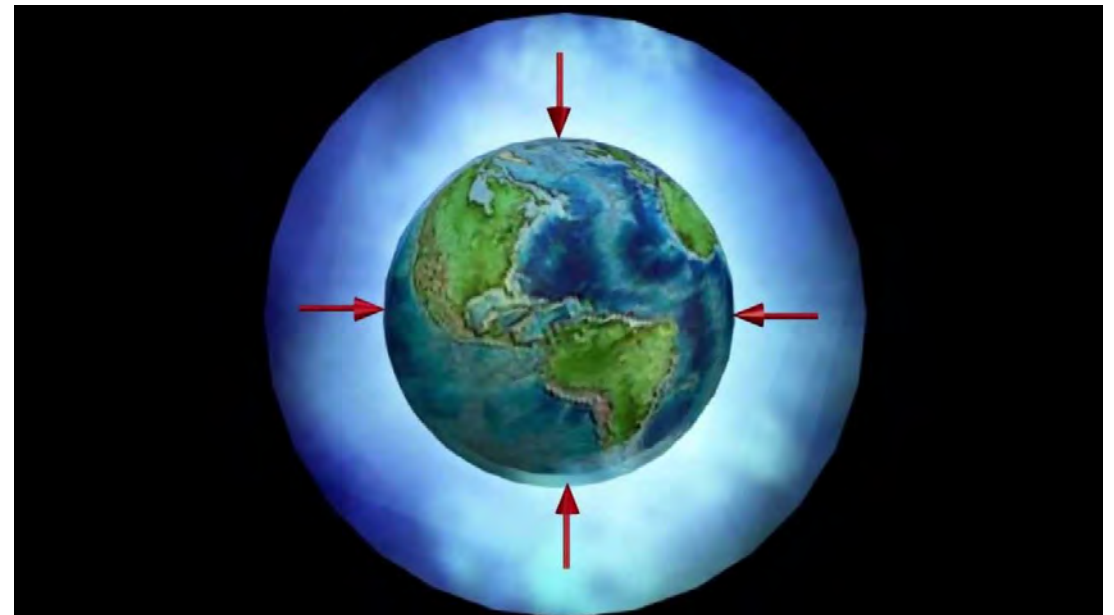
BARODAR



BARODAR: A mission for Surface Air-Pressure sensing

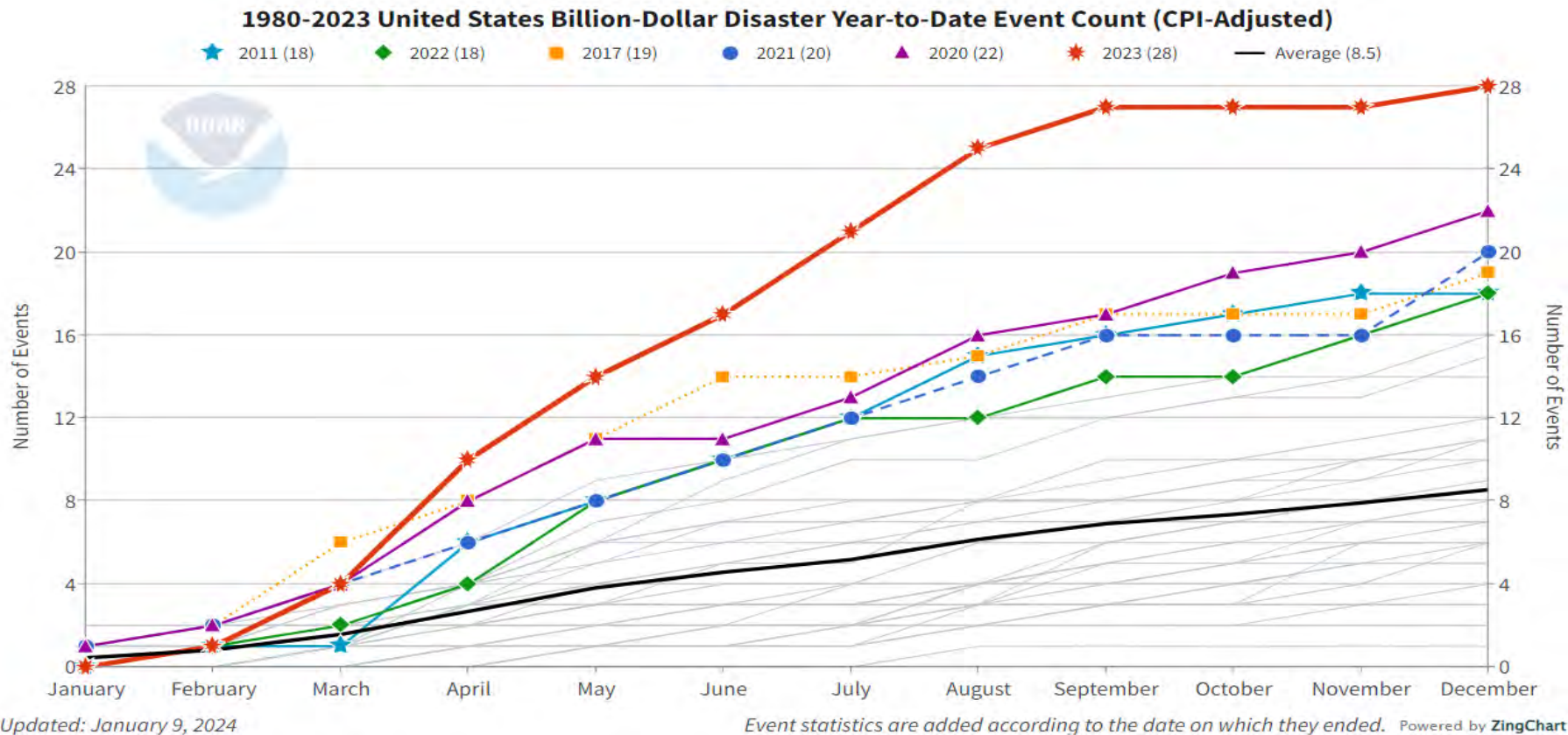
BARODAR is an **EO** mission to provide global, regular, and consistent **surface air pressure** measurements **from space for the first time**.

- **Surface Pressure** is a result of the fluid and thermodynamics of the atmosphere.
- It is therefore **critical** for **assessing the state** of both the **atmosphere** and **oceans**.
- Over the ocean pressure influences, **sea height and roughness**.
- It plays a **major role in storm surges**.
- **ESA-ITT GSP** started in 2017 collaboration with Met Office and NOC.

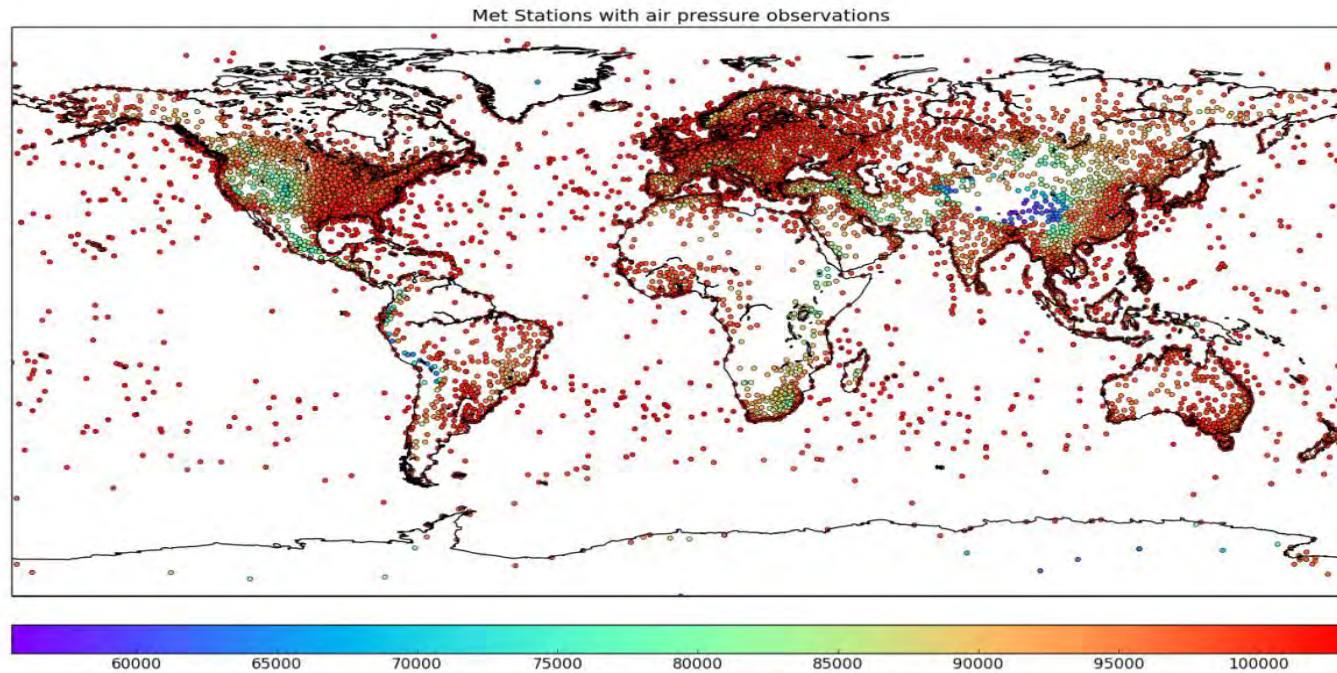


Mission Justification

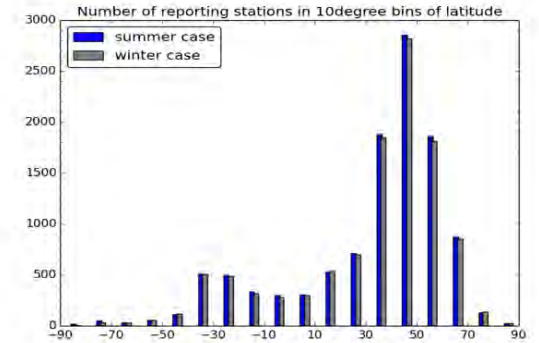
- **Extreme** weather events increasing in number **and intensity** due to **climate change**.
- **Pressure** is one of the **most important parameters** for weather forecasting models.
- **Storms and hurricanes** are **significantly underestimated** in Numerical Weather Prediction (**NWP**) models today due to the **lack of pressure data**.



Current Distribution of Pressure Sensors



Coverage of surface pressure observations for the 00 UTC assimilation cycle on 19th July 2017 in the Met Office global model. Observations are used from 10 236 stations globally, some reporting hourly, giving approximately 40 000 observations assimilated in a 6 hour window.



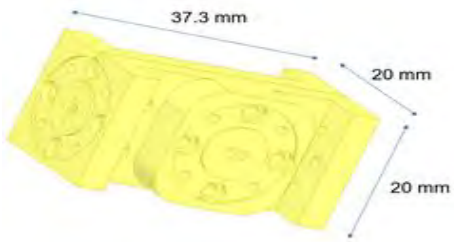
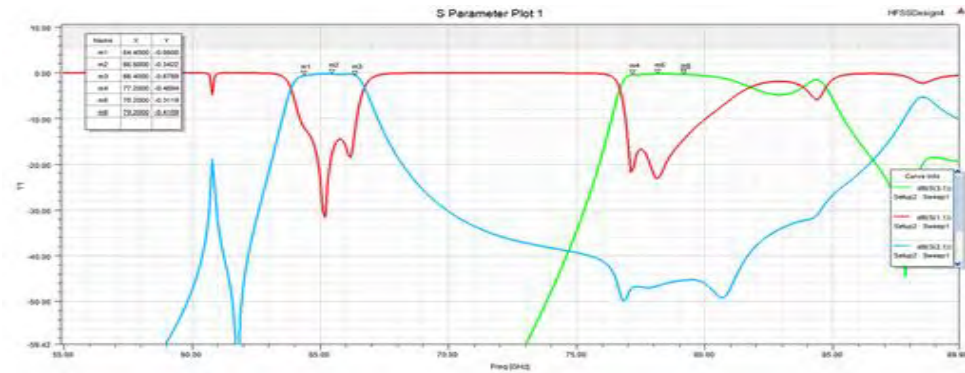
Only 30% of the Earth is currently measured

90% of stations are on land and concentrated on the Northern Hemisphere.

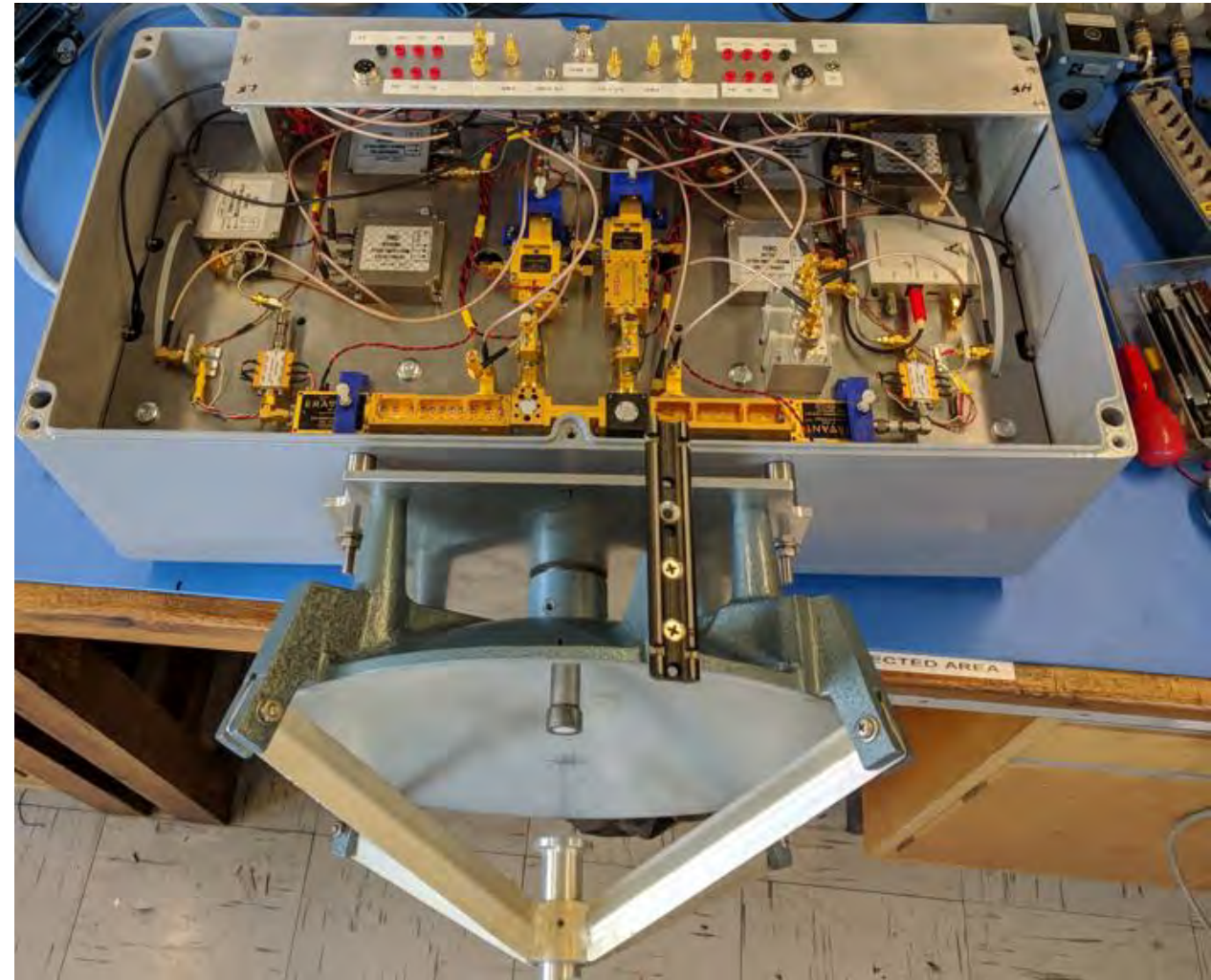
Ground based instruments are not homogeneous, data quality control, installation, maintenance and calibration are challenging.

Satellite remote sensing is the only way to provide, global, consistency, and continuous observations.

Diplexer and dual channel radar HW



- **Diplexer** based on H plane T junction and waveguide resonant cavities band pass filters in WR12
- **HFSS Simulation results**
- S21 and S31 around -0.4 dB in the band pass
- S21 and S31 better than -20 dB out of band
- S11 better than -10 dB
- Port 2 (6 poles filter)
- Port 3 (7 poles filter)



With STFC funding