INTERNATIONAL TRENDS IN POLAR DATA MANAGEMENT

Perspectives from the Standing Committee on Antarctic Data Management

Johnathan Kool –SCADM chair, Australian Antarctic Data Centre

ABOUT SCADM

- Standing Committee on Antarctic Data Management
  - https://www.scar.org/resources/scadm/overview/

- Falls under the auspices of SCAR (https://www.scar.org/)
- Chair: Johnathan Kool (Australian Antarctic Division)
- Co-Vice Chairs:
  - Helen Peat (British Antarctic Survey)
  - Frank Nitsche (Lamont-Dohert Earth Observatory, USAP)
- Members from 33 countries (and counting)
- Monthly meetings

OBLIGATIONS ON THOSE COLLECTING DATA IN POLAR REGIONS

Requirements under the Antarctic Treaty - Section III c

- *"scientific observations and results from Antarctica shall be exchanged and made freely available"*

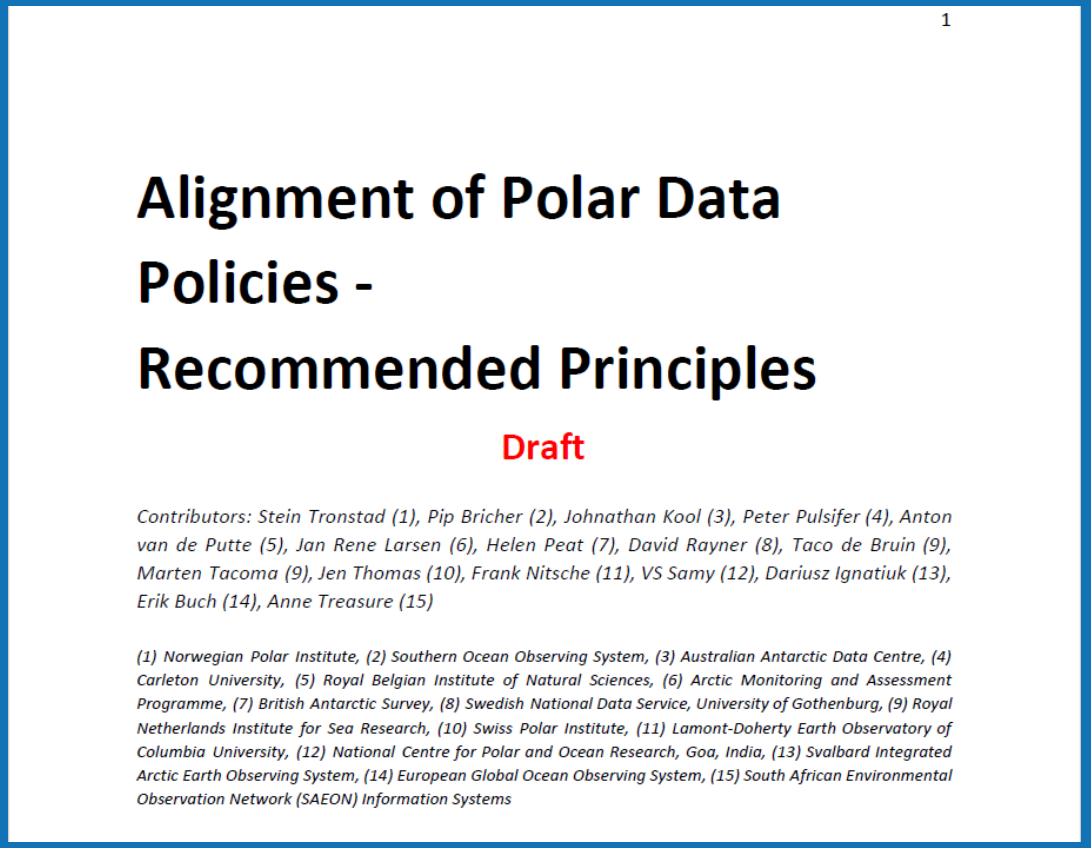
Objective of the International Arctic Science Committee (IASC)

- *"seek to ensure that scientific data and information from the Arctic are safeguarded, freely exchangeable and accessible"*

Photo credit: NASA

DATA POLICIES

- SCAR Data Policy - Currently undergoing revision



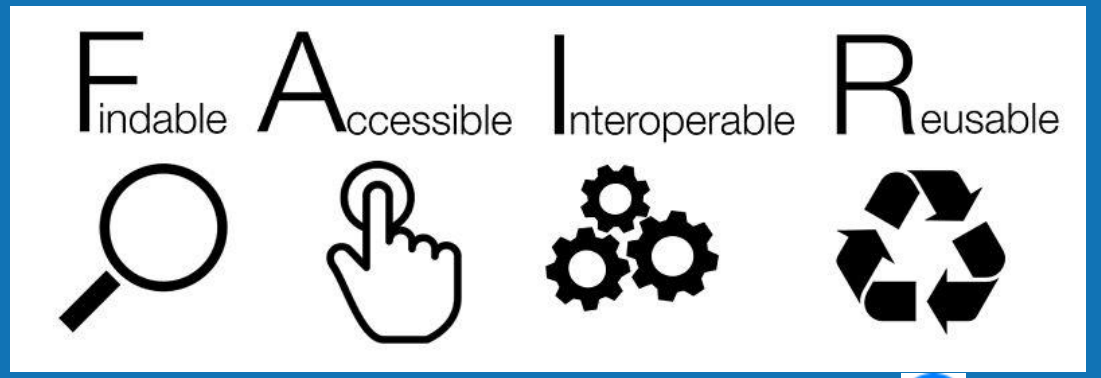
Alignment of Polar Data Policies - Recommended Principles

Draft

Contributors: Stein Tronstad (1), Pip Bricher (2), Johnathan Kool (3), Peter Pulsifer (4), Anton van de Putte (5), Jan Rene Larsen (6), Helen Peat (7), David Rayner (8), Taco de Bruin (9), Marten Tacoma (9), Jen Thomas (10), Frank Nitsche (11), VS Samy (12), Dariusz Ignatiuk (13), Erik Buch (14), Anne Treasure (15)

(1) Norwegian Polar Institute, (2) Southern Ocean Observing System, (3) Australian Antarctic Data Centre, (4) Carleton University, (5) Royal Belgian Institute of Natural Sciences, (6) Arctic Monitoring and Assessment Programme, (7) British Antarctic Survey, (8) Swedish National Data Service, University of Gothenburg, (9) Royal Netherlands Institute for Sea Research, (10) Swiss Polar Institute, (11) Lamont-Doherty Earth Observatory of Columbia University, (12) National Centre for Polar and Ocean Research, Goa, India, (13) Svalbard Integrated Arctic Earth Observing System, (14) European Global Ocean Observing System, (15) South African Environmental Observation Network (SAEON) Information Systems

MAKING DATA FAIR

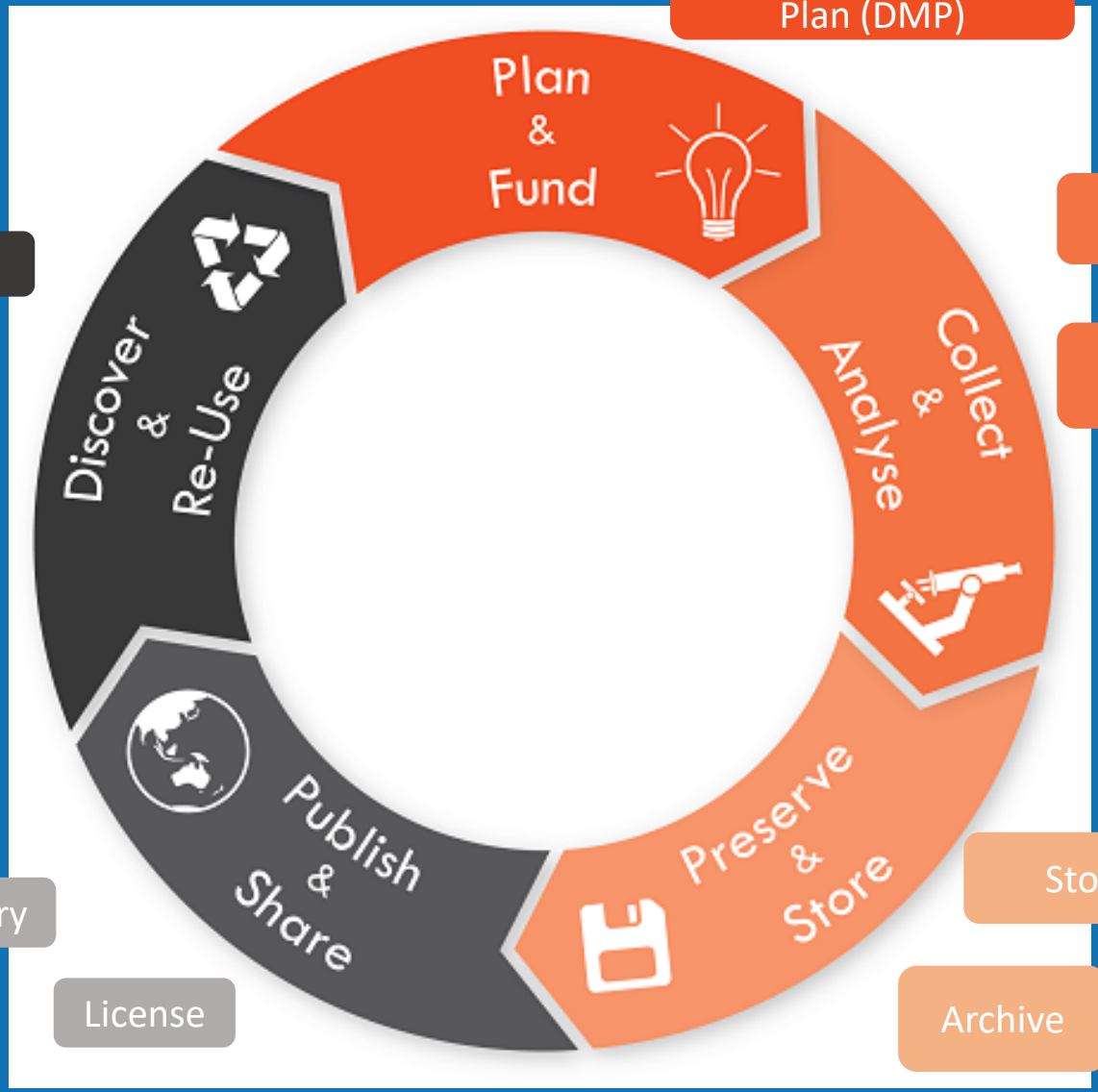


Force 11

- FAIR – Findable, Accessible, Interoperable, and Reusable

- Findable: Easily discoverable – e.g. via Google, catalogues, linked websites
- Accessible: getting to the data – open downloads, data streams, APIs
- Interoperable: combinable data – standards, consistent formats, vocabularies
- Reusable: derived products – versatile, non-restrictive, clean, understandable

THE DATA LIFE CYCLE



Data Management Plan (DMP)

Naming convention

Back up storage

Versioning

Metadata

Storage

Data formats

Archive

License

Data Papers

Repository

Persistent identifier

Metadata catalogue

Citation

Source: The University of Sydney

DATA MANAGEMENT PLANS

- Assist with the process of meeting data management requirements as work progresses.
- What will you do with data during and after research
- Who, what, when, where, how, and why
- https://www.ands.org.au/working-with-data/data-management/data-management-plans

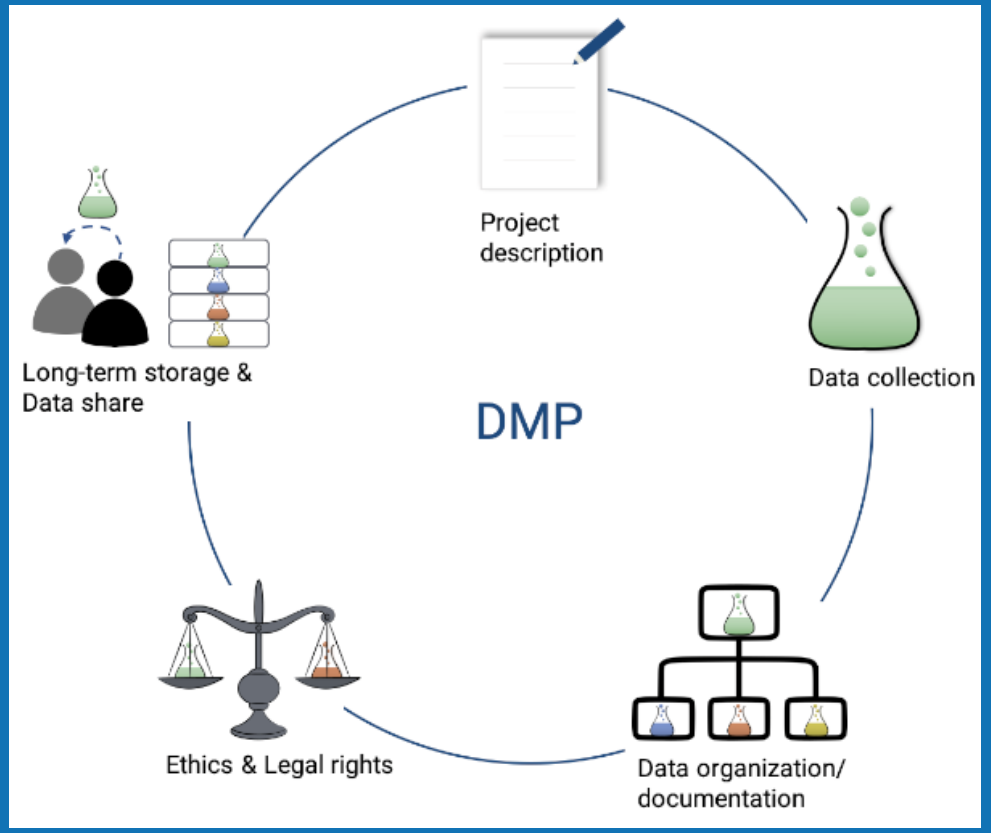


Image credit: Franziska Kappert

METADATA

- Data about data – e.g.
  - Creator(s)
  - Keywords
  - Download information
  - Usage restrictions
- Basis of searchability (and also interoperability)
- DIF (Directory Interchange Format), ISO-19115, DCAT

PERMISSIONS AND SHARING

- Data should be accompanied by some form of rights statement, public domain statement, or an internationally recognised data license.
- The absence of any of the above may make the data legally unusable in some jurisdictions!
- Rights statements – rightsstatements.org
- Public domain statement (e.g. CC0)
- International data licenses – Creative Commons
- Open-source software – MIT, Apache, BSD-3

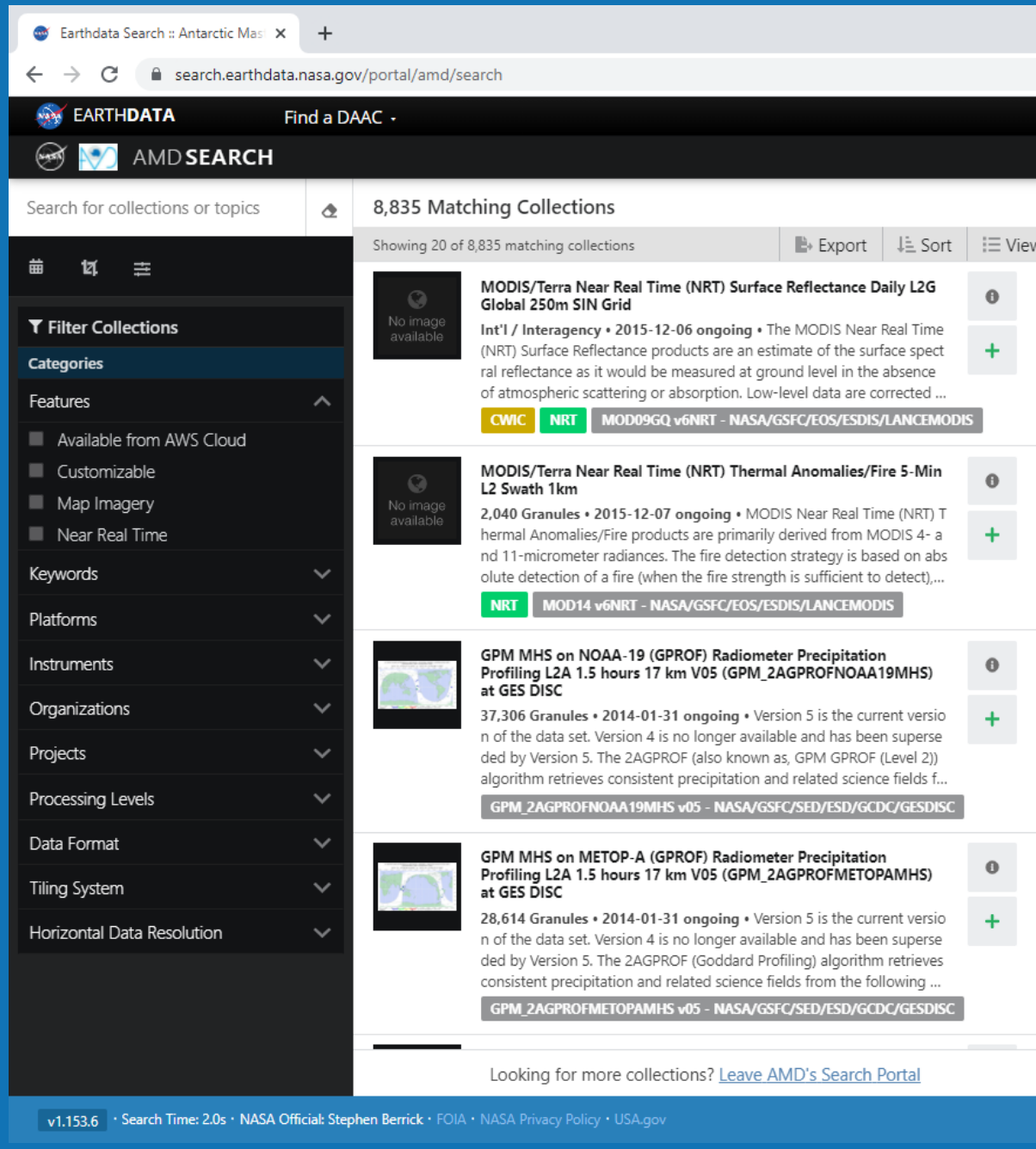
ATTRIBUTION AND PROVENANCE

- Licensing – e.g. CC-BY requires attribution
- Persistent identifiers
  - DOIs for digital objects (data, databases)
  - ORCID for researchers (people)
- Snapshots in time and amalgamations can become complicated
  - Open StreetMap, Google Earth
  - Dynamic DOIs

FINDING ANTARCTIC DATA

- Google
- Google Datasets
- SOOS – https://www.soos.aq
- Antarctic Master Directory/EarthData
  - https://search.earthdata.nasa.gov/portal/amd/search

- Your friendly neighbourhood Polar Data Centre – for example
- Australia – https://data.aad.gov.au
- UK – https://bas.ac.uk/data
- US - https://www.usap-dc.org/
- Pangaea - https://www.pangaea.de/



AUSTRALIAN ANTARCTIC DIVISION

RSV NUYINA CAPABILITIES

- **GPS and Positioning (MRU)**
- **Seabed Mapping**
  - Kongsberg EM 122 (Deep)
  - Kongsberg EM 712 (Shallow)
  - Simrad EK80 broadband echosounder
- **Fish Acoustics**
  - SimRad SH90 (downward) and MS70 (sidescan)
- **Radar**
  - Arc-X Doppler weather, Sigma 6 Ice Wave
- **Oceanography**
  - ADCP, OceanPack (7 variables), PCO_2, ISAR SST
- **Moving Vessel Profiler**
  - Continuous CTD and SVP
- **Atmospheric**
  - Radiation sensors, Wind, Temperature, Pressure, Clouds
- **USBL Capability**
- **Flowthrough system**

Satellites

Data Sources

Field Scientists

Drones and Autonomous Vehicles

RSV *Nuyina*

Files

Data Storage

Cloud Services

Databases

Metadata

@Title
@Author
@Keywords
@Fields

@Structure
@Meaning

...

Web Services

- Dataset search
- Automated weather station data
- Place names gazetteer
- ... and more

Data Interrogation & Processing

Analytics

$y=f(x_1,x_2,x_3\ldots)$

AI

Reports

Data Products & Visualisation

Maps

Data Science Notebooks

Dashboards

Logging, Provenance, and Metrics

CLOUD SERVICES

What's up with 'The Cloud'?

- Scalability
- Accessibility
- Portability
- Cost effective (if done well)

Simple Storage Service (S3)

- Object store – similar to a file system, but not quite…
- Everything is accessible through code via a URL

Remote Sensing of Near-Coastal Antarctic Sea Ice and Its Impacts on Ice Shelves and Ecosystems.

Massom, R.

ASAC_3024

Massom, R. (2009) Remote Sensing of Near-Coastal Antarctic Sea Ice and Its Impacts on Ice Shelves and Ecosystems., Ver. 1, *Australian Antarctic Data Centre* - https://data.aad.gov.au/metadata/records/ASAC_3024, Accessed: 2021-10-08

Dataset: fast_ice_1997_1999

| public | 30 Jan 2012

Browse dataset

Request dataset

Quality

The values provided in temporal and spatial coverage are approximate only. Taken from the 2008-2009 Progress Report: Variations to work plan or objectives: The only variation has been to geographically extend Objective 3 to analyse the potentially significant impact of very thick fast ice on the dynamic and calving behaviour of the floating Mertz Glacier Tongue (see Section 1.1 above). It is anticipated that this extension will enhance the project, by highlighting a previously overlooked yet potentially important process affecting floating glacier tongue/ice shelf breakup, whereby strong coupling between very thick perennial sea ice and continental ice provides stability in certain ice sheet margin regions. It also enhances the link with AAS Project #2698 (PI: Warner), on which Dr Massom is a Co-I ("Antarctica - past, present, and future: exploring the dynamic interactions of ice sheet and ice shelves within the global climate system through computer modeling"). Field work: This is predominantly a remote sensing-based project. However, in situ and airborne observations of fast ice acquired during SIPEX (V1 2007/8) by other projects on which the PI (Massom) is a Co-I (#2901 and 3030) may prove to be useful in helping to interpret satellite laser altimeter-based estimates of fast ice thickness. Moreover, and given its extrem

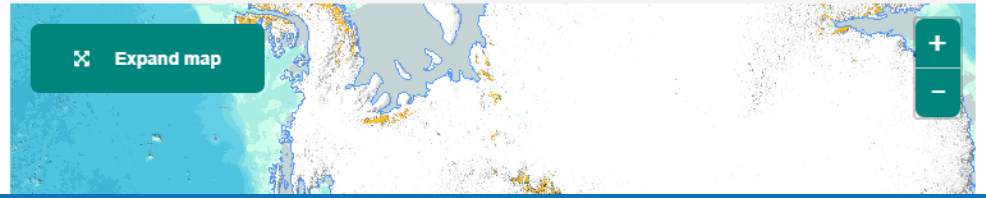
About this data record

Metadata record for data from AAS (ASAC) Project 3024. Public The proposed research will derive improved estimates of East Antarctic fast-ice extent and thickness, and their variability, from satellite data. These will be used to explicitly test relationships between fast ice/other environmental parameters and Emperor penguin population dynamics. We shall also combine observations with a wave-ice shelf-sea ice interaction model to test the hypothesis that catastrophic ice shelf break-up events on the E. Antarctic Peninsula are linked to…

Show more

Coverage: 30 Sep 2008 - 31 Mar 2011
Created: 23 Apr 2009
Revised: 26 Apr 2017
Expected release date: 8 Oct 2021
Version: 1
Data centre: Australian Antarctic Data Centre

Lat N -70.0 S -63.0 **Lon** W -180.0 E 180.0



Fast-ice Distribution in East Antarctica During 1997 and 1999 Determined Using RADARSAT Data

An image correlation technique has been applied to RADARSAT ScanSAR images from November in 1997, and November 1999, to create the first detailed maps of fast ice around East Antarctica (75E-170E). This method is based upon searching for, and distinguishing, correlated regions of the ice-covered ocean which remain stationary, in contrast to adjacent moving pack ice. Within the overlapping longitudinal range of ~86E-150.6E, the total fast-ice area is 141,450 km2 in 1997 and 152,216 km2 in 1999. Calibrated radar backscatter data are also used to determine the distribution of two fast-ice classes based on their surface roughness characteristics. The outer boundaries of the determined fast-ice area for November in 1997 and 1999 are contained in the data files for this record. This work has been allocated to ASAC project 3024.

Search

Resource	Type	Last Modified	File Size
ASAC_3024.xml		2020-05-22 00:46	
LICENSE		2020-05-22 00:21	
README		2020-07-02 12:06	
fast-ice/	Folder		

4 records

Download Dataset | View Full Record

Citation

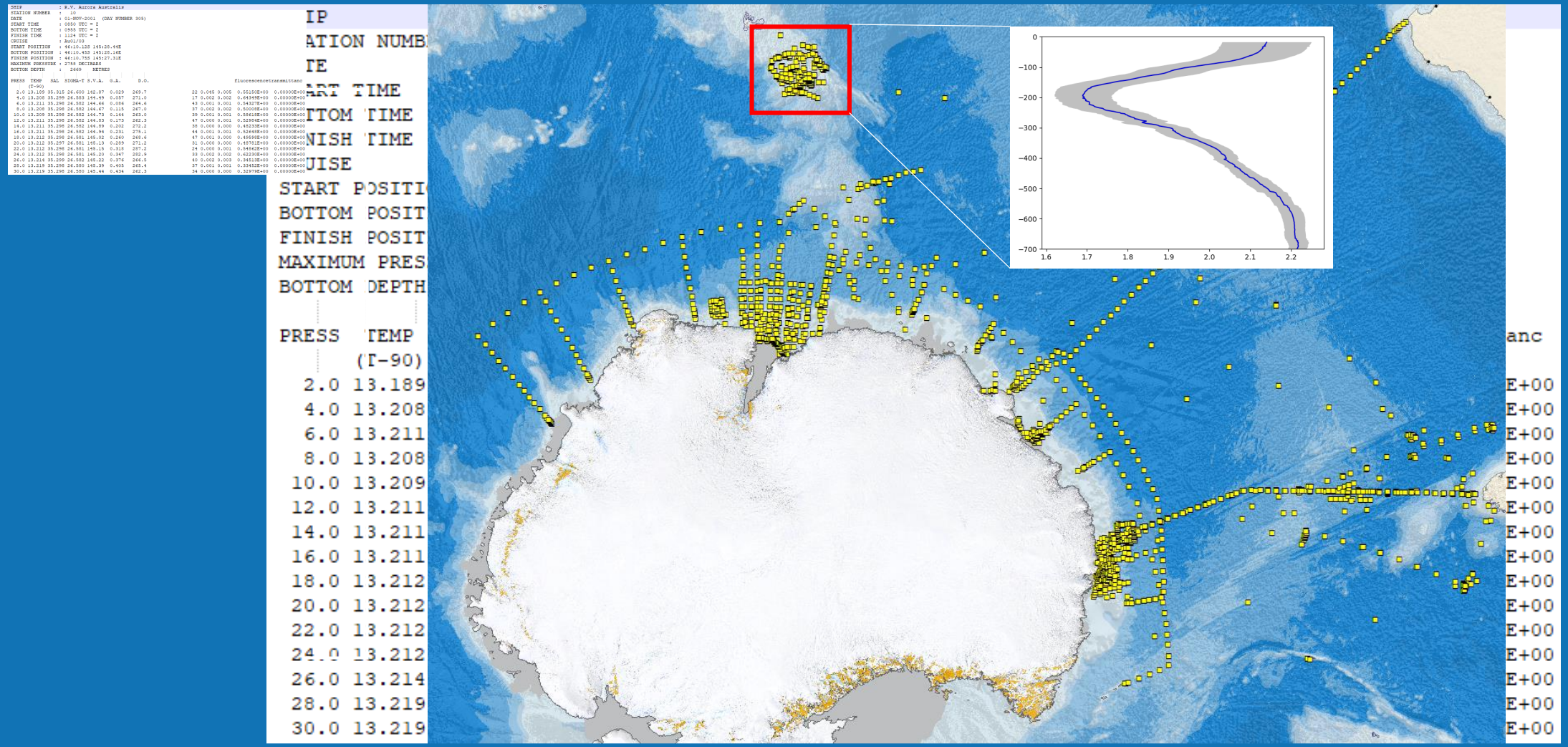
Massom, R. (2012) Fast-ice Distribution in East Antarctica During 1997 and 1999 Determined Using RADARSAT Data, Ver. 1, *Australian Antarctic Data Centre* - doi:10.4225/15/5afe50d677c8e, Accessed: 2021-10-08

THE BEGINNINGS OF BIG DATA

- All of the AADC's collections are available online
  - Online does not necessarily mean public
  - Datasets are organised at the top level according to level of protection (public, embargoed, AADC-only, etc.), but access is also controlled using permissions/policies.
- File size is no longer limiting
- Analytics can be performed "in-place"

Artwork: Medium.com

Example:
CTD data directly from raw files



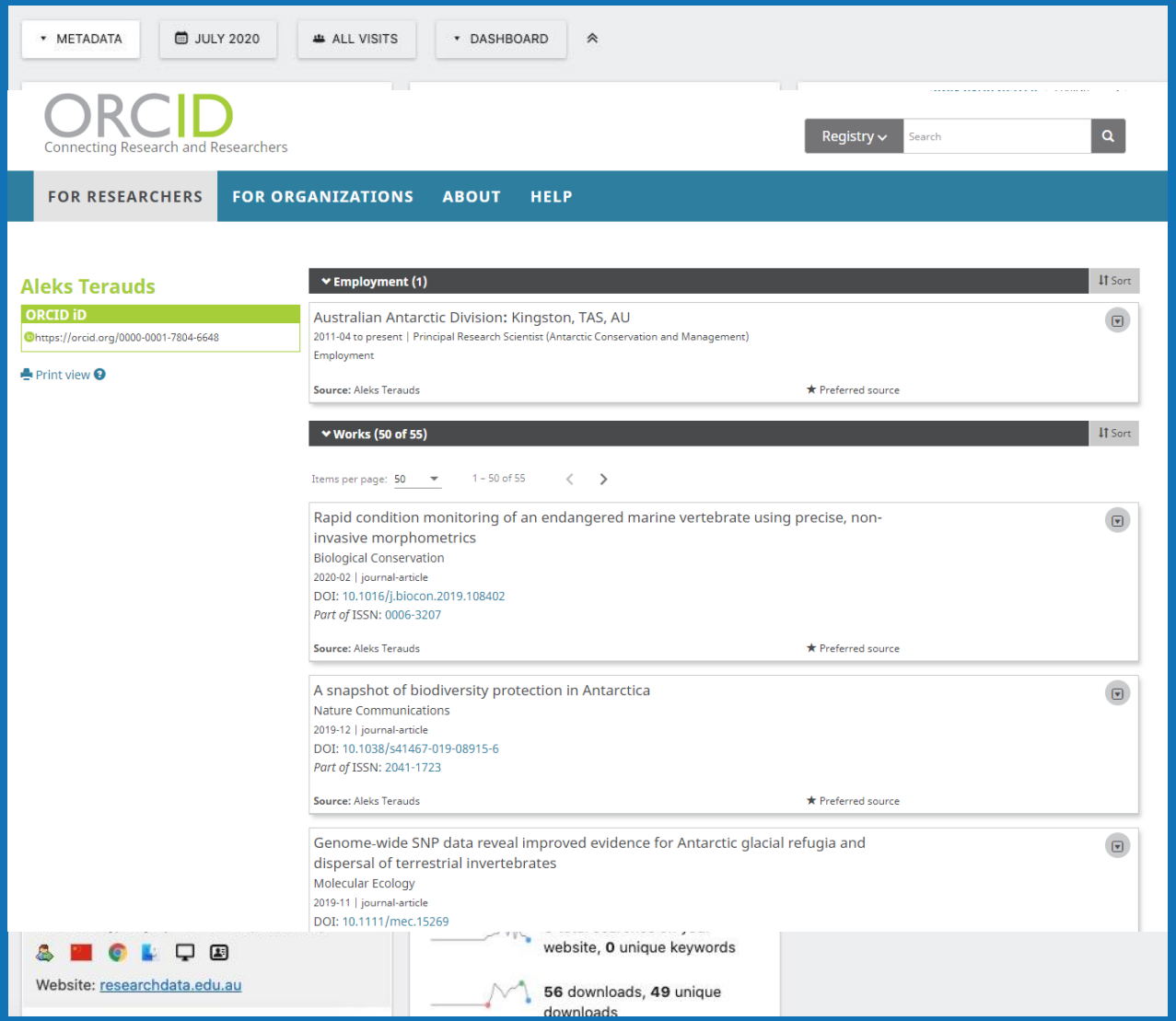
IMPROVED RELIABILITY

- Cloud services are also improving data resilience
- We have been working with IT to trial corporate backups of data to AWS.
- Our data collections are >100 TB - too large for our tape systems to handle effectively.
- AWS' systems have 99.999999999% reliability

Artwork: Pixabay

BUSINESS INTELLIGENCE AND GOVERNANCE

- Reporting, metrics
- Matomo, Google Analytics
- Logging
- ORCID



DIGITAL EARTH: ANTARCTICA

- Stacks of satellite imagery (Landsat, Sentinel) that can be compared over long periods of time
- Monitor changes in land cover (snow, ice), and generate statistics such as frequency of cover, or change trend
- It may also be possible to incorporate radar information to study evolution of crevasses
- Improved communications
- Expanding AAD's remote sensing and imaging capabilities (including drone imagery analysis)

Photo: NASA

Questions?