Time-Series Data Products from the Australian Integrated Marine Observing System

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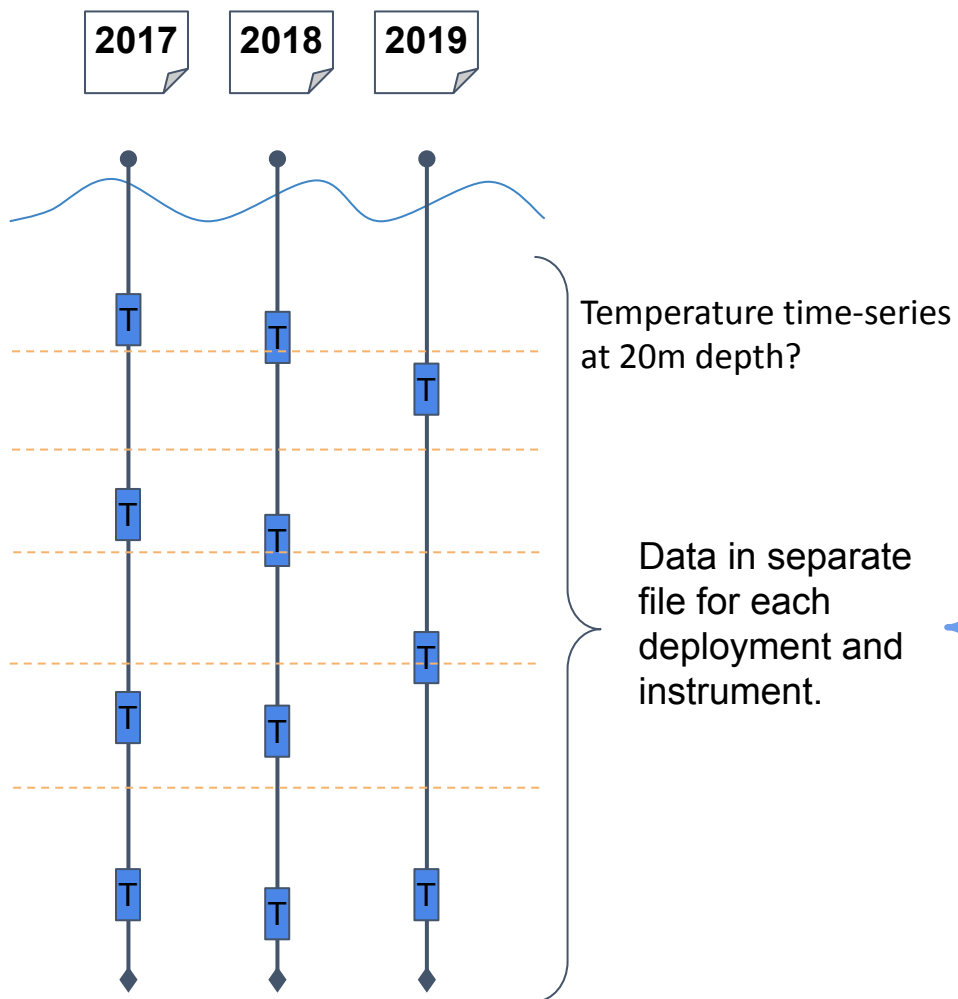Michael Hemming (UNSW)

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IMOS Integrated **Marine Observing** System

Overview

- Why do we need new data products?
- The development process
- Products developed to date
- How to access
- Future development

Motivation: the trouble with moorings data

2017 2018 2019

Temperature time-series at 20m depth?

Data in separate file for each deployment and instrument.

Barriers to data uptake and use

- Many files for one time series

- Instruments deployed to varying depths

- Instruments sample at different times

- Significant work and expert knowledge required to view and analyse time series

- Different user groups need different products (gridded density, MLD, data combined from multiple sources, plots, etc…)

IMOS_ANMN-NSW_TZ_20100127T130000Z_PH100_FV01_PH100-1001-Aqualogger-520PT-24_END-20100225T040000Z_C-20160803T010702Z.nc

IMOS_ANMN-NSW_TZ_20100127T130000Z_PH100_FV01_PH100-1001-Aqualogger-520PT-40_END-20100225T034000Z_C-20160803T010702Z.nc

Products created

Three levels of product:
1. Aggregate many files into one per site
2. Bin to common hourly time interval
3. Interpolate vertically to fixed depths

Inputs: Single instrument netCDF files, including quality control flags (auto QC)

Outputs: Aggregated netCDF file per site (and variable)

	Point time series (except current meters)	Profile time series for velocity (+ current meters)
Aggregated	✔️	✔️
Hourly	✔️	✔️
Gridded (time-depth)	✔️	(TBD)...

Aggregated time series

- All measurements of *one parameter at one site* in a single netCDF file
- + pressure, depth
- Includes *all original data* + QC flags
- Original measurements at full sampling rate => large files!
- For expert users
- File structure: [Indexed ragged array](#)
- Access: THREDDS server

All temperature in one file
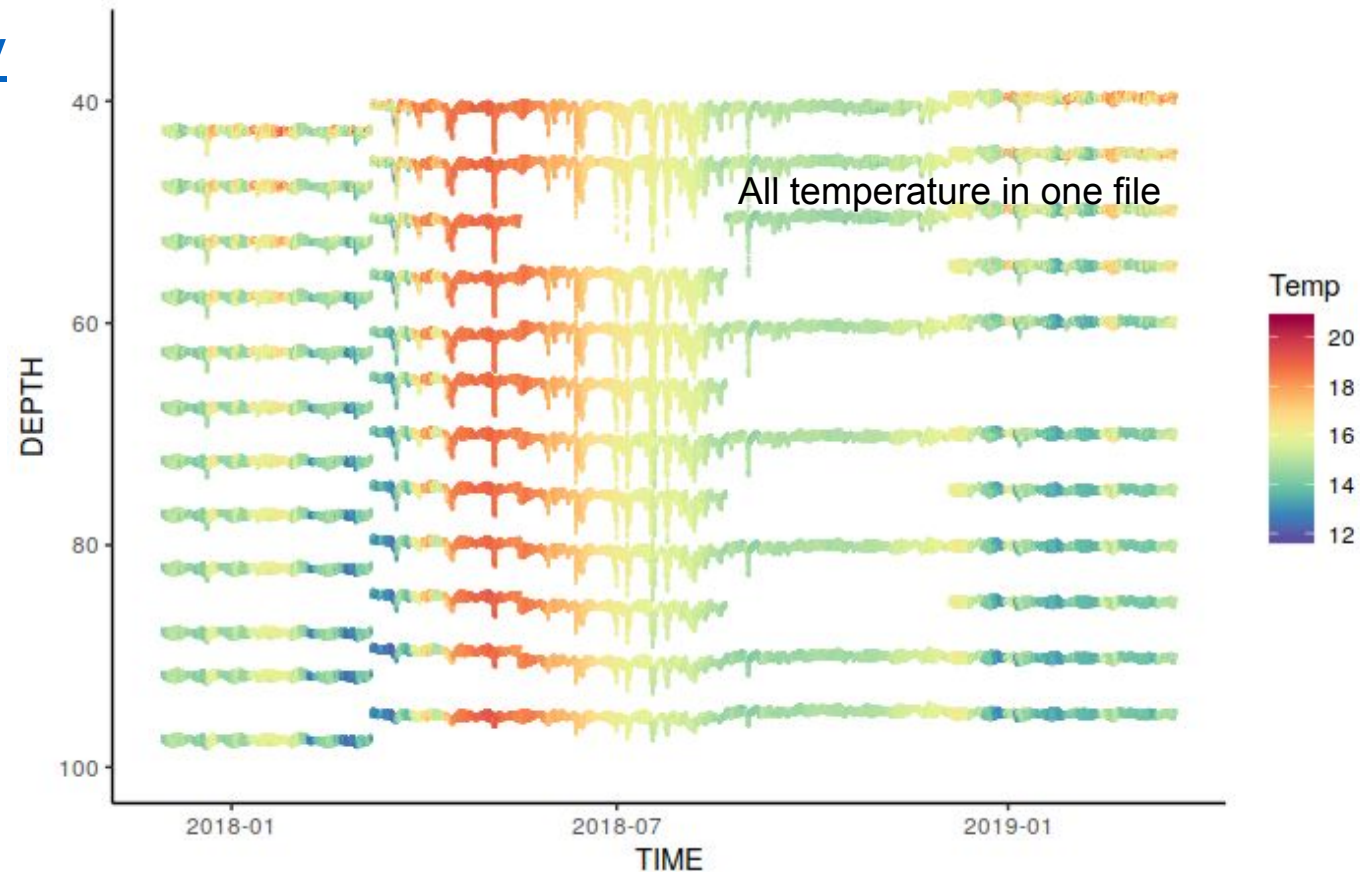
Hourly time series

- *All parameters at one site* in two files (1 velocity, 1 everything else)
- Only *"good" data* (according to QC flags)
- Binned into 1-hour time intervals
- Stats on each bin (min/max, stddev, # obs)
- Smaller files, more user friendly
- File structure: [Indexed ragged array](#)
- Access: AODN Portal & THREDDS

Mean temperature with min-max bars
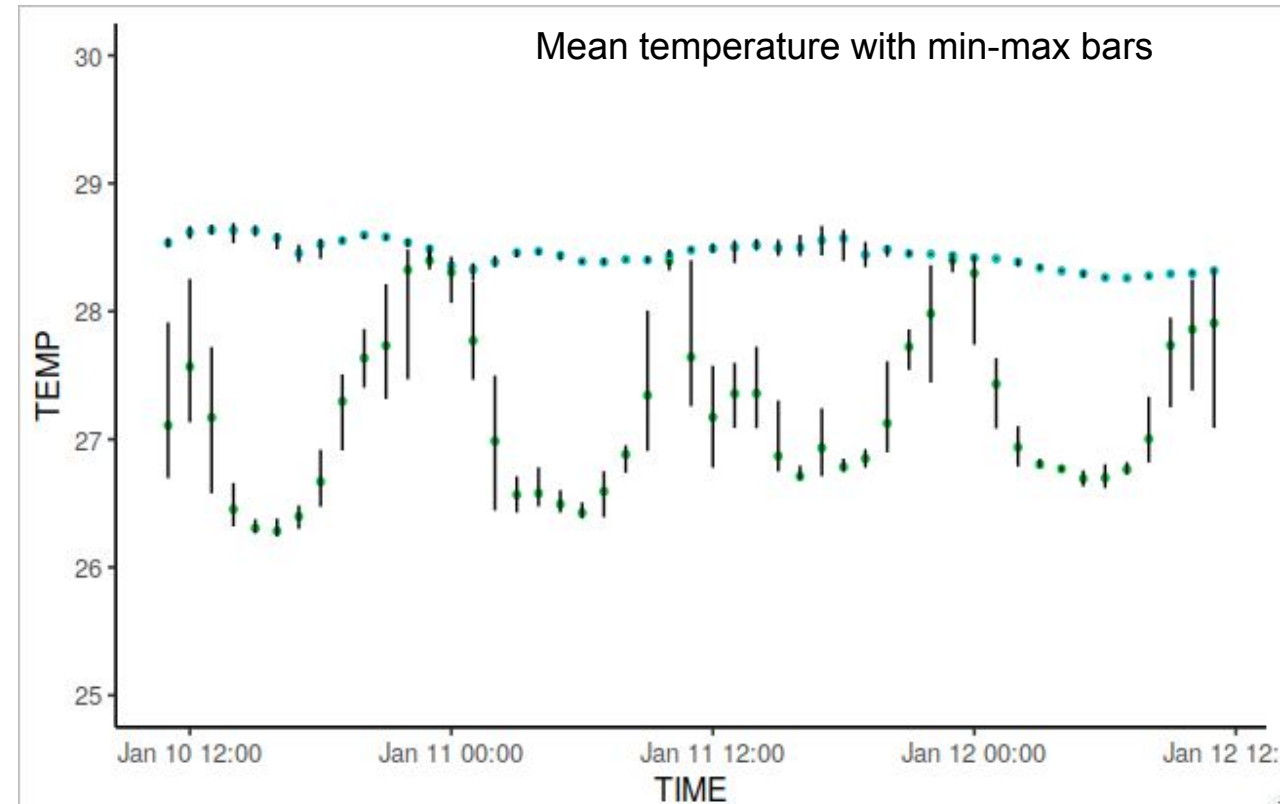
Gridded time series

- Based on the hourly product
- At each timestamp, interpolate vertically
  - Linear interpolation between adjacent measurements (if separation is < preset limit)
  - Target depths and max separation configurable by site

=> Long time series at each predefined depth

(with some missing values)

- Only temperature (velocity TBD)
- File structure: 2-dimensional time-depth grid
- Access: AODN Portal & THREDDS

TIME	0	1	2	3	4	5	6	7
DEPTH 0								
1								
2		TEMPERATURE						
3								
4								
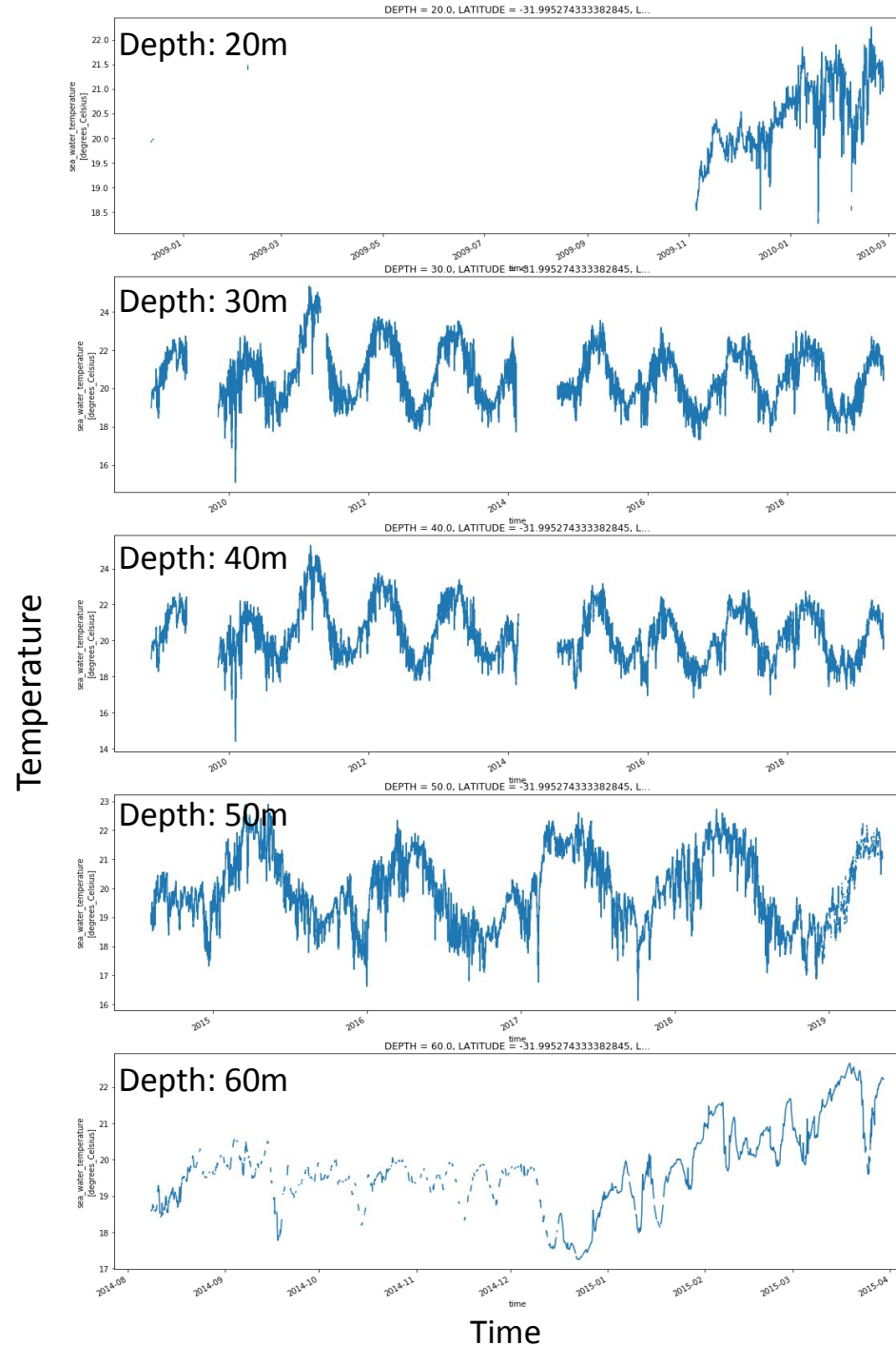
Accessing the products

https://portal.aodn.org.au

IMOS - Moorings - Hourly time-series product

IMOS - Moorings - Gridded time-series product

AODN THREDDS server

- https://thredds.aodn.org.au/thredds/catalog/IMOS/ANMN/catalog.html
- Sub-folders for each site
  - "aggregated_timesries"
  - "hourly_timesries"
  - "gridded_timesries"

- Remote access via OPeNDAP protocol

Current & future work

We are now integrating these five products into the AODN infrastructure

- Automating the process of (re-)generating the products to
  - Include new data
  - Apply changes made in the code
- Improving the metadata in the product files
- Open to feedback ([issue tracker](#))
- Future project?
  - Gridded velocity product
  - Aggregated products from CTD profiles, etc...

For more info…
- [News story](#) about the products
- Code & documentation on [GitHub](#)

NCRIS
National Research Infrastructure for Australia
An Australian Government Initiative

Australia's Integrated Marine Observing System (IMOS) is enabled by the National Collaborative Research Infrastructure Strategy (NCRIS). It is operated by a consortium of institutions as an unincorporated joint venture, with the University of Tasmania as Lead Agent. **www.imos.org.au**

PRINCIPAL PARTICIPANTS

UNIVERSITY of TASMANIA
(Lead Agent)

Australian Government

AUSTRALIAN INSTITUTE OF MARINE SCIENCE

Australian Government
Bureau of Meteorology

CSIRO

Government of South Australia

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THE UNIVERSITY OF WESTERN AUSTRALIA

sims
sydney institute of marine science

UTS

THE UNIVERSITY OF SYDNEY

MACQUARIE University

UNSW SYDNEY

SIMS is a partnership involving four universities.

ASSOCIATE PARTICIPANTS

Curtin University

Australian Government
Department of Agriculture, Water and the Environment
Australian Antarctic Division

AUSTRALIAN ANTARCTIC PROGRAM

DEAKIN UNIVERSITY

THE UNIVERSITY OF MELBOURNE

The development process

Using the products

File structure: Indexed ragged array