

CRITICAL THRESHOLDS FOR DATA-SHARING ON THE NORTH WEST SHELF OF AUSTRALIA

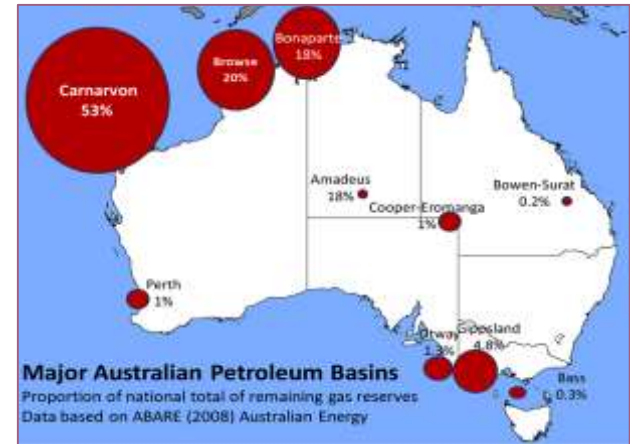
Greg Williams
RPS MetOcean
15 October 2019

rpsgroup.com



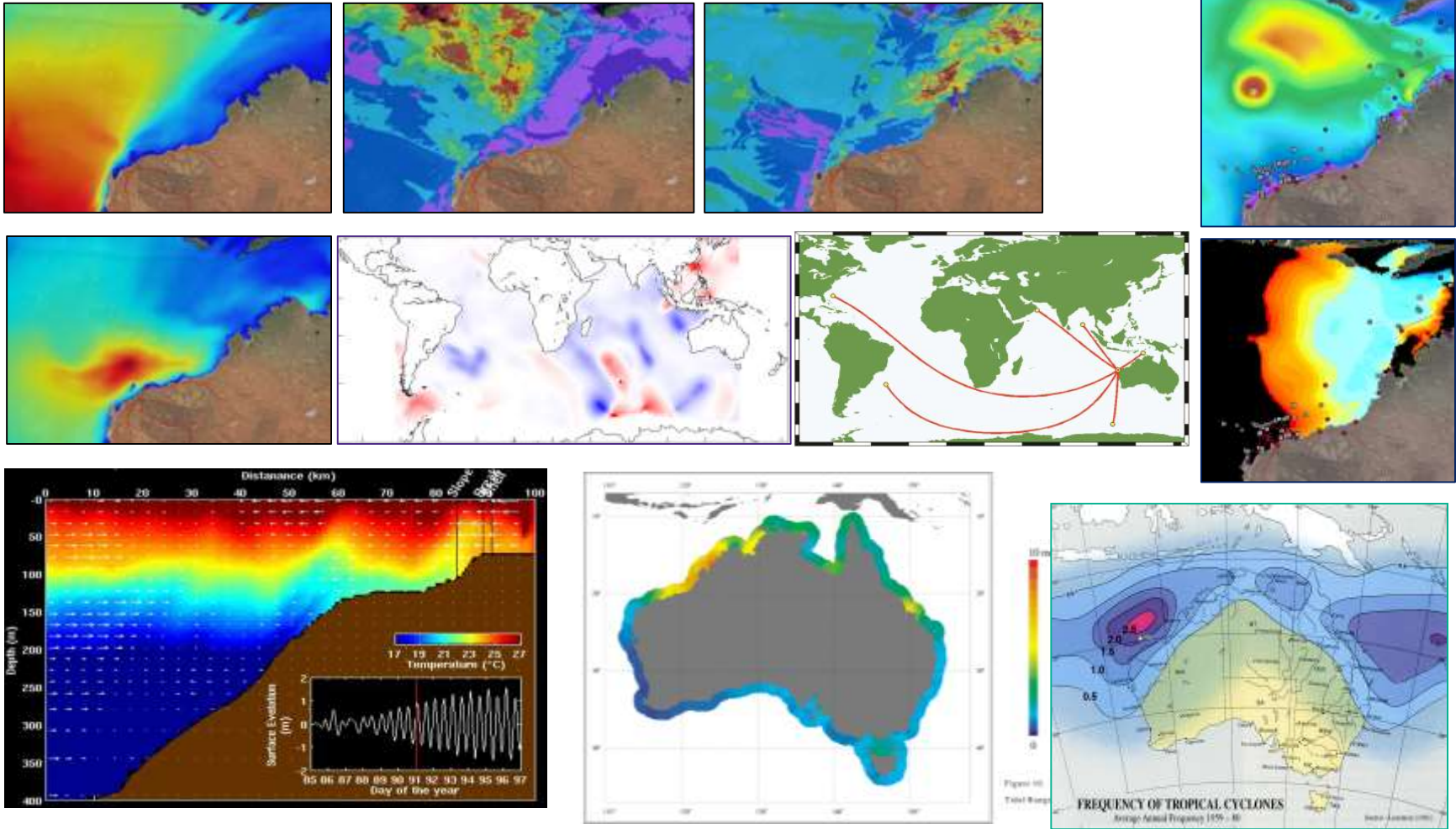
A Blue Commercial Economy...

- Western Australia is a major contributor to Australia's GDP through offshore oil&gas, mining, and related industries.
- The North West Shelf of Australia has **over a trillion dollars of operating assets** – including offshore facilities, pipelines, ports and coastal infrastructure
- **NWS is a place of extremes** – 10m tidal ranges, extreme currents, severe tropical cyclones, long-range/long-period swell, 20m waves, solitons, and complex bathymetry.



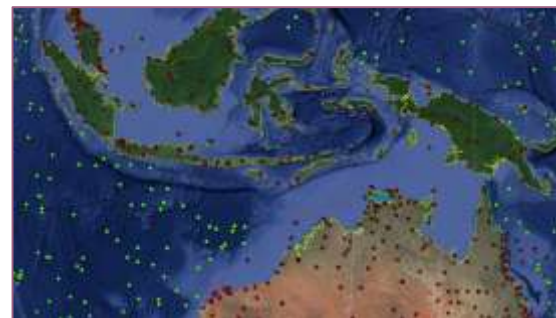
- Perth is home to over **1600 specialist companies** and institutions providing support for offshore oil&gas, ports, coastal, defence, and research activities on the NWS and worldwide
- This is a heavily **competitive commercial environment**, with minor or project-based collaboration within industry, and little overlap across sectors.

Operating in an Interesting Environment...



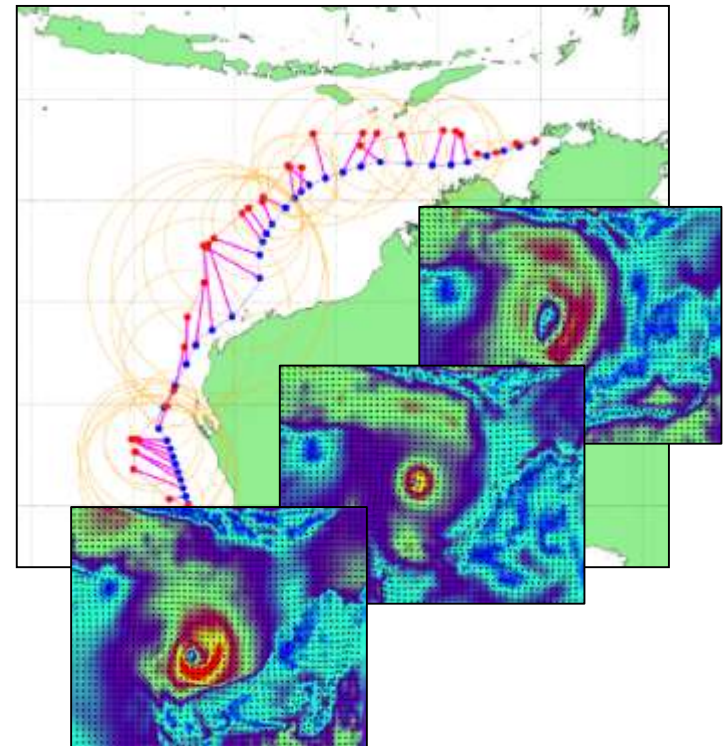
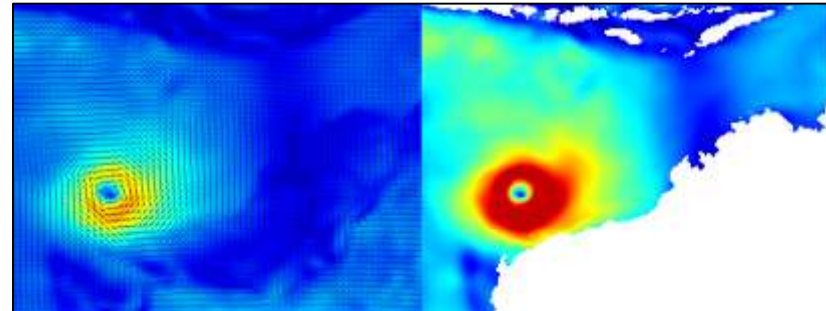
With No Common Data Pool

- Elsewhere **public ocean observing systems and government data exist** in the form of long-running measurement archives, realtime data, and reanalysis datasets, backed by **mature standards** for quality assurance, data pedigree, metadata description, data-discovery and request, format, distribution, etc.
- Examples are IOOS and NDBC portals, legislated FGDC and Inspire frameworks, Copernicus Earth Observation Programme, SIMORC, and various **reanalysis datasets** such as NCEP's CFSR and ECMWF's ERA-5.
- Global reanalysis products are generally 'one-shot funded' (eg. USD\$3m over 2 years for CFSR), developed with a large team of experienced domain-experts, and refreshed every 5-10 yrs as technology, data, and knowledge evolve.
- Such **reanalysis products don't work very well for the NWS**, since public data availability and quality is poor – with very few points of calibration or validation across the entire region and particularly further offshore.



RPS MetOcean

- Continuous oceanographic measurement of NWS since 1976. Ongoing.
- **95% of all oceanographic data collection** for the offshore oil&gas industry has been done by RPS
Also quality assurance, audit, quality control, and data management.
- World leader in design criteria
- World leader in tropical cyclone modelling, synthetic storm studies, pipeline route studies, etc
- Criteria for **every facility** in WA and NT waters, and for **every major operator**
- Onshore processing plants, recertification
- Defence infrastructure (eg Garden Island causeway, Darwin Harbour facilities)
- Pioneering methodologies, presenting, publishing, working groups, etc
- Various industry tropical cyclone databases (Woodside, Shell, others)
- Savings of a few billion dollars appreciated



RPS Regional Reanalysis

- Safety, engineering, cost = why we measure, model, and quantify all those interesting things.
- Along the way **RPS generate 3-5 hindcasts per year** calibrated against 40 years of QA/QC measurements – for technically-auditable design criteria, and savings of tens or hundreds of millions to clients and operators
- The latest 25 or so datasets are kept online for studies. Available via API queries.



- Models are overtaking measurement (but are they realistic?)
- **RPS improve, design, and fabricate new instrumentation as required** to correctly detect and measure NWS metocean phenomena – Currents, Solitons, Tides, Waves, etc
These devices are becoming the industry standard worldwide.

Ingredients for an Optimal Model Reanalysis

- Winds (very good in this 'satellite era', but still recalibrated +/- 20% via measurement)
- Tropical Cyclones & Circulation Modelling (RPS best-track databases, TC blending, developed for industry with demonstrated accuracy)
- Waves (GI=GO, but with tuned 'perfect' inputs models give true outputs, proven)
- Tides (measurement-based constituent database, world-class analysis techniques)
- Currents (state of the art models, calibrated against RPS CM04 current meters)
- Bathymetry (thanks to Geoscience Australia and private survey data, blended)

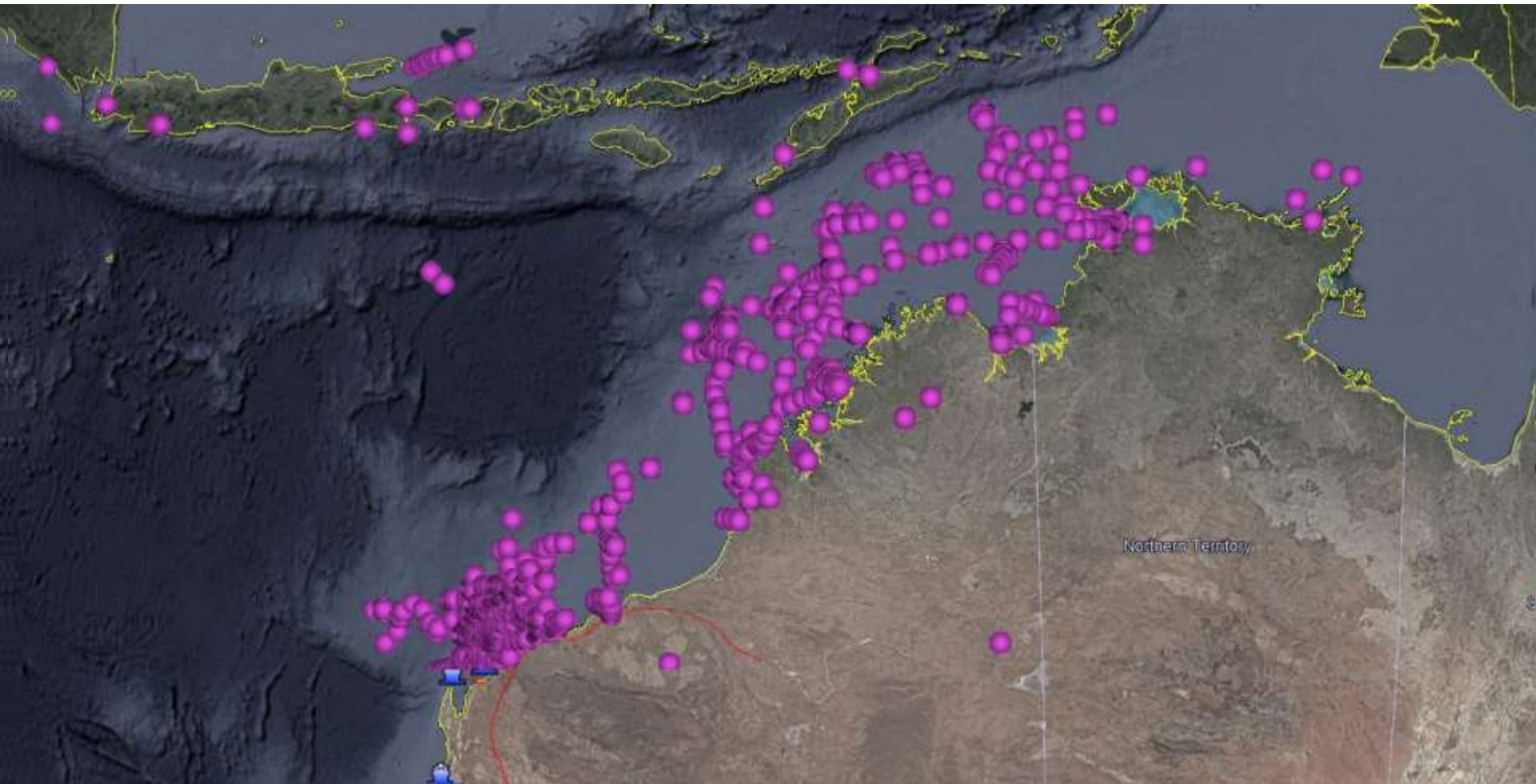
plus:

- RPS QA processes and QC methods+software (evolved over 40 years)
- RPS Experience and Expertise (oceanographers, meteorologists, electrical engineers, communications experts, marine biologists, mooring specialists, etc)

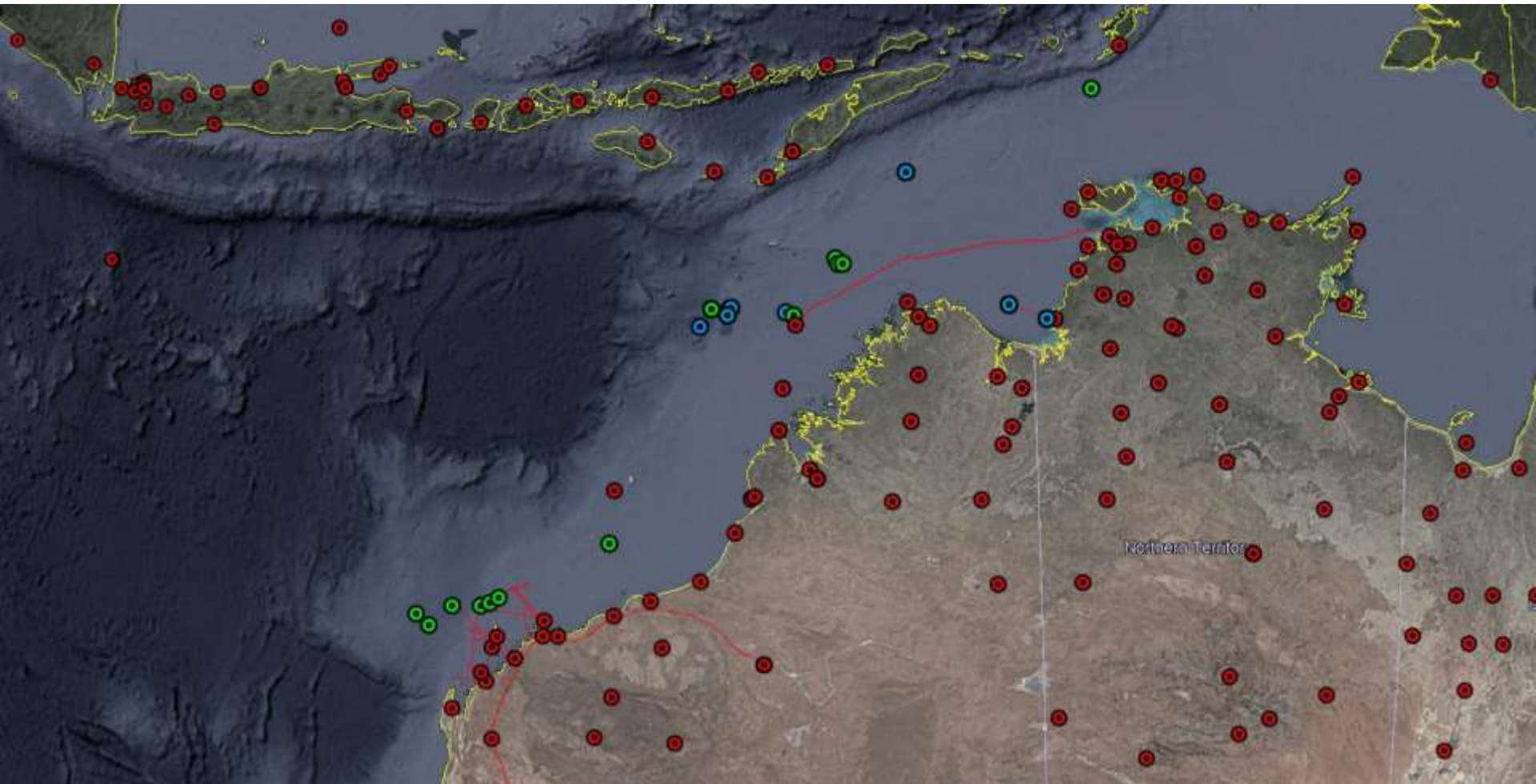
and:

- **1 billion data points, at over 1000 measurement sites in 25000 datasets!**

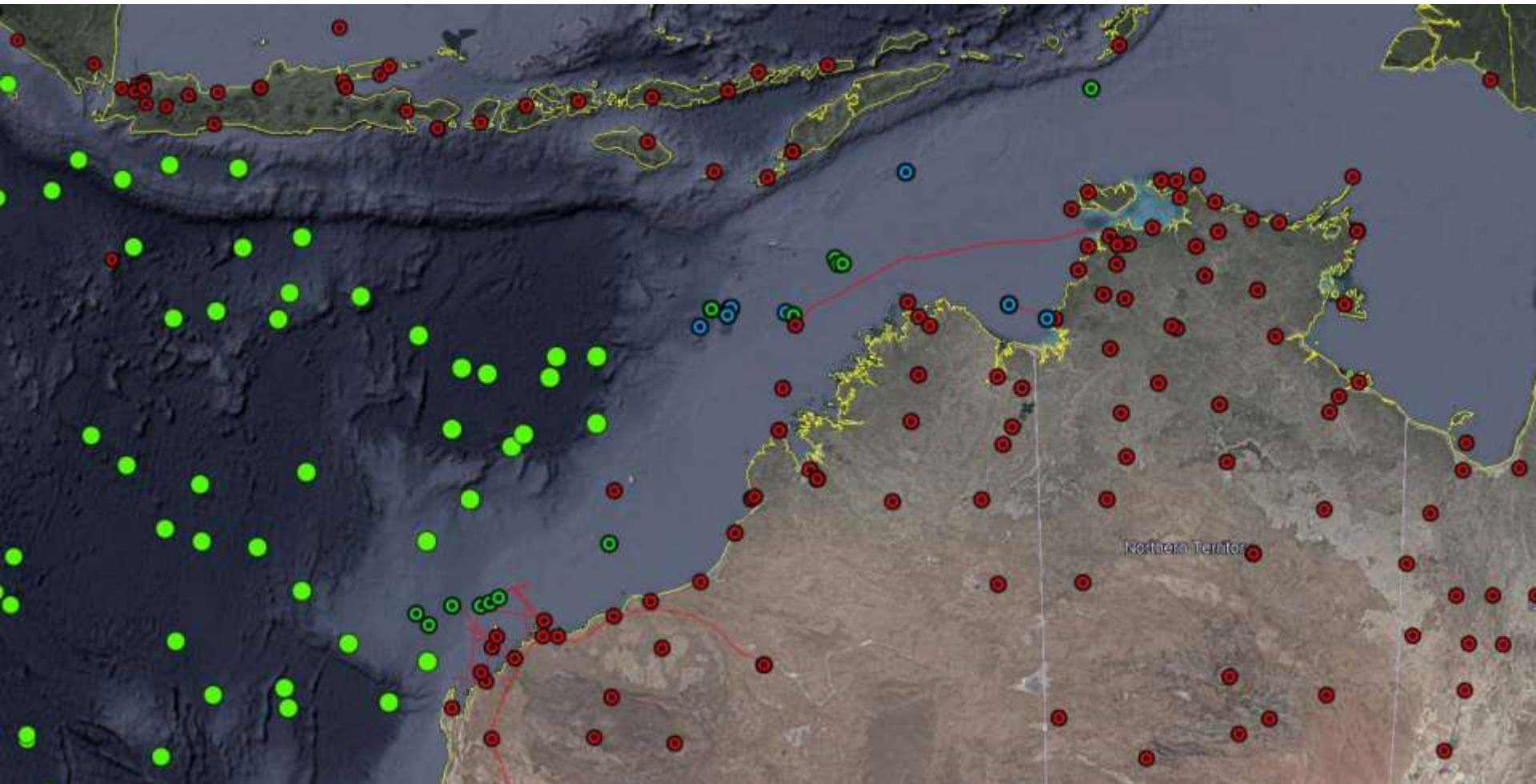
Measurement Coverage – a billion data points



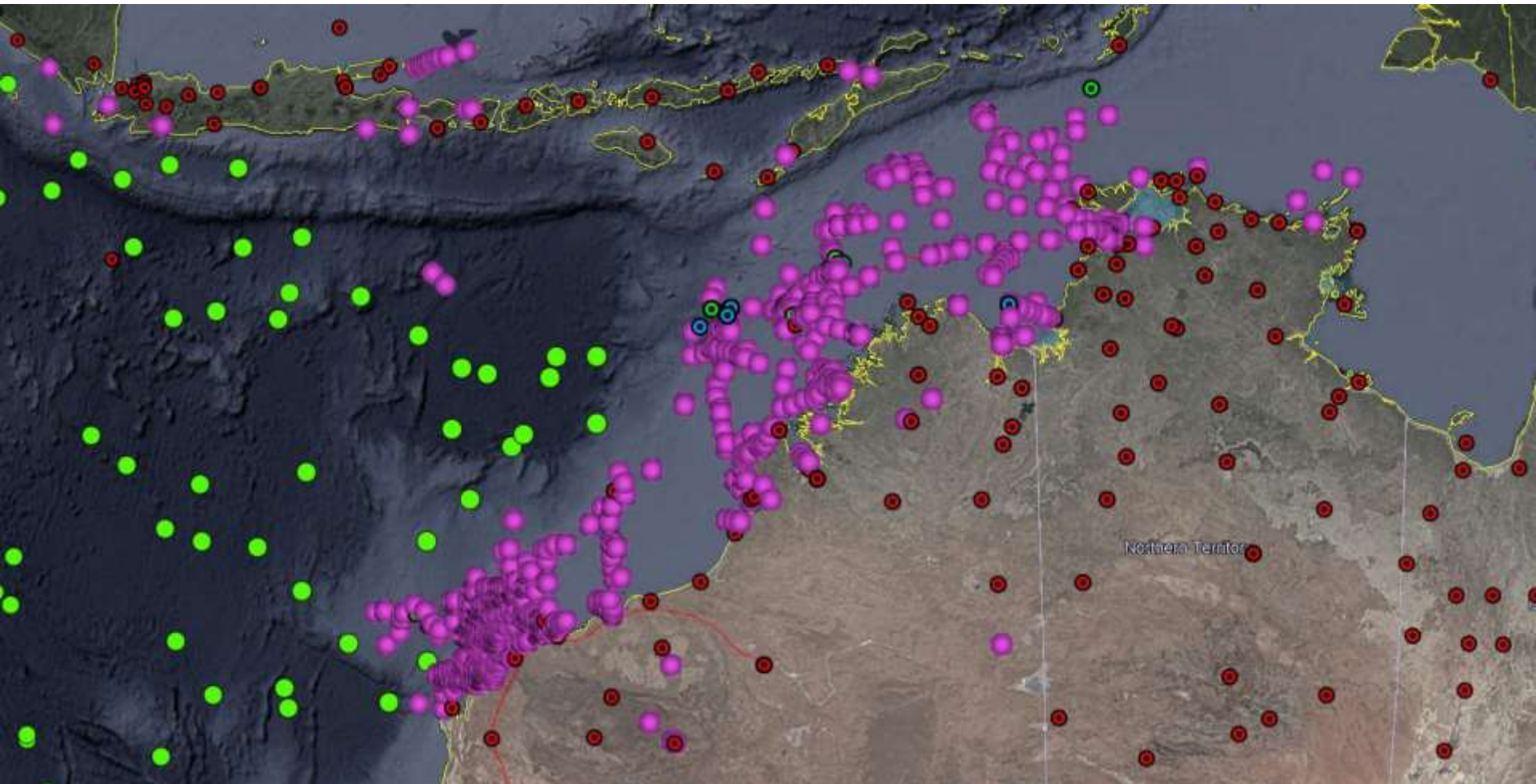
Measurement Coverage – WMO metstations



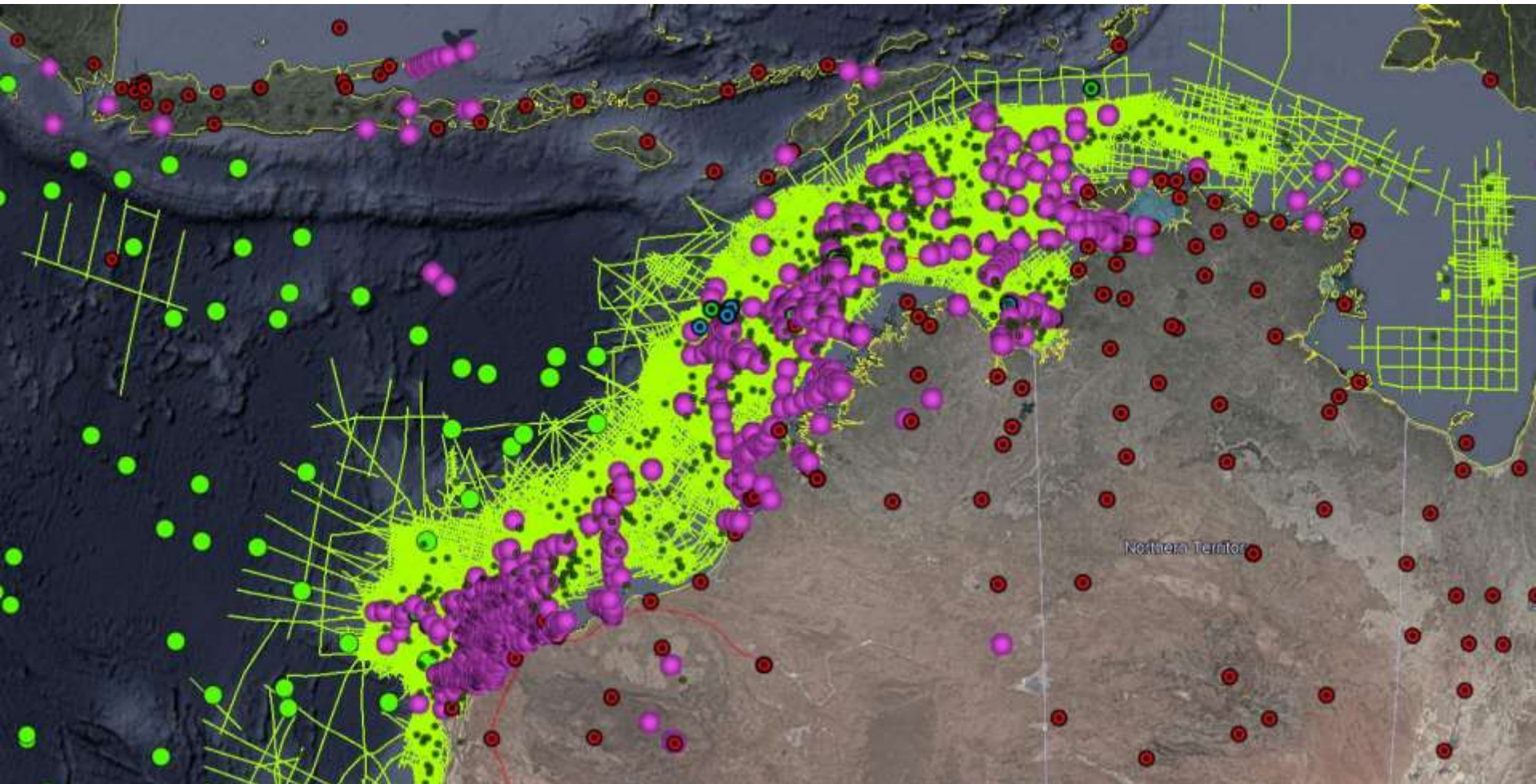
Measurement Coverage – some Argo coverage



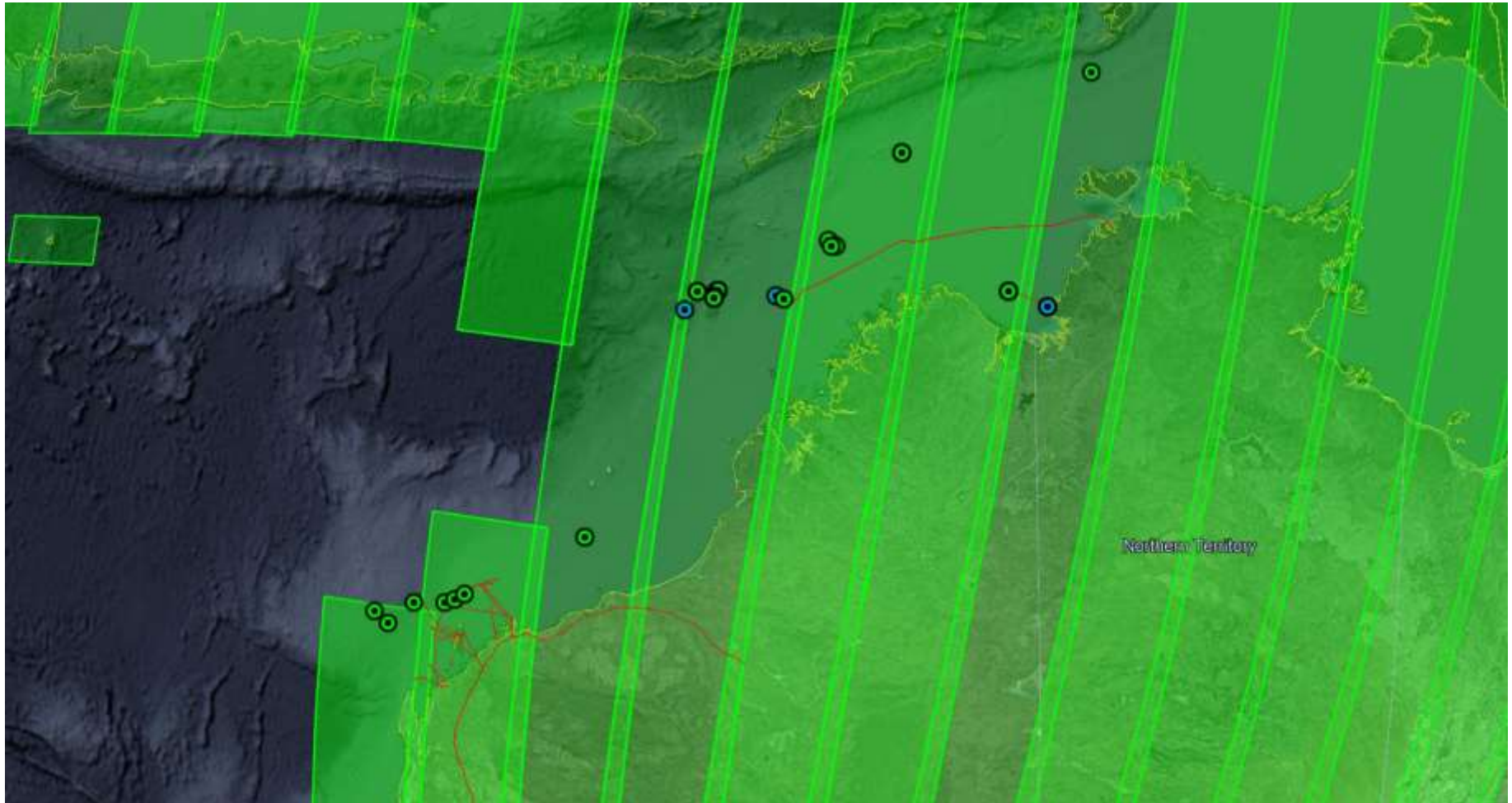
Measurement Coverage – best we can do is world class



Measurement Coverage – plus improving bathymetry



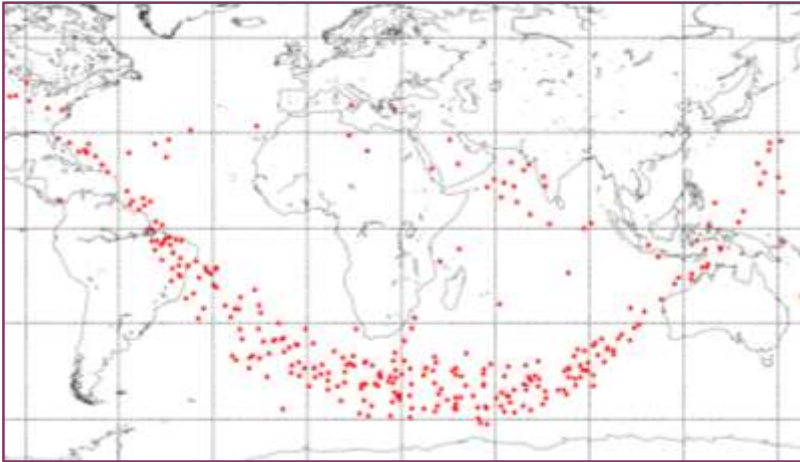
Measurement Coverage – and evolving remote-sensing



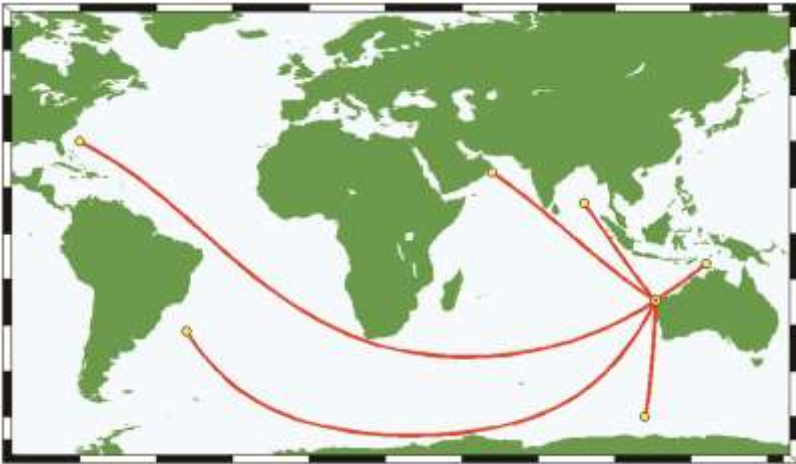
What Next?



Opportunities for Collaboration and Data Sharing



- **No single operator or government agency** has the budget or coverage to offer a full view of swell arrival, offshore wind, or cyclone impacts for this region. Nor the knowledge or local experience.
- **Collaboration and data-sharing** offer the only reasonable and efficient solution to supporting operations in the NWS, protecting assets, and reducing risk. Must be viable commercially and provide value.
- A **NWS Reanalysis resource** – quality data and knowledge packaged together.
- Complemented by a **regional North West Shelf monitoring and prediction network**, with all available information used and presented in a single system, to provide a clear understanding across all offshore industry, ports, coastal, defence, and research groups.



Ingredients for a Monitoring and Prediction Network

- Wind measurements (sufficient coverage to recalibrate models and satellite sources)
- Tropical Cyclones & Circulation Modelling (forecast track blending, and circulation models calibrated against full historical record of Best Track position/intensity)
- Wave model tuned for long-period swell and local ambient and cyclonic conditions
- Hydrodynamic model tuned against tidal databases and RPS CM04 current meters
- Bathymetry (blended Geoscience Australia and private survey data)

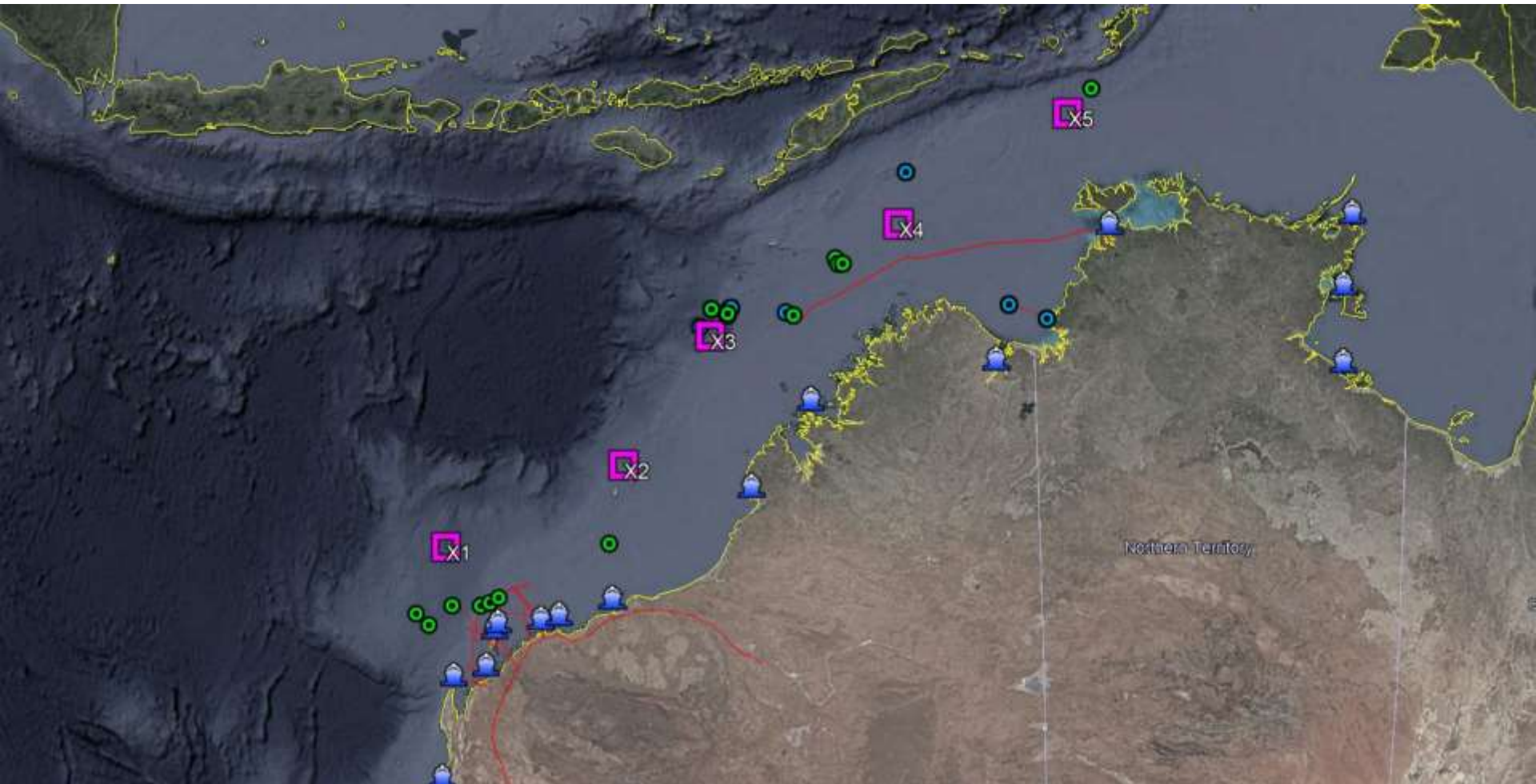
plus:

- RPS QA processes and QC methods+software (evolved over 40 years)
- RPS Experience and Expertise (oceanographers, meteorologists, electrical engineers, communications experts, marine biologists, mooring specialists, etc)

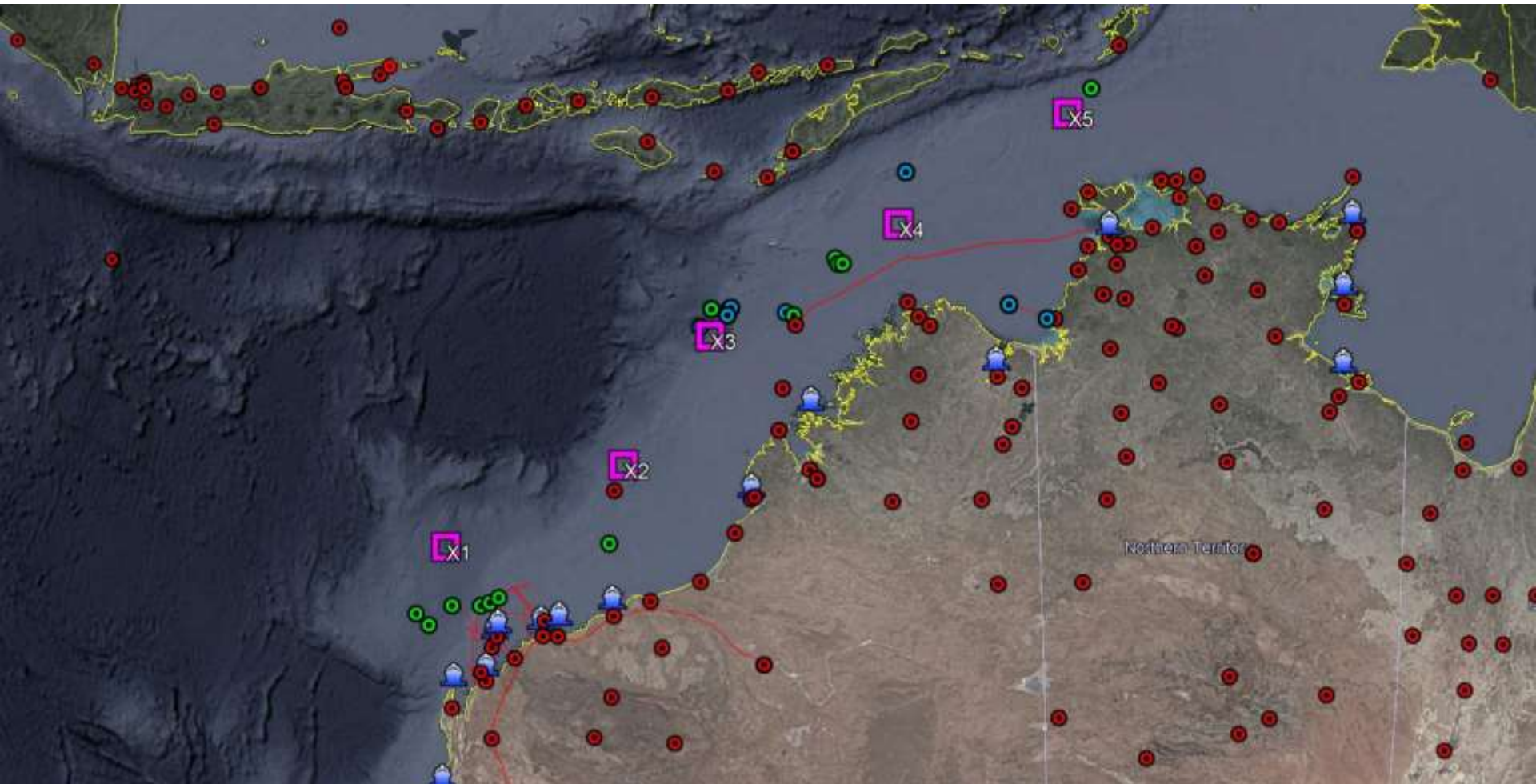
and:

- **Carefully selected realtime data collection points** (proven optimal by validation)

Optimal Measurement Coverage for Prediction



Optimal Measurement Coverage for Prediction





Questions?

**For further information:
metocean@rpsgroup.com.au
www.rpsmst.com**