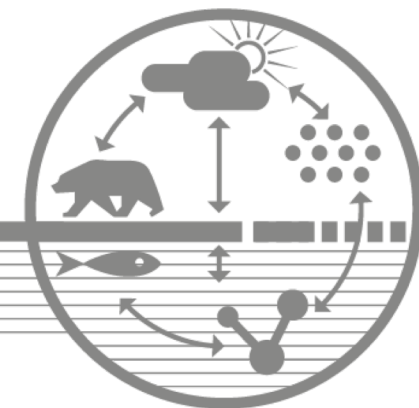


MOSAIC

International
Arctic Drift
Expedition



MOSAIC goes O2A - Arctic Expedition Data Flow from Observations to Archives and Analysis

A. Immerz, M. Ajjan, J. Bein, B. Bräuer, T. Dinter, A. Driemel, T. Duede, J. Eilers, P. Gerchow, F. O. Glöckner, M. Günster, A. Haas, N. Harms, S. Immoor, R. Koppe, H. Liegmahl-Pieper, A. Macario, S. Makedanz, J. Matthes, M. Petri, H. Pfeiffenberger, S. Pinkernell, D. Ransby, S. Rehmcke, A. Schaefer, C. Schäfer-Neth, J. Schlüter, S. Schumacher, R. Spettnagel, A. Steinbach, A. Thiele, F. Thiele-Wolff, M. Thoma, A. Walter, P. Weidinger, S. Frickenhaus

Alfred Wegener Institute
Helmholtz Centre for Polar and Marine Research
Bremerhaven



EGU General Assembly 2020

05.05.2020



ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR-
UND MEERESFORSCHUNG

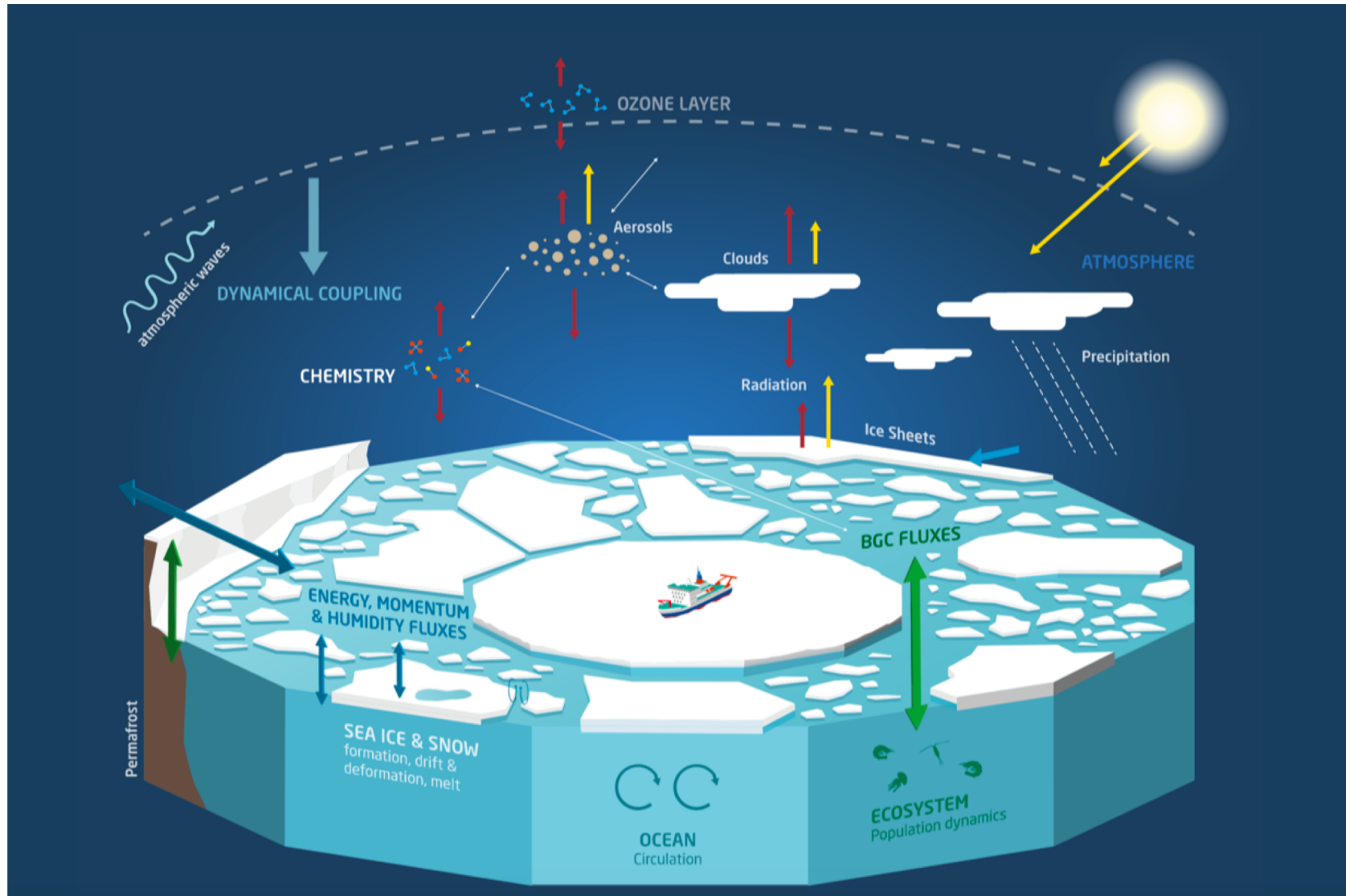


MOSAIC - Multidisciplinary drifting Observatory for the Study of Arctic Climate

- Largest Arctic research expedition ever
 - to describe the processes coupling the atmosphere, sea ice, and ocean
- large suite of in-situ and remote sensing observations of physical, ecological and biogeochemical parameters
- Integrates between disciplines and between observations & models
- Will lead to breakthrough in Arctic climate science.
- More than 60 institutions, 17 nations
- A total of ~600 people will operate in the central Arctic
- estimated up to 600 to be registered data users



Main scientific focus areas



MOSAiC Data Policy

Expedition Start 19.09.2019

- First data back on land: January 2020

- project's success relies upon professional coordination and data sharing across the participants
- transparent Data Policy is essential to achieve MOSAiC science objectives, to facilitate collaboration, and to enable broad use and impact of the MOSAiC data legacy

Expedition End: October 2020

January 2021

- All Sensor Data on MCS
- fast analysis sample data on MCS
- primary subset of laboratory data on MCS

January 2022

- full collection of laboratory data on MCS

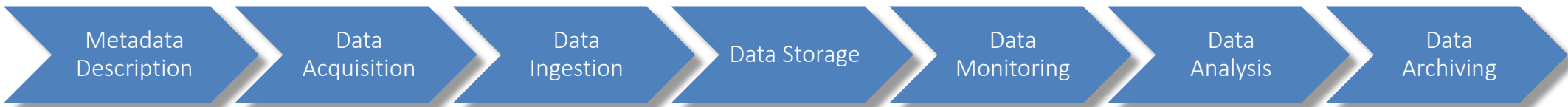
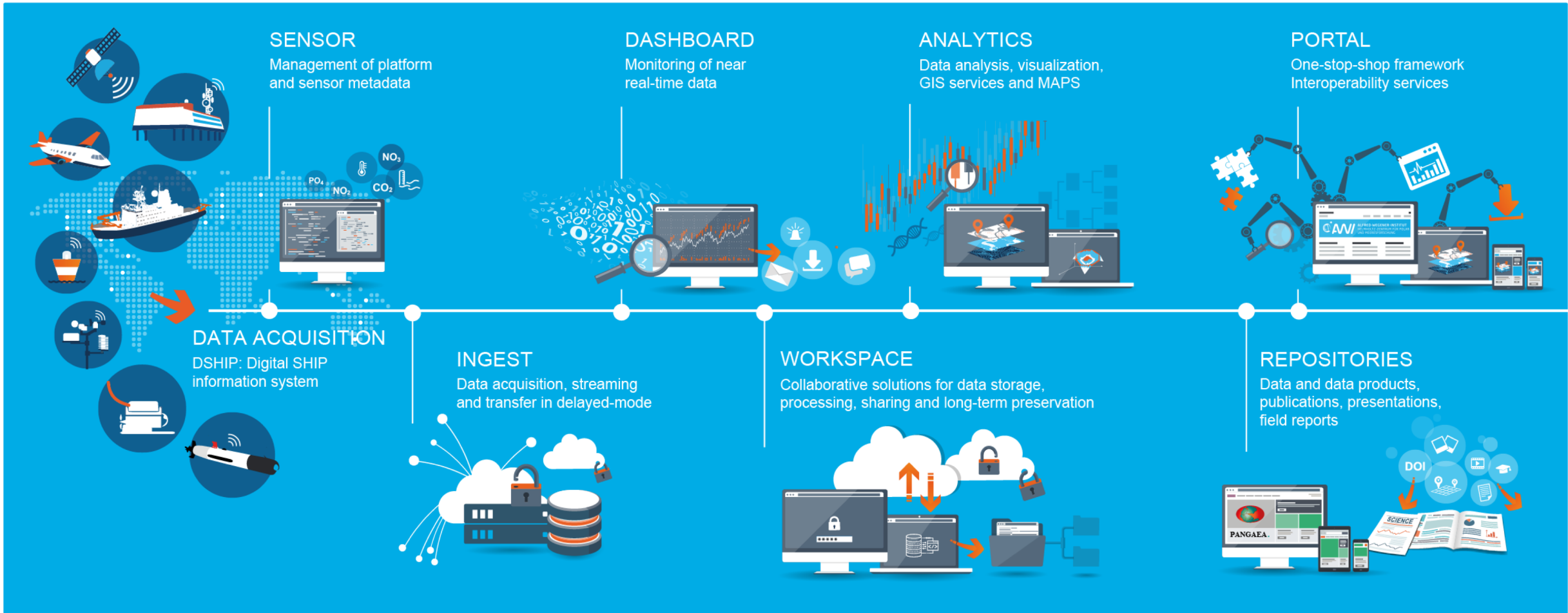
Public release: 01.01.2023 or earlier!

MOSAiC Central Storage (MCS)

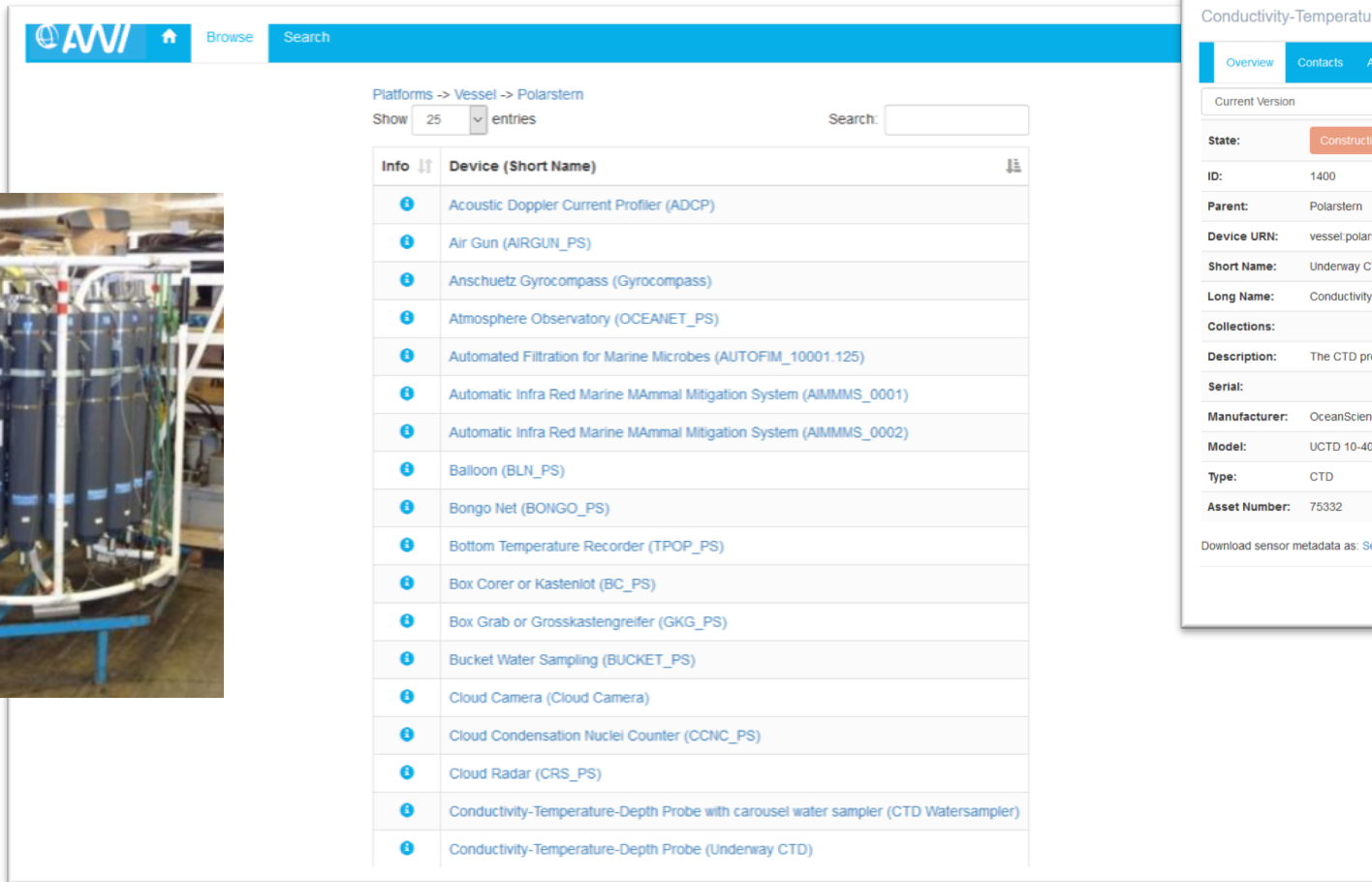
- Aboard Polarstern: basis for gathering data along the year of operation
- On land: central and reliable storage and working database of MOSAiC data.

<https://spaces.awi.de/display/EFPW/MOSAiC+Data+Policy>

<https://spaces.awi.de/display/DM/>

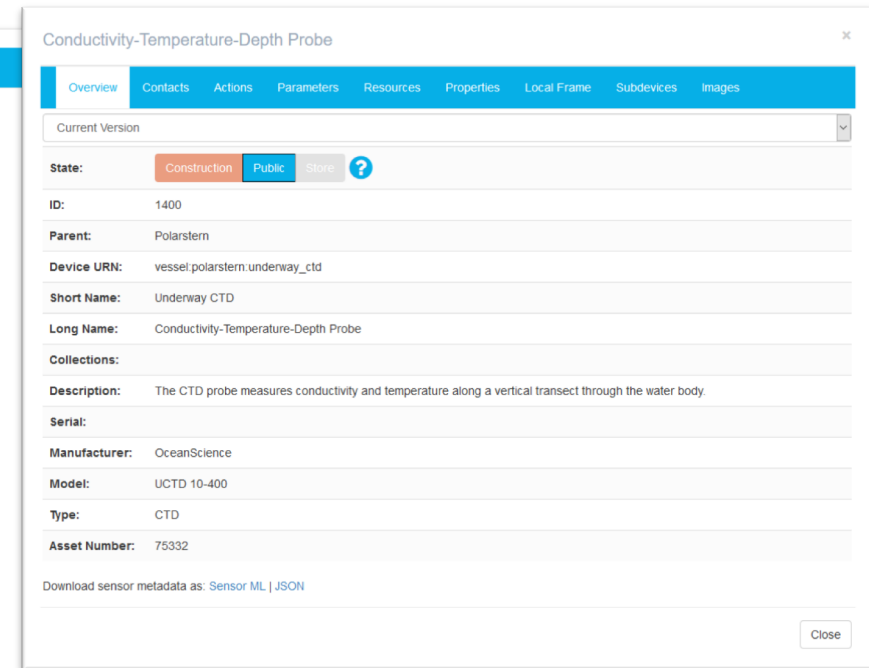


- ... a sensor information system to create and manage meta data of scientific devices

Platforms -> Vessel -> Polarstern
Show 25 entries

Info	Device (Short Name)
ⓘ	Acoustic Doppler Current Profiler (ADCP)
ⓘ	Air Gun (AIRGUN_PS)
ⓘ	Anschuetz Gyrocompass (Gyrocompass)
ⓘ	Atmosphere Observatory (OCEANET_PS)
ⓘ	Automated Filtration for Marine Microbes (AUTOFIM_10001.125)
ⓘ	Automatic Infra Red Marine MAMmal Mitigation System (AIMMMS_0001)
ⓘ	Automatic Infra Red Marine MAMmal Mitigation System (AIMMMS_0002)
ⓘ	Balloon (BLN_PS)
ⓘ	Bongo Net (BONGO_PS)
ⓘ	Bottom Temperature Recorder (TPOP_PS)
ⓘ	Box Corer or Kastenlot (BC_PS)
ⓘ	Box Grab or Grosskastengreifer (GKG_PS)
ⓘ	Bucket Water Sampling (BUCKET_PS)
ⓘ	Cloud Camera (Cloud Camera)
ⓘ	Cloud Condensation Nuclei Counter (CCNC_PS)
ⓘ	Cloud Radar (CRS_PS)
ⓘ	Conductivity-Temperature-Depth Probe with carousel water sampler (CTD Watersampler)
ⓘ	Conductivity-Temperature-Depth Probe (Underway CTD)



Conductivity-Temperature-Depth Probe

Overview | Contacts | Actions | Parameters | Resources | Properties | Local Frame | Subdevices | Images

Current Version

State: Construction | Public | Store ?

ID: 1400

Parent: Polarstern

Device URN: vessel.polarstern.underway_ctd

Short Name: Underway CTD

Long Name: Conductivity-Temperature-Depth Probe

Collections:

Description: The CTD probe measures conductivity and temperature along a vertical transect through the water body.

Serial:

Manufacturer: OceanScience

Model: UCTD 10-400

Type: CTD


Asset Number: 75332

Download sensor metadata as: Sensor ML | JSON

Close



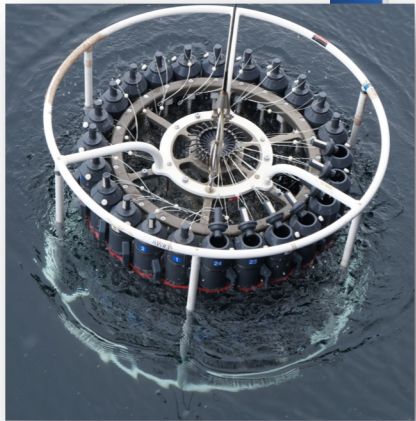
- ... an interactive logbook of measurement and sampling activities

DSHIP MOSAIC20192020/1 || 75° 08,241' N 039° 07,762' E || 2019-09-22 ... 

DSHIP_ActionLog +

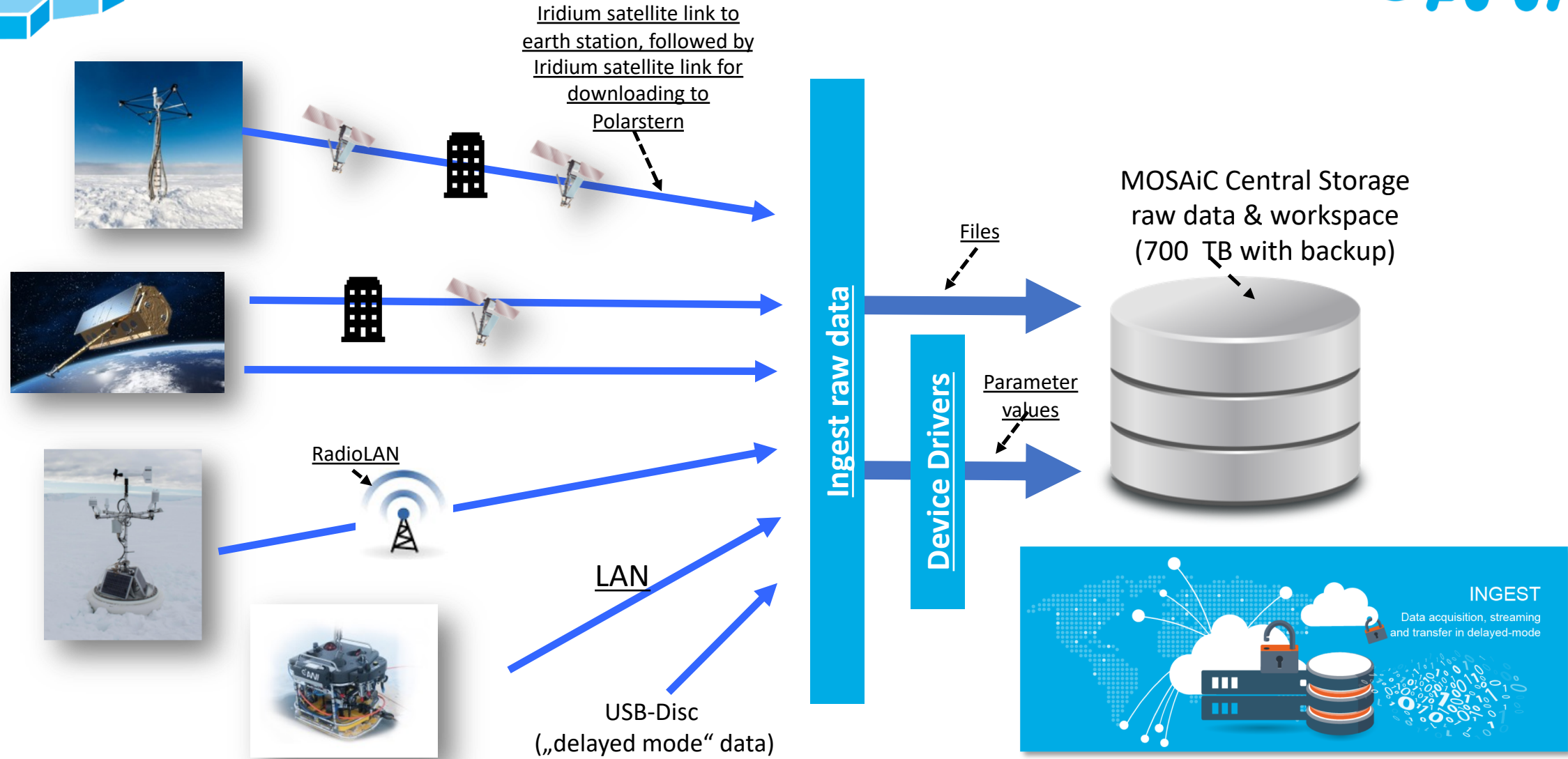
DSHIP_ActionLog

↑ Activity - Device Operation ▾	Timestamp	Device	Action	Latitude	Longitude	Depth (m)	Speed (kn)	Co
PS122/1_4-1 CTD_SBE9plus_485	22.09.2019 09:...	Conductivity-Te...	information	75° 07,932' N	039° 05,969' E	184.0	13.1	^
PS122/1_3-1 topAWI	22.09.2019 09:...	Towed Ocean ...	information	75° 05,362' N	038° 51,058' E	186.0	13.3	
PS122/1_2-1 AIRGUN_PS	22.09.2019 08:...	Air Gun	profile start	74° 59,125' N	038° 15,496' E	177.0	13.3	
PS122/1_1-1 topAWI	21.09.2019 18:...	Towed Ocean ...	information	73° 08,358' N	029° 49,934' E	267.0	12.7	
PS122/1_0_Underway-60 Weather	20.09.2019 17:...	Weather Station	station start	69° 40,773' N	018° 59,799' E	0.0	0.0	v



- werum.de
- dms.awi.de/

Data Ingestion via different channels...



MOSAIC Central Storage

- ... naming convention derived from *SENSOR.awi.de*



SENSOR.awi.de

vessel:polarstern:ctd_watersampler:SBE3plus_temperature_sensor

- Platformtype
 - vessel
- Platform
 - polarstern
- Device
 - ctd_watersampler
 - SBE3plus temperature sensor
 - temperature



MCS



- vessel/polarstern/ctd_watersampler/SBE3plus_temperature_sensor/DEVICEOPERATION_ID.../SensorFile.xxx
- vessel/polarstern/ctd_watersampler/SBE3plus_temperature_sensor/DATE.../File.xxx



- vessel:polarstern:ctd_watersampler:SBE3plus_temperature_sensor:temperature

WORKSPACE
Collaborative solutions for data storage, processing, sharing and long-term preservation

Sensor Metadata Description

Data Acquisition

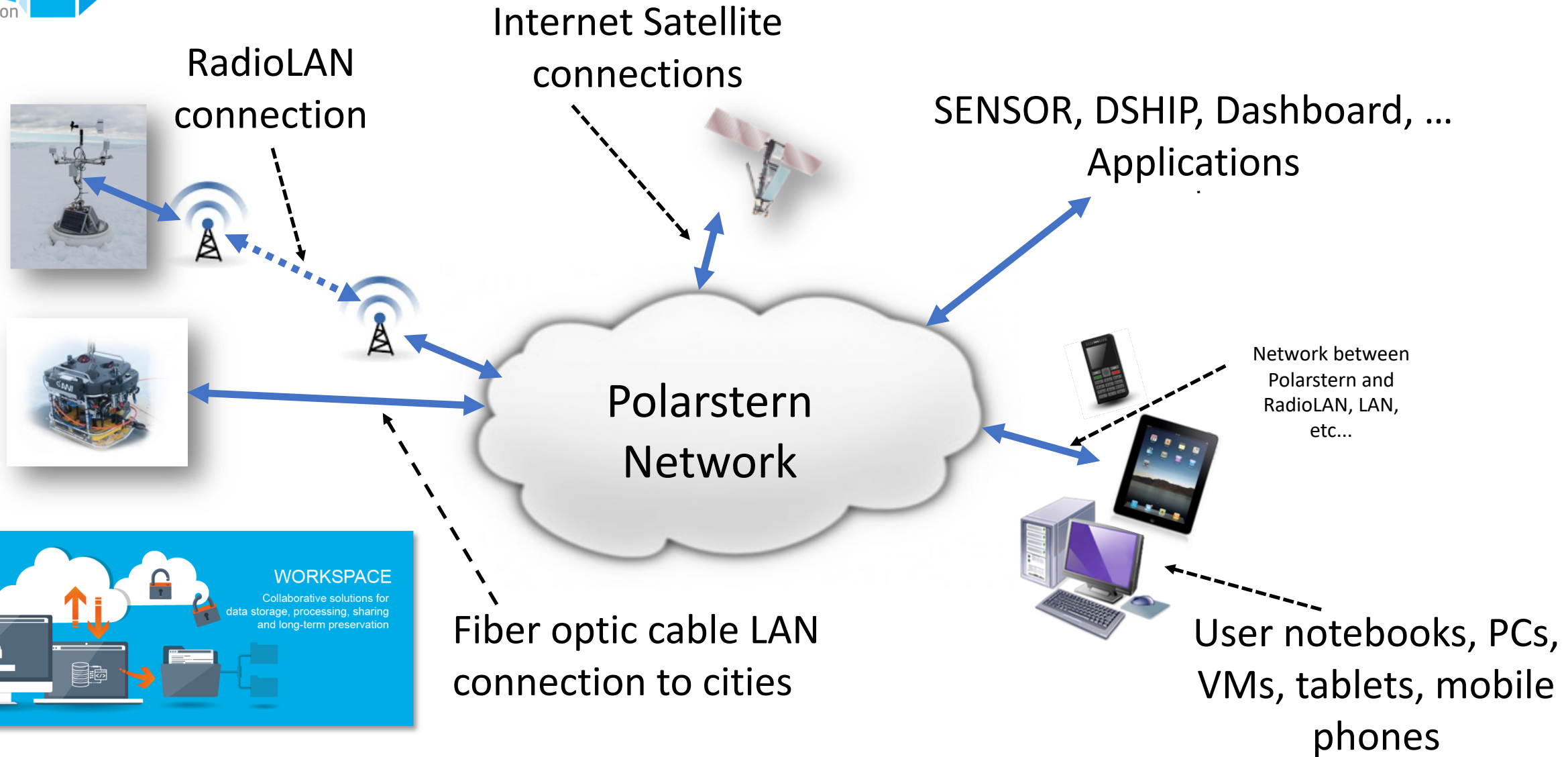
Data Ingestion

Data Storage

Data Monitoring

Data Analytics

Data Archiving

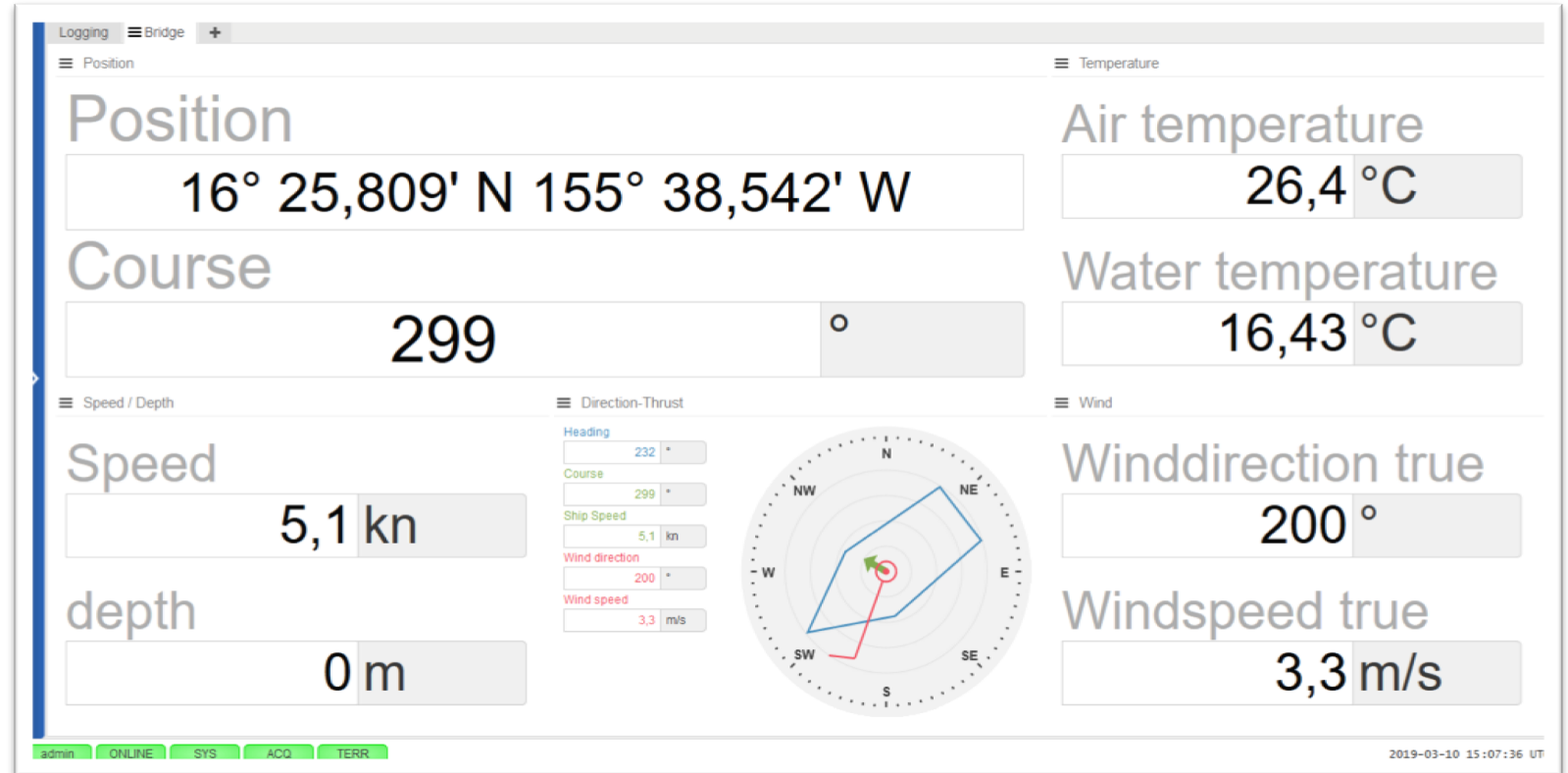


WORKSPACE
Collaborative solutions for data storage, processing, sharing and long-term preservation



DSHIP raw data

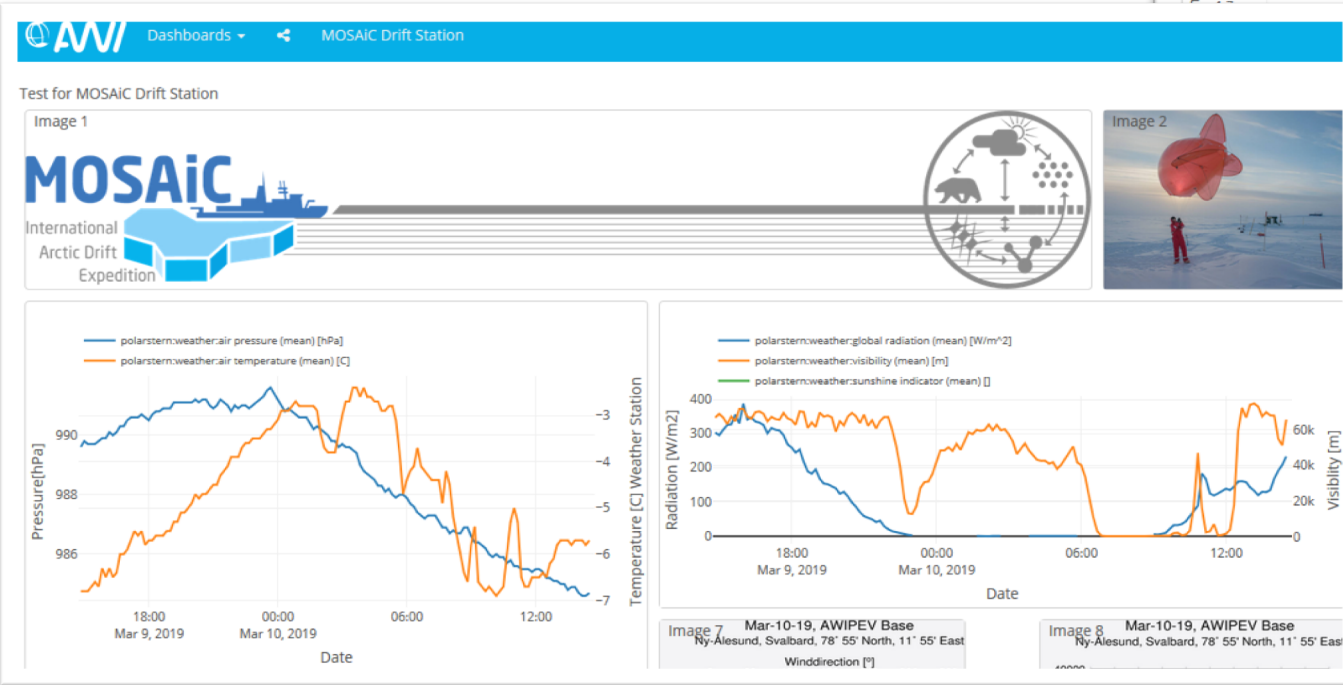
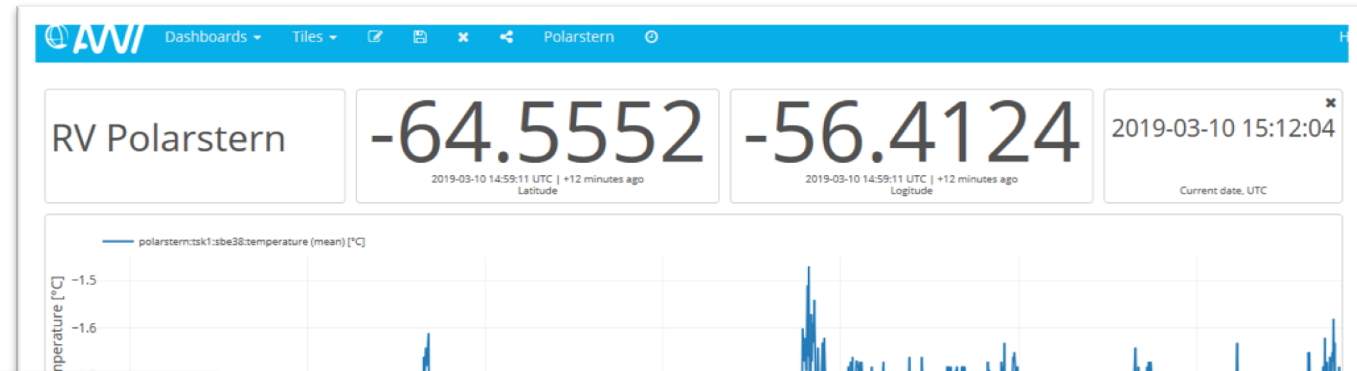
- Monitoring near real-time data from ship sensors



werum.de
dms.awi.de/

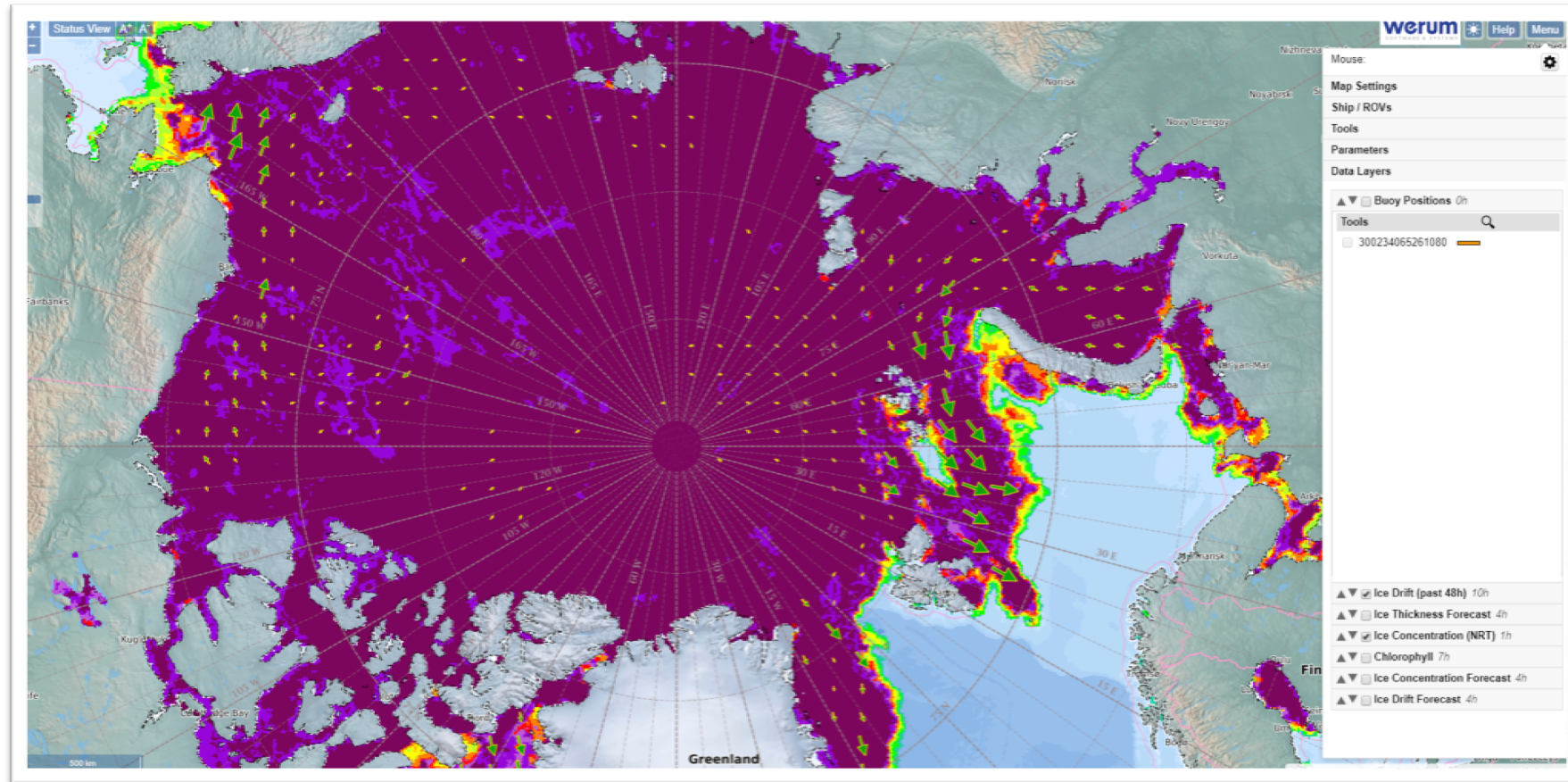


- Monitoring of near real-time and delayed-mode data



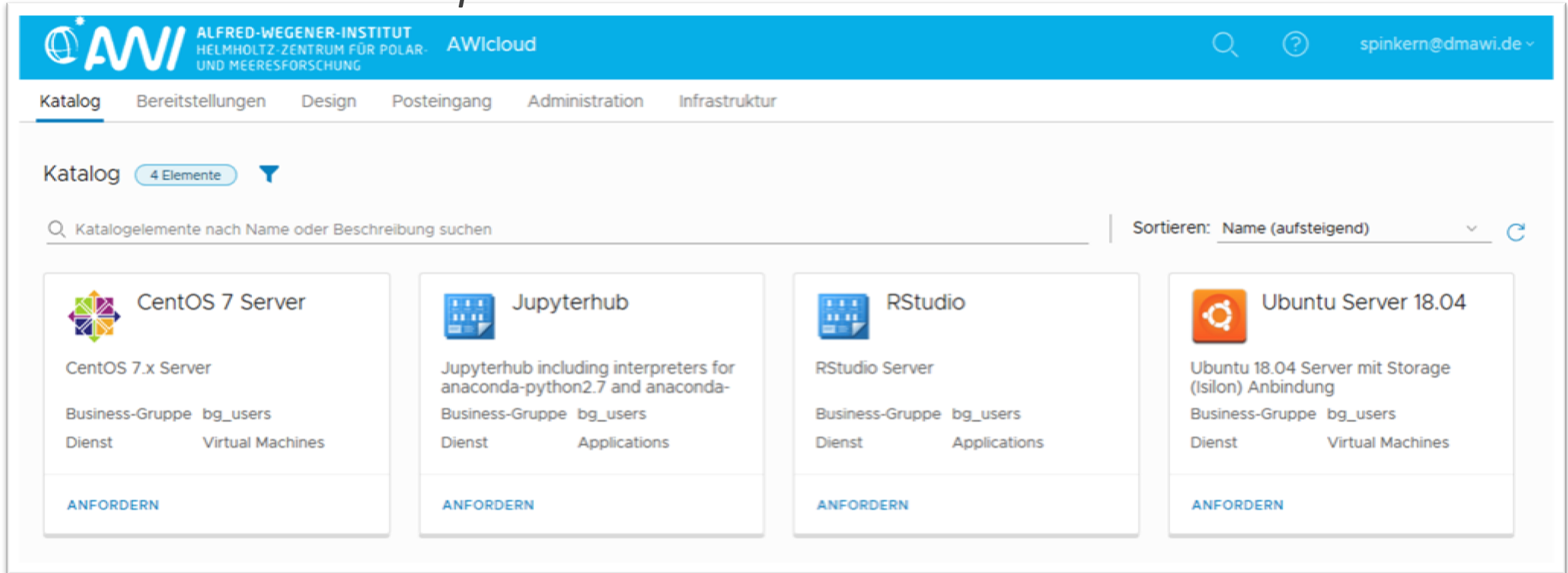
MapViewer

- ...browser based mapping and viewing system
- decision support on board



Workspace solution used by O2A framework

- Marketplace for ordering pre-installed virtual machine different operating systems and development environments

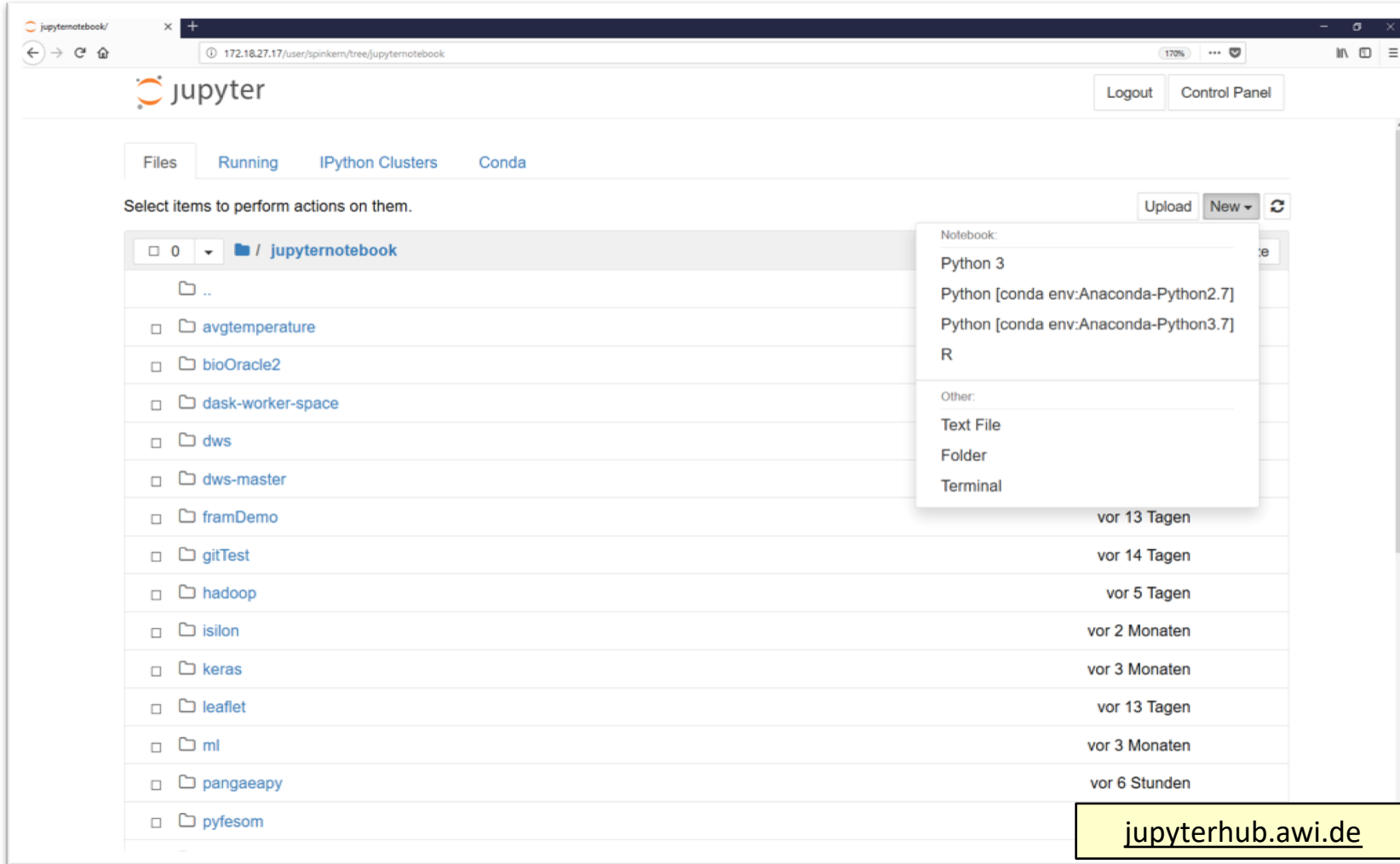


The screenshot shows the AWIcloud marketplace interface. The header includes the AWI logo, the text 'ALFRED-WEGENER-INSTITUT HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG', and 'AWIcloud'. A navigation menu contains 'Katalog', 'Bereitstellungen', 'Design', 'Posteingang', 'Administration', and 'Infrastruktur'. The 'Katalog' section shows 4 elements. A search bar is present with the text 'Katalogelemente nach Name oder Beschreibung suchen'. The sorting is set to 'Name (aufsteigend)'. Four virtual machine offerings are displayed:

- CentOS 7 Server**: CentOS 7.x Server, Business-Gruppe bg_users, Dienst Virtual Machines, ANFORDERN
- Jupyterhub**: Jupyterhub including interpreters for anaconda-python2.7 and anaconda- Business-Gruppe bg_users, Dienst Applications, ANFORDERN
- RStudio**: RStudio Server, Business-Gruppe bg_users, Dienst Applications, ANFORDERN
- Ubuntu Server 18.04**: Ubuntu 18.04 Server mit Storage (Isilon) Anbindung, Business-Gruppe bg_users, Dienst Virtual Machines, ANFORDERN

jupyterhub.awi.de

- *pre-installed environments*
- *access to persistent storage*



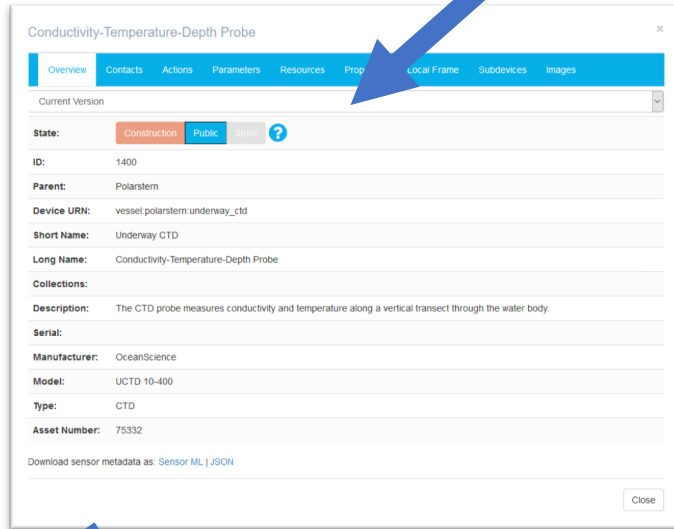
The screenshot shows the JupyterLab interface in a browser window. The address bar shows the URL `172.16.27.17/user/spinkern/tree/jupyternotebook`. The interface includes a 'Logout' and 'Control Panel' button in the top right. Below the Jupyter logo, there are tabs for 'Files', 'Running', 'IPython Clusters', and 'Conda'. A message says 'Select items to perform actions on them.' Below this is a file browser showing a list of folders: `..`, `avgtemperature`, `bioOracle2`, `dask-worker-space`, `dws`, `dws-master`, `framDemo`, `gitTest`, `hadoop`, `isilon`, `keras`, `leaflet`, `ml`, `pangaeapy`, and `pyfesom`. A context menu is open over the `framDemo` folder, listing options: 'Notebook:' (Python 3, Python [conda env:Anaconda-Python2.7], Python [conda env:Anaconda-Python3.7], R) and 'Other:' (Text File, Folder, Terminal). A yellow box at the bottom right of the screenshot contains the text `jupyterhub.awi.de`.



ANALYTICS
Data analysis, visualization,
GIS services and MAPS

Devices registered in [SENSOR.awi.de](https://sensor.awi.de)

SENSOR



Conductivity-Temperature-Depth Probe

Overview | Contacts | Actions | Parameters | Resources | Properties | Local Frame | Subdevices | Images

Current Version

State: Construction Public Store ?

ID: 1400

Parent: Polarstern

Device URN: vessel.polarstern.underway.ctd

Short Name: Underway CTD

Long Name: Conductivity-Temperature-Depth Probe

Collections:

Description: The CTD probe measures conductivity and temperature along a vertical transect through the water body.

Serial:

Manufacturer: OceanScience

Model: UCTD 10-400

Type: CTD

Asset Number: 75332

Download sensor metadata as: Sensor ML | JSON

Close

DSHIP-ActionLog

DSHIP MOSAic20192020/1 || 75° 08,241' N 039° 07,762' E || 2019-09-22 ... **werum**

DShip_ActionLog +

DShip_ActionLog

Activity - Device Operation	Timestamp	Device	Action	Latitude	Longitude	Depth (m)	Speed (kn)	Co
PS122/1_4-1 CTD_SBE9plus_485	22.09.2019 09:...	Conductivity-Te...	information	75° 07,932' N	039° 05,969' E	184.0	13.1	
PS122/1_3-1 topAWI	22.09.2019 09:...	Towed Ocean ...	information	75° 05,362' N	038° 51,058' E	186.0	13.3	
PS122/1_2-1 AIRGUN_PS	22.09.2019 08:...	Air Gun	profile start	74° 59,125' N	038° 15,496' E	177.0	13.3	
PS122/1_1-1 topAWI	21.09.2019 18:...	Towed Ocean ...	information	73° 08,358' N	029° 49,934' E	267.0	12.7	
PS122/1_0_Underway-60 Weather	20.09.2019 17:...	Weather Station	station start	69° 40,773' N	018° 59,799' E	0.0	0.0	

← — — — — →

**Synchronized:
Devices and
Device Operations**

**Log device operations:
Directly in DHSIP,**

**or via import from log files
(e.g generated by IceFloeNavi-App)**



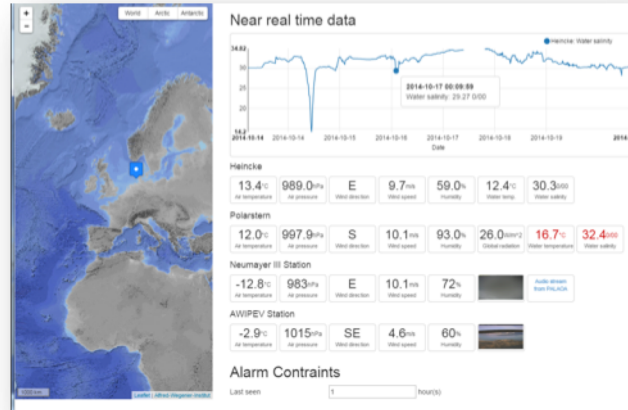
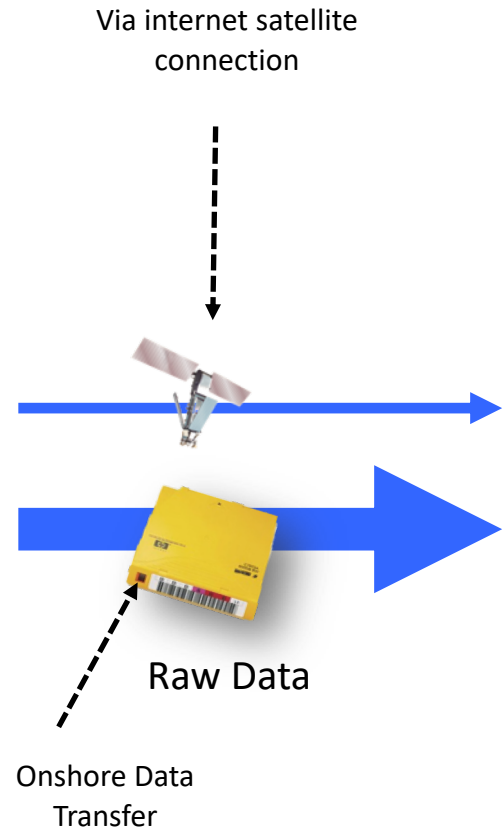
**Synchronized:
devices & device operation**

Storage MCS

vessel/polarstern/ctd_watersampler/SBE3plus_
temperature_sensor/DEVICEOPERATION_ID/

**Directory structure on MOSAic Central Storage
derived from SENSOR (and DSHIP-ActionLog)**

Transfer of data to the AWI for early sharing among the consortium



Land-MOSAic Central Storage

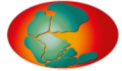


- *submit and share data*
- *search, find, combine and reuse data*



pangaea.de





Citation:

Rex, Markus (2020): Links to master tracks in different resolutions of POLARSTERN cruise PS122/1, Tromsø - Arctic Ocean, 2019-09-20 - 2019-12-13. *Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Bremerhaven, PANGAEA*, <https://doi.org/10.1594/PANGAEA.911224>

Always quote above citation when using data! You can download the citation in several formats below.

- RIS Citation
- BaTeX Citation
- Copy Citation
- Facebook
- Twitter
- Show Map
- Google Earth



Other version:

Master track of POLARSTERN cruise PS122/1 in 1 sec resolution (zipped, 34.3 MB) [Q](#)

Further details:

Generalized master track of POLARSTERN cruise PS122/1 [Q](#)

Station list of POLARSTERN cruise PS122/1 [Q](#)

Trackline map and processing report for navigation sensors from POLARSTERN cruise PS122/1 [Q](#)

Project(s):

Multidisciplinary drifting Observatory for the Study of Arctic Climate (MOSAIC) [Q](#)

Coverage:

Median Latitude: 84.972877 * Median Longitude: 120.353461 * South-bound Latitude: 69.679426 * West-bound Longitude: 18.996638 * North-bound Latitude: 84.972877 * East-bound Longitude: 120.353461
Date/Time Start: 2019-09-20T17:50:00 * Date/Time End: 2019-12-13T09:04:45

Event(s):

PS122/1-track [Q](#) * Latitude Start: 69.679550 * Longitude Start: 18.996650 * Latitude End: 86.593190 * Longitude End: 119.241500 * Date/Time Start: 2019-09-20T17:50:00 * Date/Time End: 2019-12-13T09:04:45
Campaign: PS122/1 (MOSAIC20192020) [Q](#) * Basis: Polarstern [Q](#) * Method/Device: Underway cruise track measurements (CT) [Q](#) * Comment: Tromsø

Parameter(s):

#	Name	Short Name	Unit	Principal Investigator	Method/Device	Comment
1	DATE/TIME Q	Date/Time				Geocode
2	LATITUDE Q	Latitude				Geocode
3	LONGITUDE Q	Longitude				Geocode
4	Speed Q	Speed	kn		Calculated Q	10-min average
5	Course Q	Course	deg		Calculated Q	10-min average

Data

Download dataset as tab-delimited text (use the following character encoding:)

1	2	3	4	5
Date/Time	Latitude	Longitude	Speed [kn]	Course [deg]
2019-09-20T17:50	69.67955	18.99664	0.001	226.2
2019-09-20T18:00	69.67955	18.99664	0.001	13.0
2019-09-20T18:10	69.67955	18.99664	0.000	90.0
2019-09-20T18:20	69.67955	18.99665	0.001	90.0
2019-09-20T18:30	69.67955	18.99664	0.001	270.0
2019-09-20T18:40	69.67955	18.99664	0.001	173.4
2019-09-20T18:50	69.67943	18.99680	0.047	155.1
2019-09-20T19:00	69.68379	19.02526	3.889	66.2
2019-09-20T19:10	69.70578	19.04519	8.299	17.4
2019-09-20T19:20	69.73755	19.04487	11.441	359.8
2019-09-20T19:30	69.76527	19.10146	12.221	35.2

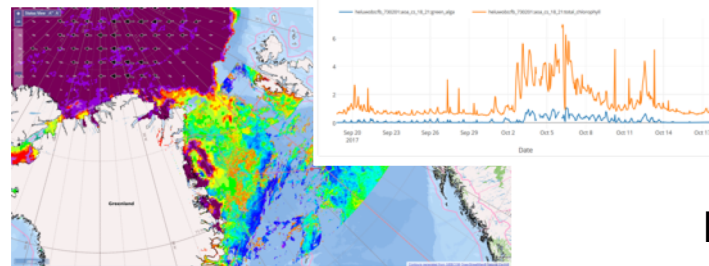


pangaea.de



ActionLog Events

Activity - Device Operator	Start	Device	Action	Latitude	Longitude
PS4_4-1 ADCP	12.10.2016 11:49:24	Acoustic Doppl...	station start	51° 03,088' N	001° 23'
PS4_1-3 BLN	11.10.2016 14:17:22	BALLON	in the water	46° 07,339' N	010° 15'
PS4_1-1 BOAT	11.10.2016 14:13:31	Boat	MyAction	46° 07,251' N	010° 15'

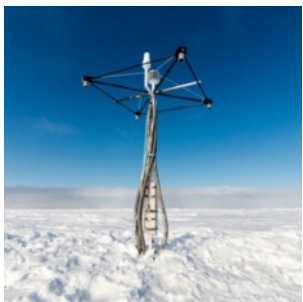


SENSORWeb at AWI and onboard of Polarstern

Acquisition organized by MOSAic groups. DSHIP-ActionLog for Device-Operation ID management

DSHIP-Mapviewer and DASHBOARD at AWI and onboard of Polarstern

Raw and primary data archiving at AWI. Data transfers after legs or parts during legs



Data transfer via satellite, local LAN, radio LAN as stream and/or in delayed mode

MOSAic Central Storage and workspace

Using workspace and Marketplace (VM) e.g. with Jupyter Notebook (R or Python) or Bash-Script or or ...?

