Standardised procedures for acoustic data collection as part of an integrated marine observing system (IMOS)

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Presentation overview

(1) Ocean Observing Systems

(2) Need to standardise

(2) Data acquisition, processing and quality control

(4) Summary

Ocean Observing Systems (OOS)

Large proportion of worlds oceans have observing systems in place

GOOS Regional alliance map

- Global Ocean Observation System (GOOS)
- Euro Global Ocean Observation System (EuroGOOS)
- US-Integrated Ocean Observation System (IOOS)
- Indian Ocean GOOS
- Integration Marine Observing System (IMOS-Australia)
- …

Characteristics of Ocean Observing Systems

	Project-based studies	Ocean Observing Systems (OOS)
Scale	Localised, few instrument types	Large scale, multiple instruments & data streams
Scope	Single Species	Whole of ecosystem
Metadata	Project or institutional metadata standards	OOS & international metadata standards (e.g. ISO 19115)
Data access	Embargoed, on request	Free and timely access
Data formats	Mix of proprietary (e.g. EK60 raw, excel, oracle) and open formats	Open data formats (e.g. netCDF)
Data integration	Variable	Ready integration between instrument data types and between national and international OOS programs

The need to standardise

Value of data can be compromised by:

- inconsistent acquisition protocols
- lack of metadata
- hardware limitations
- poor data quality and QC
- proprietary formats

Data that will last a lifetime!

(Time-series of 10, 20, 50 years)

- Calibrated measures
- Open source or published proprietary formats
- Not contingent on existence hardware or software vendors
- New instruments need to be tested and proven

OOS's requires standards to be documented

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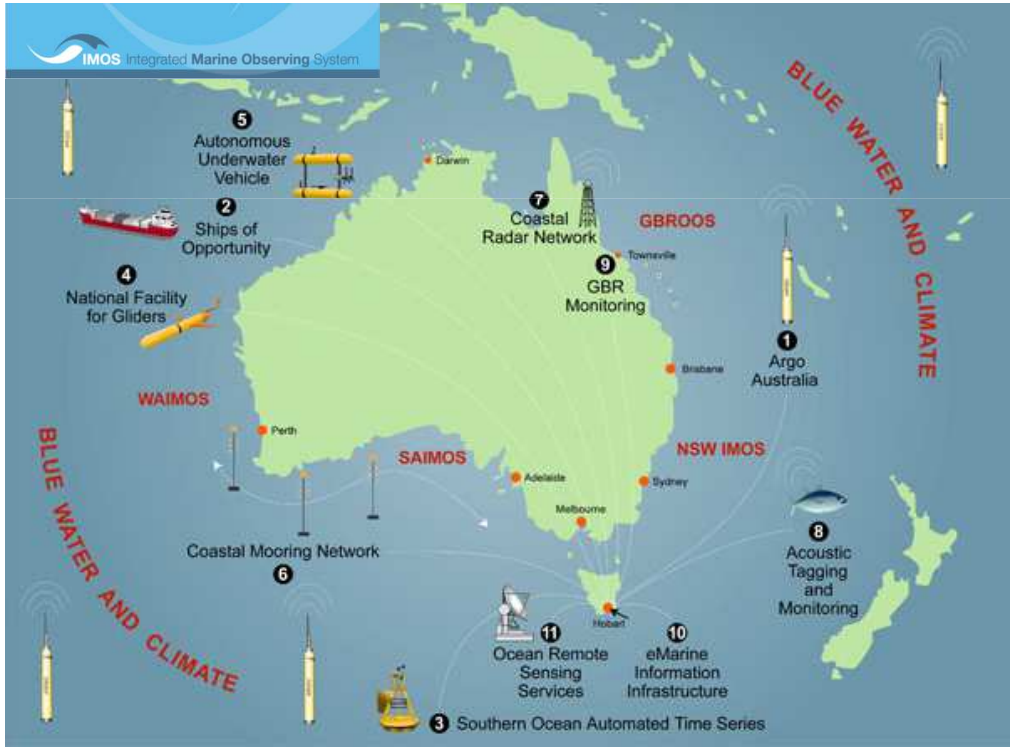
Integrated Marine Observing System (IMOS)

"IMOS is a distributed set of equipment and data-information services which collectively contribute to meeting the needs of marine climate research in Australia"



Facilities

Argo
Moorings
Gliders
AUVs
Ocean Radar
Satellite Remote Sensing
Animal tagging
Marine information (emII)
Ships of opportunty (SOOP)

- **Bio-acoustics**

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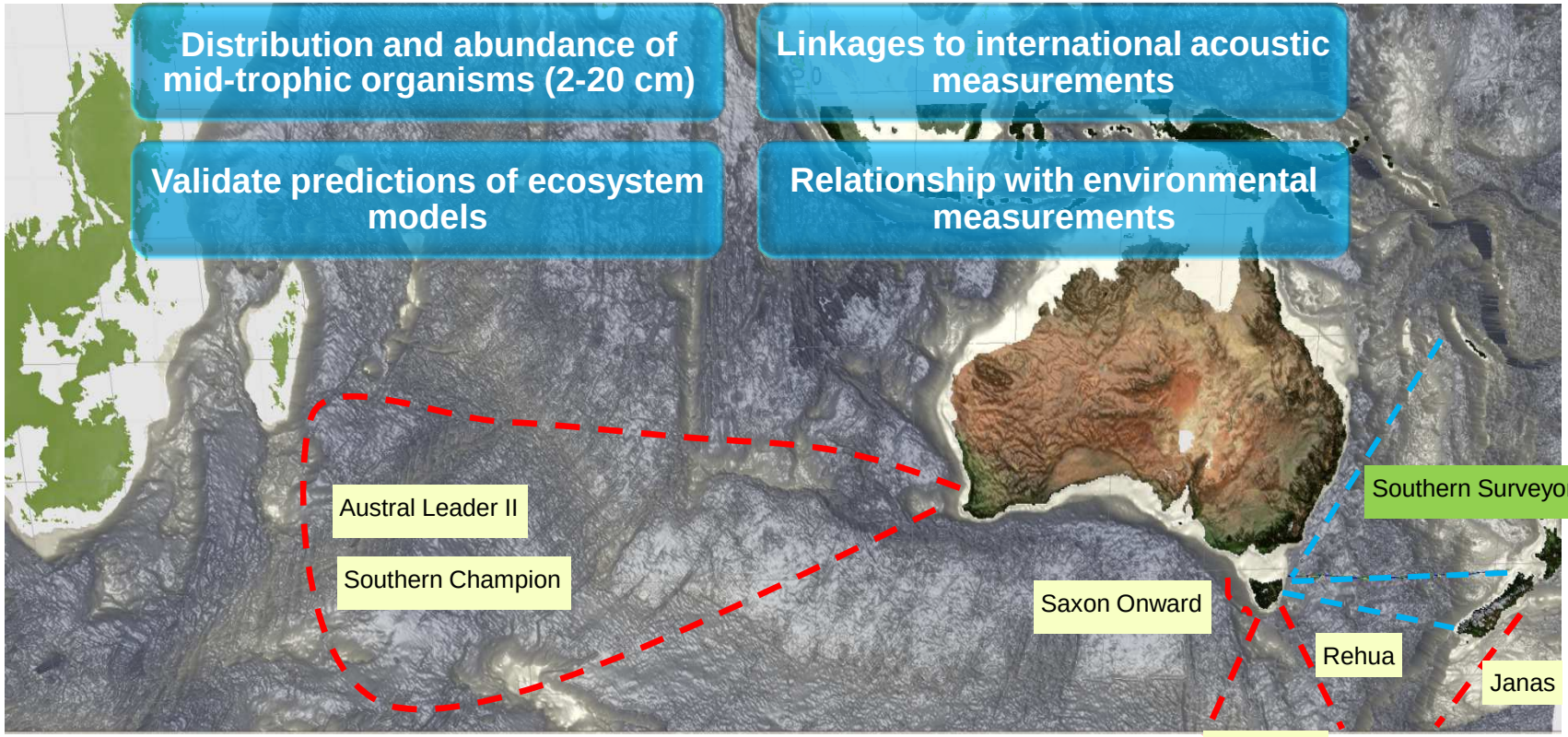
Bio-Acoustic Ship of Opportunity sub-facility (BASOOP)



Commercial and research vessels with calibrated digital echosounders

Vessel track : existing
: new

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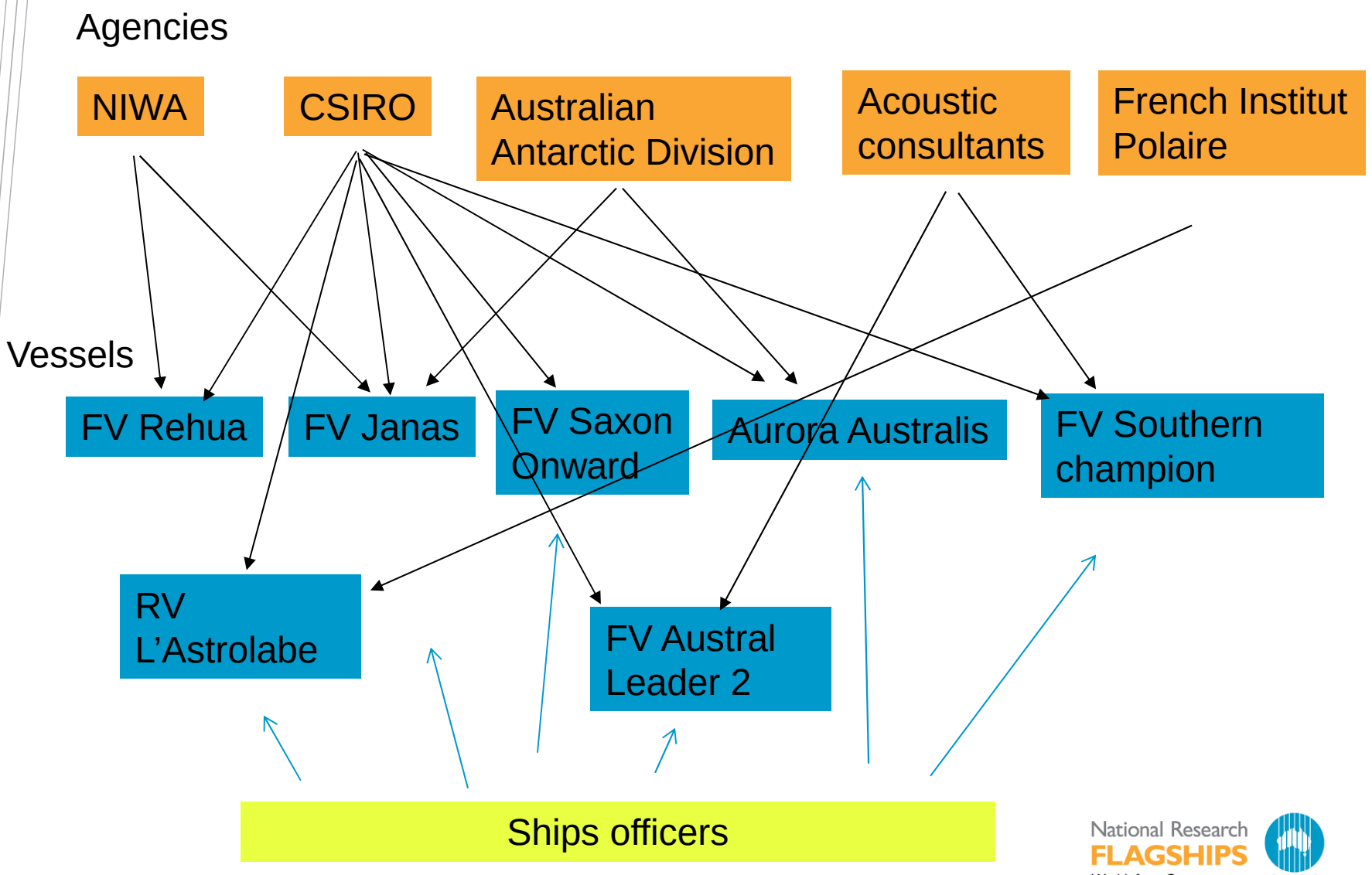
Multi-agency, multi vessel interactions requires cooperation; common acquisition standards will help



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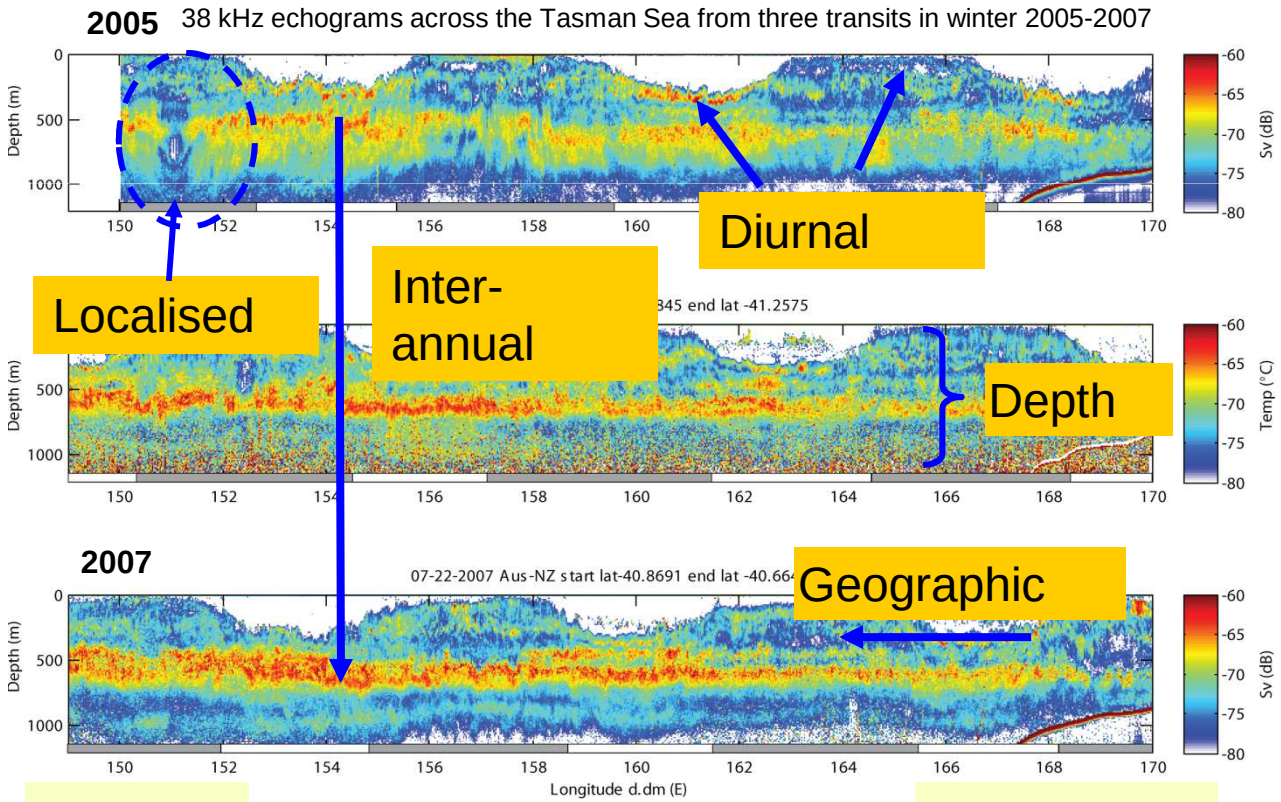
BASOOP data products

Observations will span spatial scales from eddies to basin width and timescales from seasonal to decadal.

Calibrated 38 kHz + other frequencies if available (e.g. 18, 120 and 200 kHz)



Post processed QC Sv data in 1 km by 10 m cells in IMOS netCDF format

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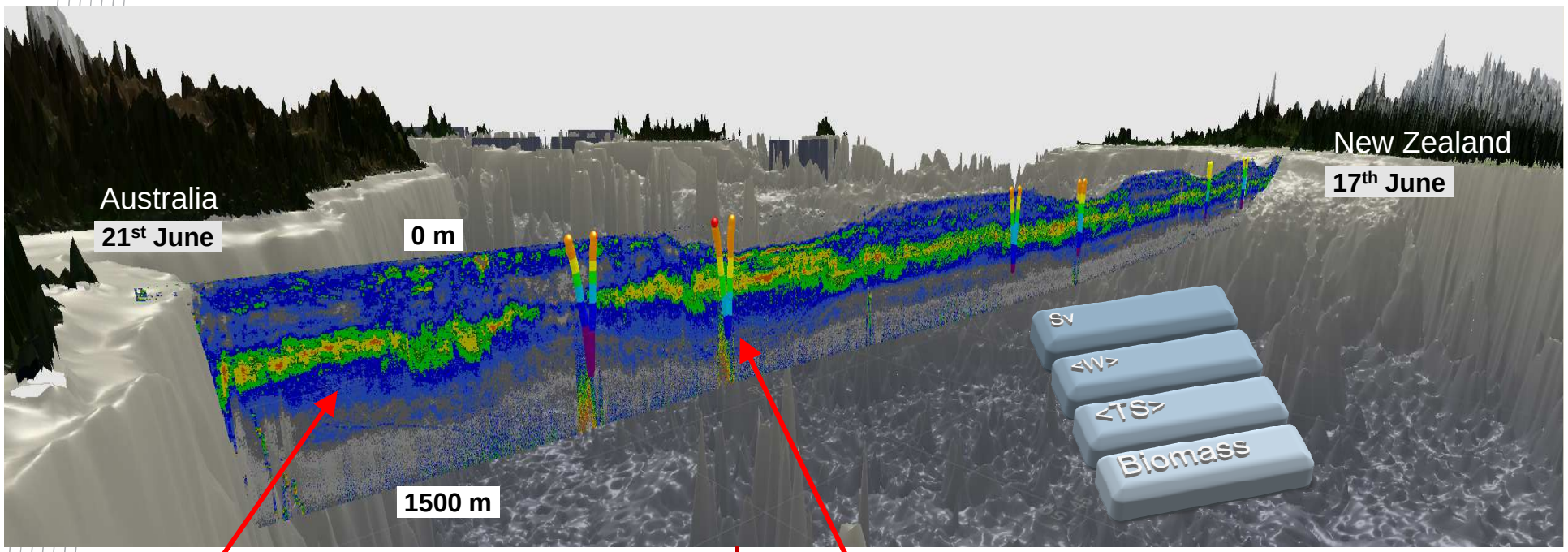
Validation, interpretation, linkages



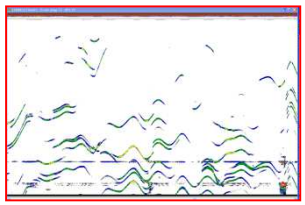
IMOS

- 38 kHz vessel acoustic data
- Calibrated

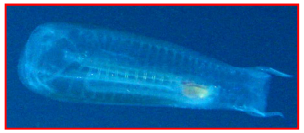
Validation experiments

- Midwater nets with attached acoustic-optical & TD or CTD systems

MIDOC net



AOS 38 kHz



AOS DSLR

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Data acquisition – the very very basic stuff!

	IMOS settings	Comment
Data logging	Port-to-port	KISS!
Format	ES/EK60 raw	Convert to HAC for archive?
Range	0-2000	(deliberately extend into noise region)
Power	2000 W	Avoid higher power levels
Pulse length	2.048 ms	Sufficient for 0-1500 m
Time	UTC	Sync via GPS (Tardis)

Data processing and quality control

Quality control

- Cannot always control data quality
- Vessel design may not be optimal
- Vessels cross ocean-basins and will encounter bad weather
- **Objective and rapid quality control methods needed**

Processing

- Large data volumes from multiple vessels
- IMOS requires a quick turnaround to produce data products
- **Automated processing essential**

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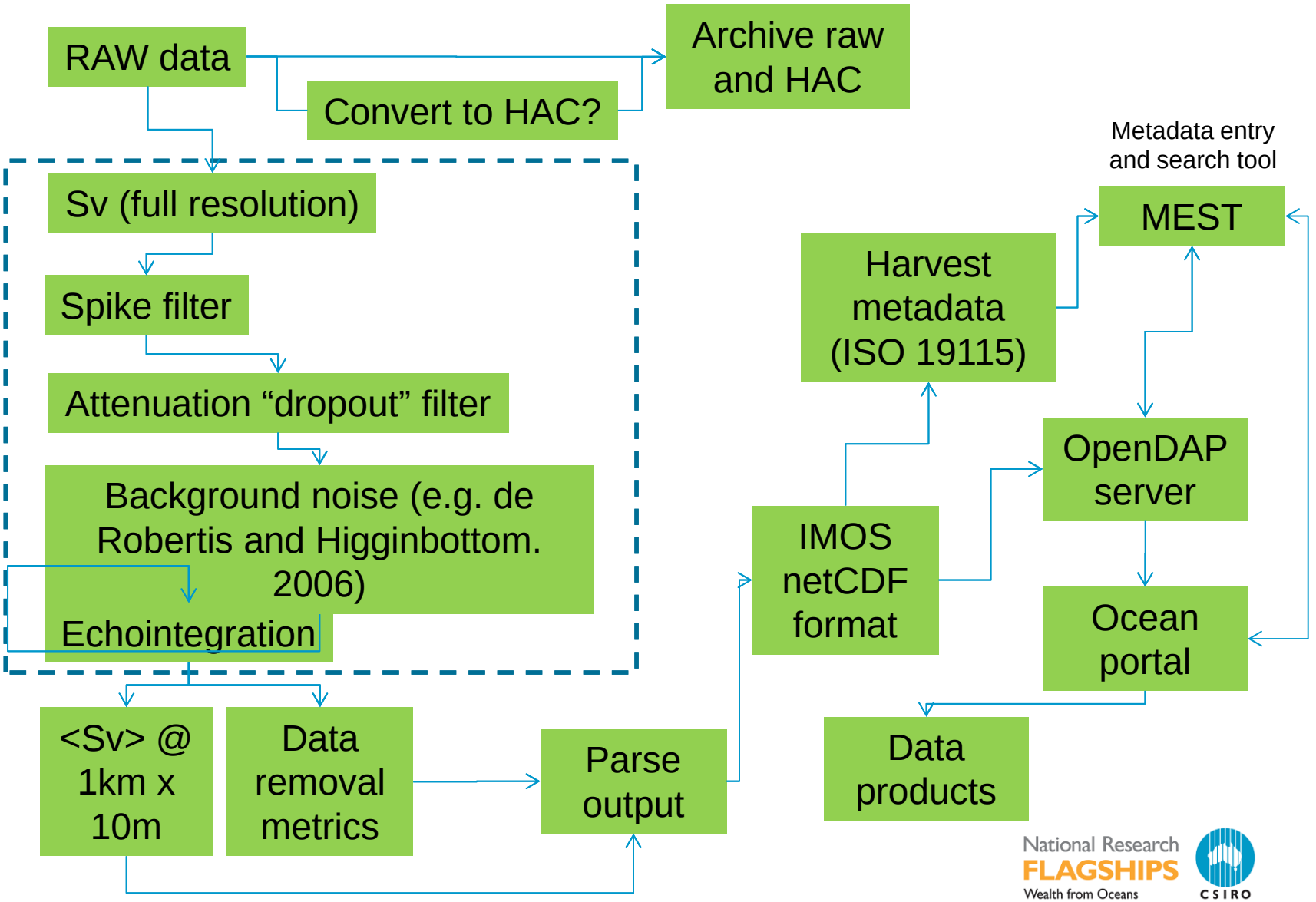
Data processing and quality control



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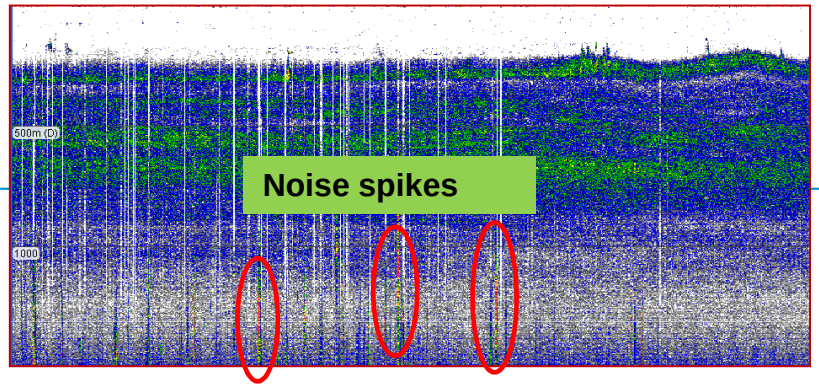
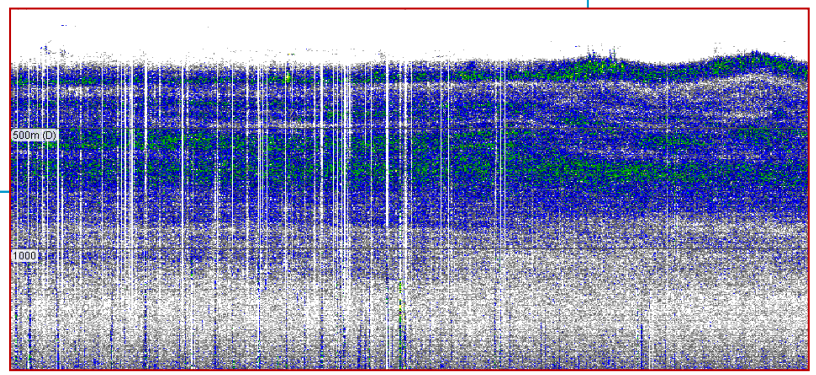
Data processing and quality control

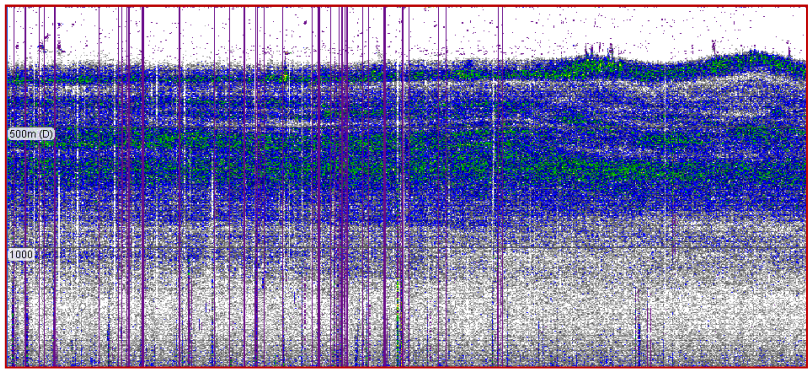
Raw Sv



Noise “Spike” removed

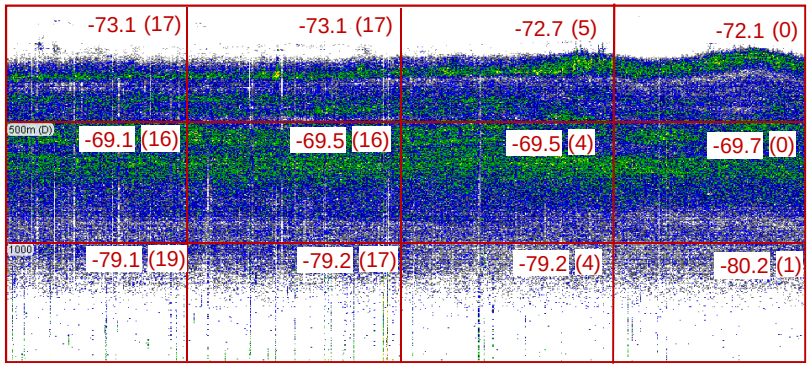


Attenuation “dropout” removed



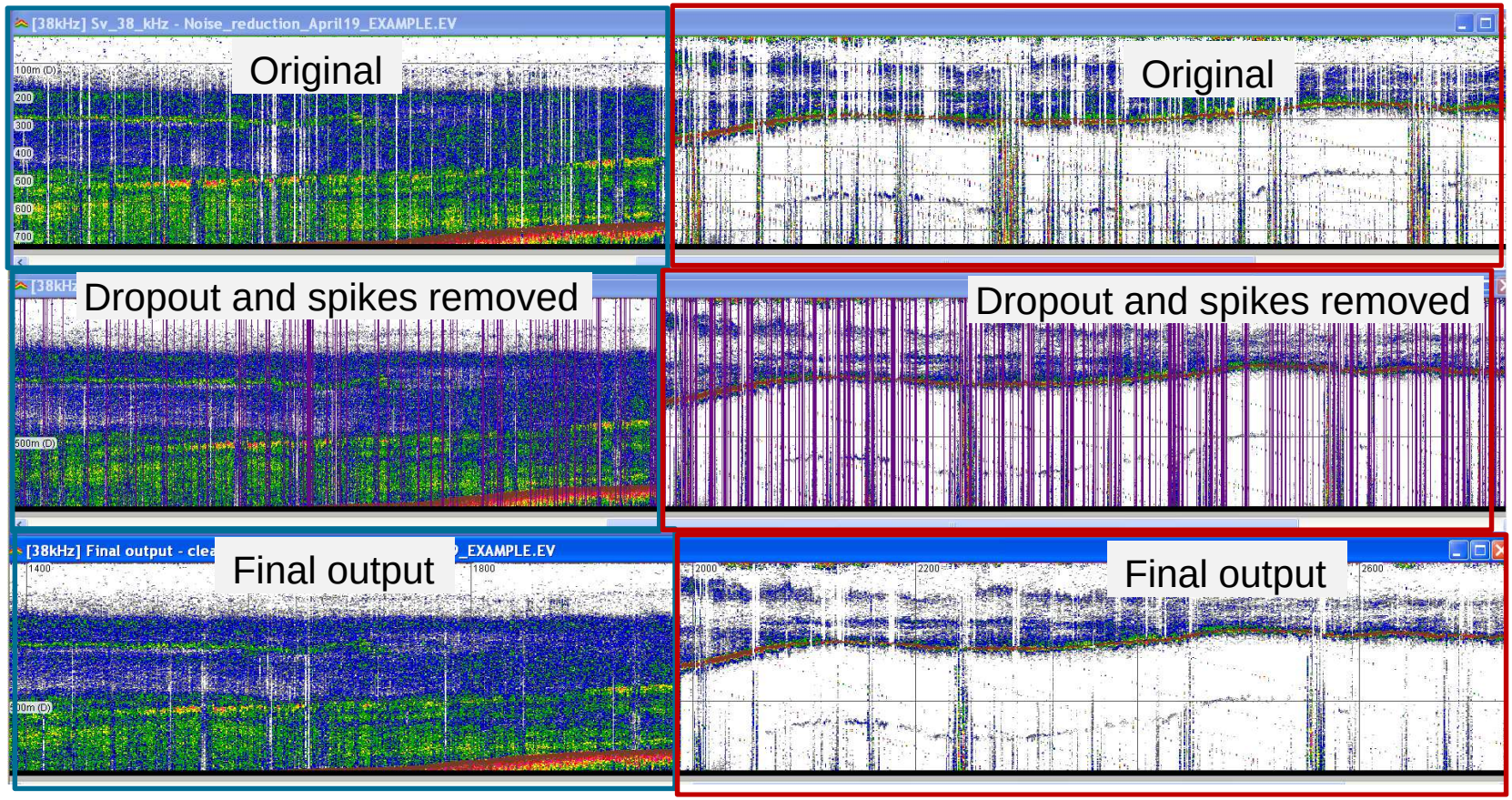
Data removed

Background noise subtracted



Echointegration <Sv> with % data rejected

Data processing and quality control



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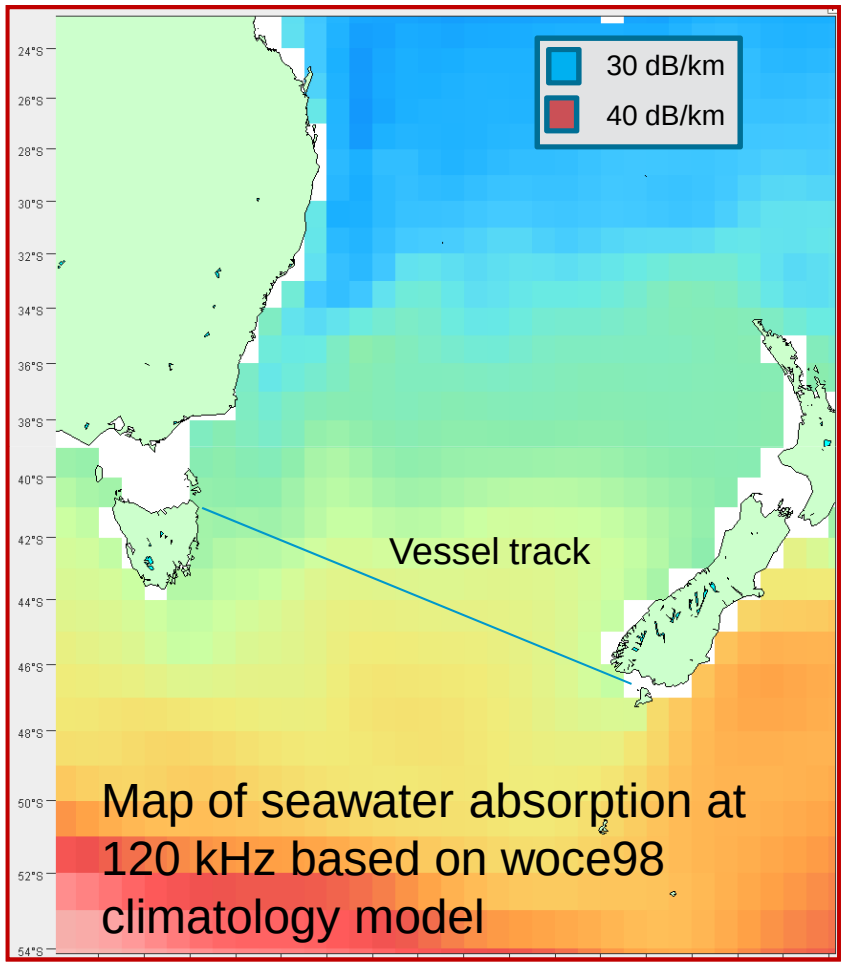
Calibration and secondary corrections

- Four systems EK500, EK60, ES60 and ES70 (soon)

- Calibrated using standard reference sphere, with triangle wave correction for ES60 and ES70

- Post-acquisition corrections for temperature effects on transducer (Demer and Renfree 2008) and changes in absorption, if significant



Map of seawater absorption at 120 kHz based on woce98 climatology model

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Summary

OOS's are ongoing and are expanding into new data streams including acoustics

Acoustic data streams will need to adhere to standardised procedures to enable repeatability and comparability between OOS's

Procedures will need to be fully documented to meet OOS requirements and needs of those who uptake data

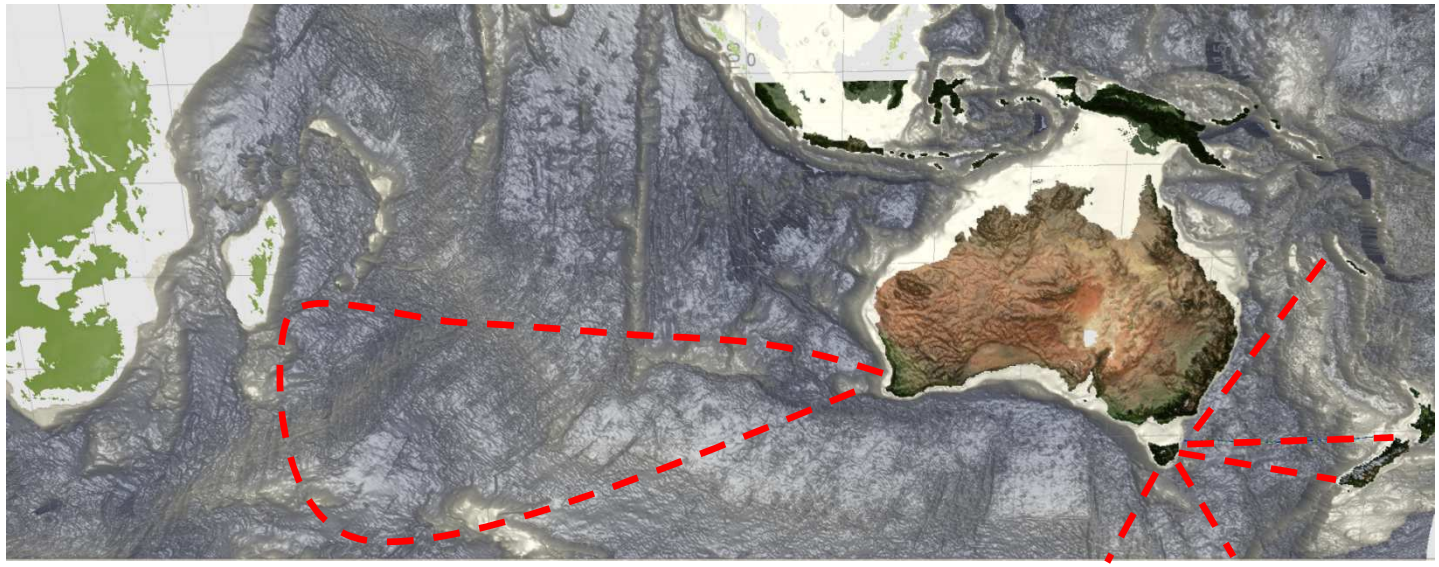
An international collaboration to establish standards would be beneficial

Suggest WGFAST consider formation of a small topic group

Thank you

Acknowledgements

• IMOS
• CSIRO WFO theme
• Participating vessels from Petuna Sealord, Austral Fisheries and Saxon Onward, Southern Surveyor, Aurora Australis and L'astrolabe



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