



SeaDataCloud

Interoperability with international data

Enrico Boldrini, Fabrizio Papeschi, Mattia Santoro, Roberto Roncella, Paolo Mazzetti, Dick Schaap

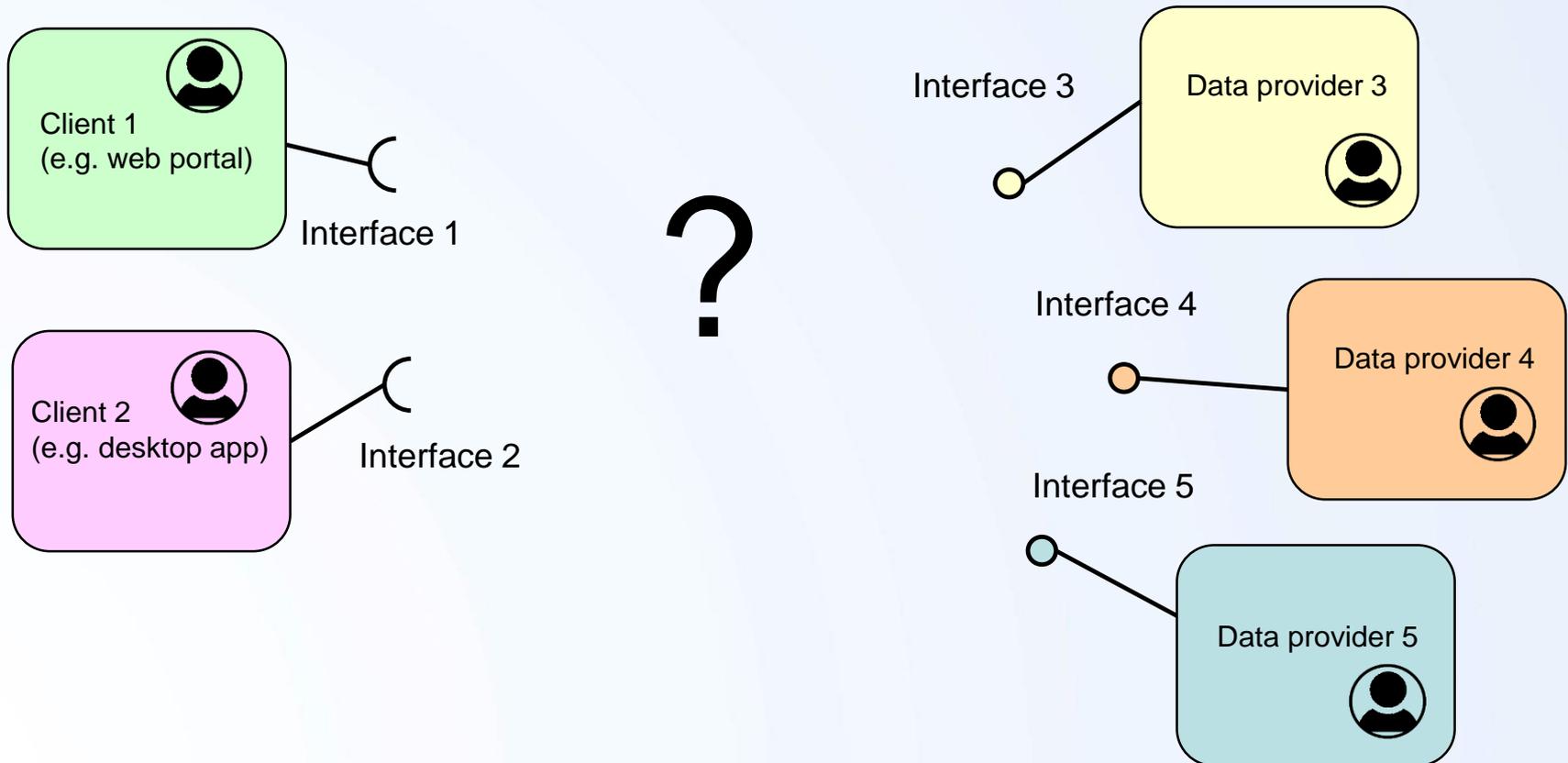
National Research Council of Italy, Institute of atmospheric pollution research (CNR-IIA)
MARIS

sdn-userdesk@seadatanet.org – www.seadatanet.org

SDC – Final meeting, by web conference, 29-30 October 2020

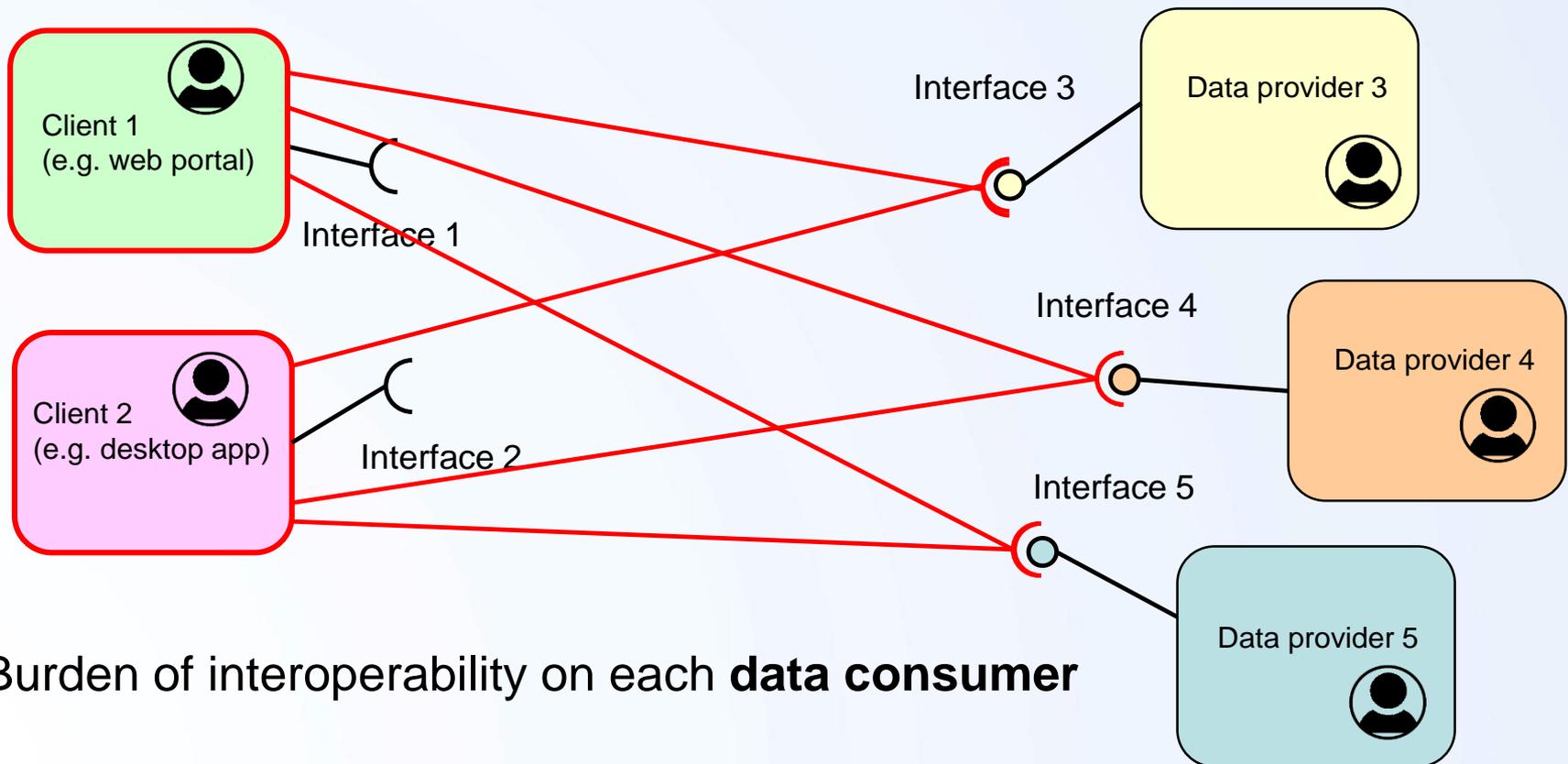
The context for a broker

- Interoperability between heterogeneous data consumers and data providers



The context for a broker

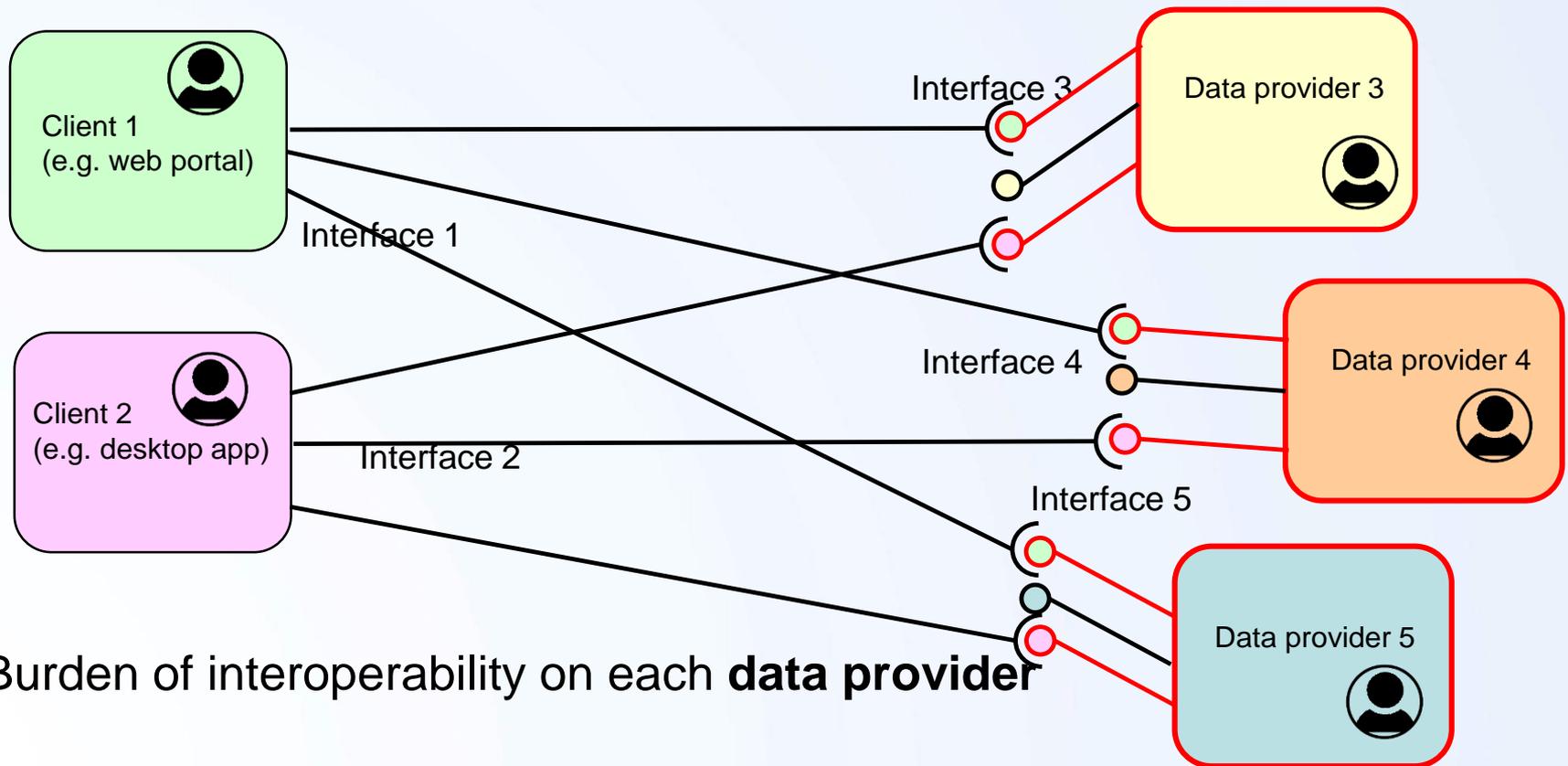
- Interoperability between heterogeneous data consumers and data providers



Burden of interoperability on each **data consumer**

The context for a broker

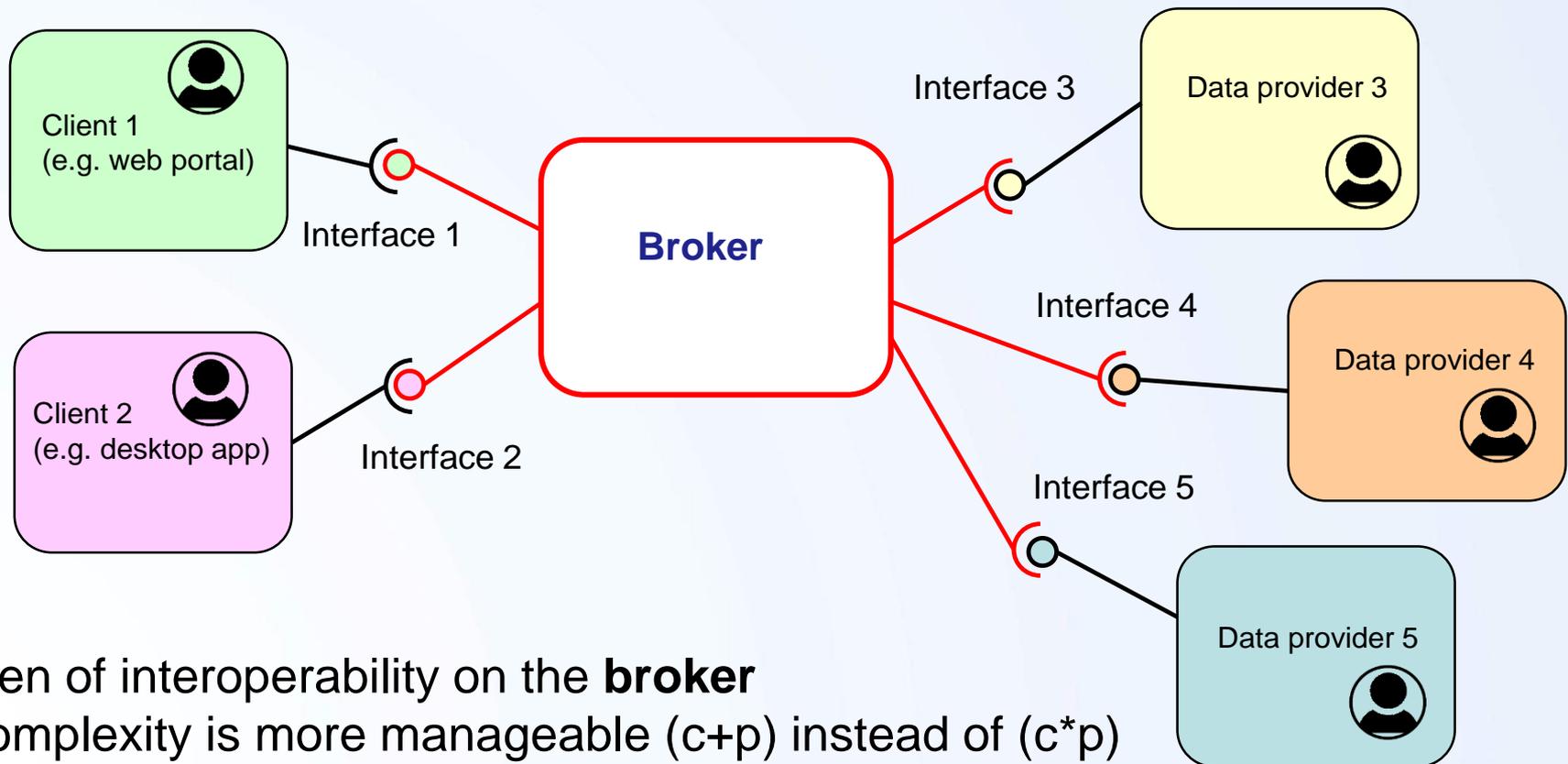
- Interoperability between heterogeneous data consumers and data providers



Burden of interoperability on each **data provider**

Broker framework

- Interoperability between heterogeneous data consumers and data providers



Burden of interoperability on the **broker**

- complexity is more manageable (c+p) instead of (c*p)

Broker Main Functionalities

– Discovery

- Metadata schemas Mediation and harmonization



– Semantic discovery

- SKOS/Sparql to access external thesauri and vocabularies



– Access: direct Download

- Online link to dataset



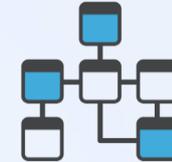
– Access: simple transformations & download

- Format transformation
- CRS transformation
- (domain) Subsetting
- (domain) Resolution change



Broker Main Artifacts

- COMMON DATA MODEL
- ACCESSORS (UPSTREAM MEDIATORS)
- PROFILERS (DOWNSTREAM FACADES)
- APIs
- COMMUNITY AND USER DEFINED VIEWS



Accessors and Profilers

OGC WCS 2.0.2 API ISO 1.0	INPE
OGC WCS 2.0.2 BRIM EO	CKAN
OGC WCS 2.0.2 BRIM CIM	DCAT
ESRI GEOPORTAL 1.0	GI-cat
OAI-PMH 2.0	ESRI GEOPORTAL 1.0
OpenSearch 1.1	NCML-OD
OpenSearch 1.1 ESIP	BCODMO
OpenSearch GENESIDR	NCML-CF
CKAN	NetCDF-CF 1.4
CUAHSI HIS-Central	FTP populated with supported metadata types
ESRI REST API 1.0.3	WAF Web Accessible Folders
OGC WCS	GeoNetwork (2.2.0 or greater)
OGC WMS	Ecological Markup Language 2.1.1
OGC WFS 1.0.0, 1.1.0, 2.0.0	NERRS (National Estuarine Research Reserve System)
OGC WMTS	HMA WCS 2.0.2 BRIM/CIM
OGC SOS 1.0.0, 2.0.0, 2.0.0 Hydro Profile	HDF
OGC WPS 1.0.0	IADC DB (MySQL)
OGC WCS 2.0.0 Core	GrADS-DS
OGC WCS 2.0.2 API ISO 1.0	FedEO
OGC WCS 2.0.2 BRIM/EO AP	ARPA DB (based on Microsoft SQL)
OGC WCS 2.0.2 BRIM/CIM AP	ESRI Map Server
IRIS Station	SHAPE files (FTP)
IRIS Event	KISTERS Web Environment of Canada
HYRAX THREDDS SERVER 1.9	Environment Canada Hydrometric Data (FTP)
OAI-PMH 2.0 Harvesting	OpenSearch 1.1
GBIF	Earth Engine
DIF	RASAQM
HYDRO	EGASKRO
UNAVCO	SITAD (Sistema Informativo Territoriale Ambientale Diffuso)
CDI 1.04, 1.3, 1.4	File System
ISO 19115-2	GDACS
THREDDS 1.0.1, 1.0.2	GeoRSS 2.0
THREDDS-NCISO 1.0.1, 1.0.2	Degree catalog Service 2.2
THREDDS-NCISO-PLUS 1.0.1, 1.0.2	OpenSearch GENESIDR

Supported Protocols



Brokered source: NOAA NCEI



<https://www.nodc.noaa.gov/archivesearch/csw>

ESRI Geoportal catalogue

- 36000+ datasets & dataset collections

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HOME SEARCH BROWSE

Search the NCEI Archive

Text:

Additional Options

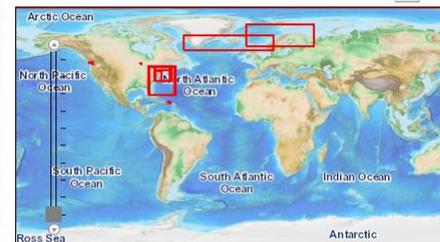
WHEN

Intersecting Fully within
Start Date: (yyyy-mm-dd)
End Date: (yyyy-mm-dd)

WHERE

Anywhere Intersecting Fully within

Text:



Results 1-25 of 56088 record(s)

Expand results

NCCOS Assessment: Assessment of Puerto Rico's coral reefs following Hurricanes Irma and Maria from 2017-09-16 to 2018-07-02 (NCEI Accession 0221189)

3-dimensional current velocity and other parameters taken by ADCP from the offshore supply ship Gerry Bordenon in Gulf of Mexico on 2017-09-24 (NCEI Accession 0221188)

Water temperature, salinity, oxygen, currents and others taken by CTD, Niskin bottles, and ADCP from the research vessel Ryofu Maru, cruise 19-06, in the north Pacific from 2019-08-20 to 2019-08-22 (NCEI Accession 0221020)

Water temperature, salinity, oxygen, currents and others taken by CTD, Niskin bottles, and ADCP from the research vessel Keifu Maru, cruise 20-02, in the north Pacific from 2020-02-08 to 2020-02-09 (NCEI Accession 0221019)

NOAA NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

HOME SEARCH BROWSE

Browse

Select a category below.

- People (Data submitters)
- Platforms
- Projects
- Institutions
- Sea Names
 - A-C
 - Adriatic Sea
 - Aegean Sea
 - Alboran Sea
 - Anadyskiy Gulf
 - Andaman Sea or Burma Sea
 - Antarctic
 - Arabian Sea
 - Arafura Sea
 - Arctic Ocean
 - Aru Sea
 - Auke Bay
 - Baffin Bay
 - Balearic (or Iberian) Sea

Text: 98 results

Showing 1-10

Partial pressure (or fugacity) of carbon dioxide, temperature, salinity and other variables collected from Surface underway observations using Carbon dioxide (CO₂) gas analyzer, Shower head chamber equilibrator for autonomous carbon dioxide (CO₂) measurement and other instruments from AEGAEO in the Aegean Sea and Mediterranean Sea from 2006-02-08 to 2006-02-13 (NCEI Accession 0084543)

NCEI Accession 0084543 includes Surface underway, chemical, meteorological and physical data collected from AEGAEO in the Aegean Sea and Mediterranean Sea from 2006-02-08 to 2006-02-13. These data include AIR TEMPERATURE, BAROMETRIC PRESSURE, Partial pres...

[Website](#) [Details](#) [Metadata](#) [Project Metadata](#) [FTP](#)

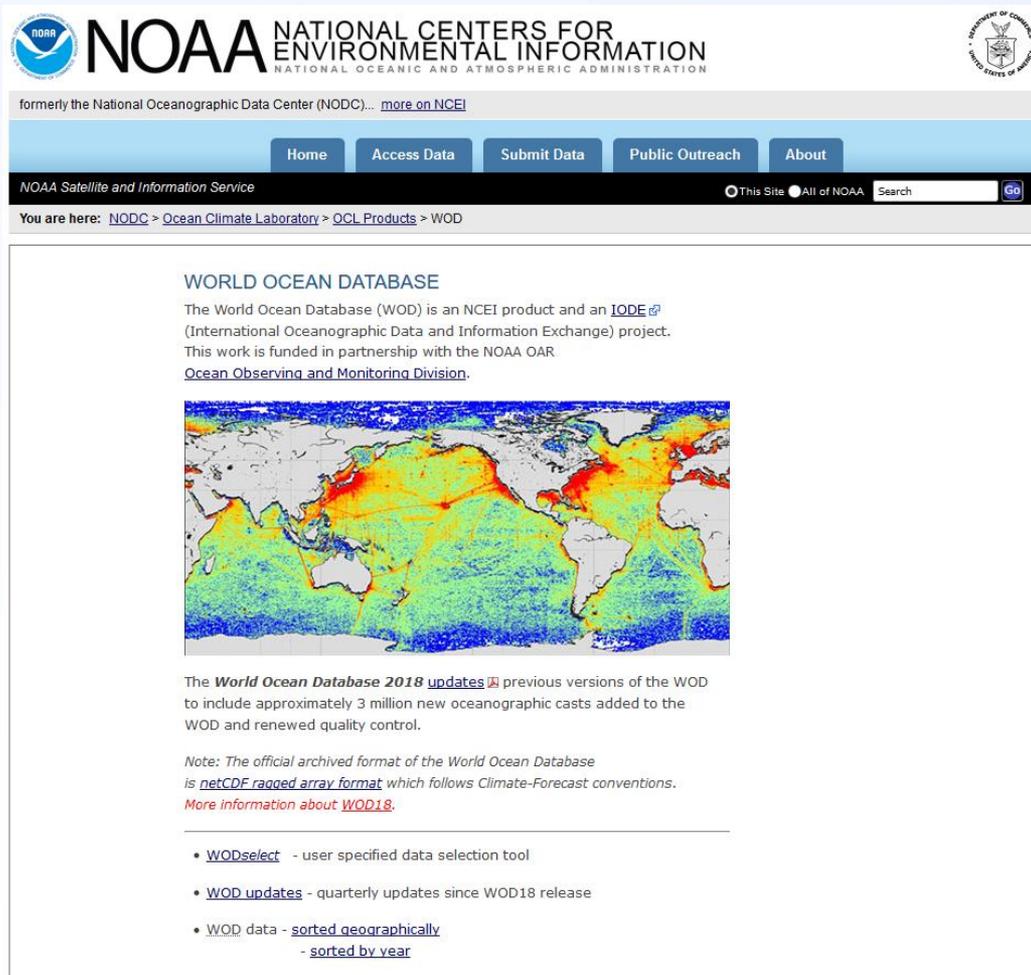
Partial pressure of carbon dioxide (pCO₂), temperature, salinity and other variables collected from surface time series coastal observations from POSEIDON E1-M3A system buoy in the Cretan Sea, Aegean Sea, Eastern Mediterranean Sea from 2018-06-25 to 2018-12-26 (NCEI Accession 0208893)

This NCEI Accession includes surface underway, chemical, meteorological, physical and time series coastal data collected from from POSEIDON E1-M3A system buoy in the Cretan Sea, Aegean Sea, Eastern Mediterranean Sea from 2018-06-25 to 2018-12-26. These da...

[Website](#) [Details](#) [Metadata](#) [Project Metadata](#) [FTP](#)

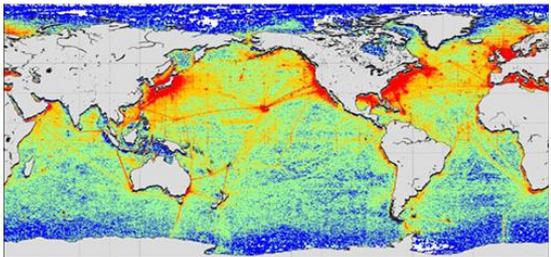
sdn-userdesk@seadatane





The screenshot shows the NOAA National Centers for Environmental Information (NCEI) website for the World Ocean Database. The header includes the NOAA logo and the text "NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION". Below the header is a navigation bar with links for Home, Access Data, Submit Data, Public Outreach, and About. A search bar is also present. The main content area is titled "WORLD OCEAN DATABASE" and contains the following text:

The World Ocean Database (WOD) is an NCEI product and an [IODE](#) (International Oceanographic Data and Information Exchange) project. This work is funded in partnership with the NOAA OAR [Ocean Observing and Monitoring Division](#).



The map shows a global view of the ocean with a color-coded overlay representing data density or quality. The colors range from blue (low density) to red (high density), with the highest density areas concentrated in the North Atlantic and the North Pacific.

The **World Ocean Database 2018 updates** previous versions of the WOD to include approximately 3 million new oceanographic casts added to the WOD and renewed quality control.

Note: The official archived format of the World Ocean Database is [netCDF ragged array format](#) which follows Climate-Forecast conventions. [More information about WOD18.](#)

- [WODselect](#) - user specified data selection tool
- [WOD updates](#) - quarterly updates since WOD18 release
- WOD data - [sorted geographically](#)
- [sorted by year](#)

Quality-controlled ocean profile and plankton data:

- 513 dataset collections

<https://data.nodc.noaa.gov/ncei/wod/>

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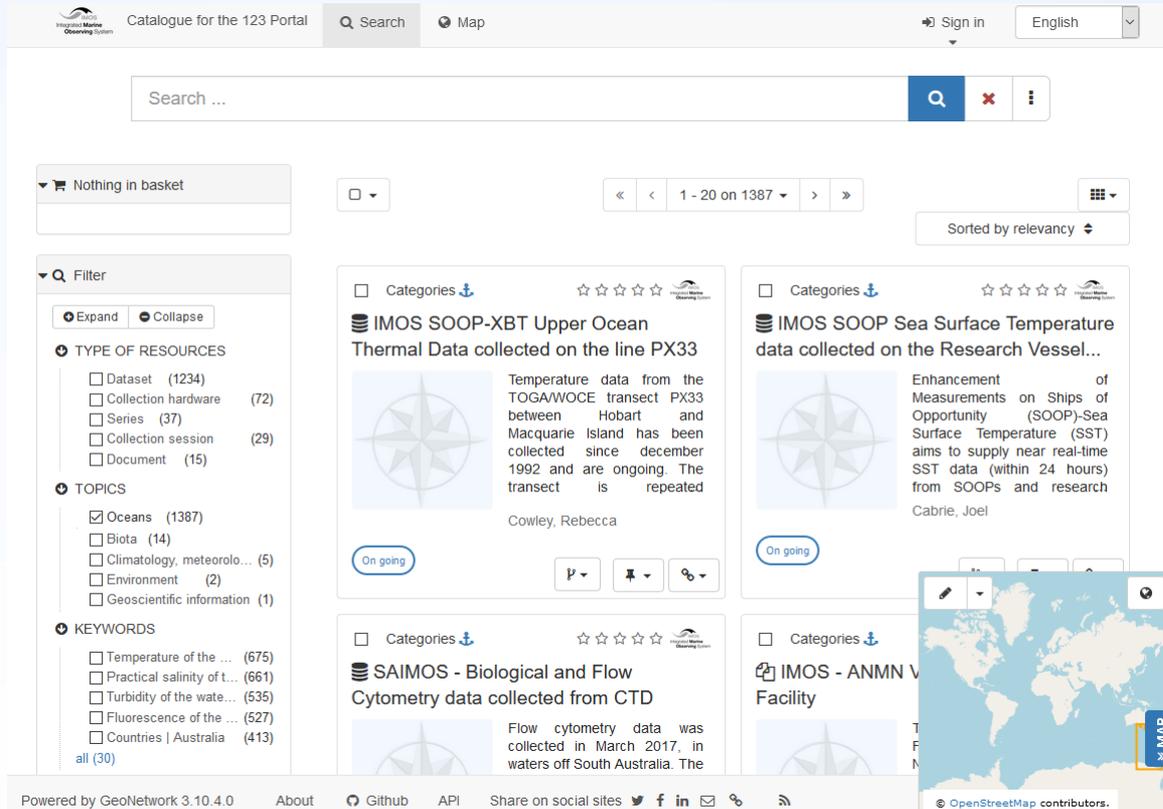


Brokered source: Australia Ocean Data Network



Geonetwork catalogue

- 1567 dataset collections



The screenshot shows the Geonetwork catalogue interface. At the top, there is a navigation bar with 'Catalogue for the 123 Portal', a search bar, a map icon, and a language dropdown set to 'English'. Below the navigation bar is a search bar with the text 'Search ...'. To the left of the main content area is a filter sidebar with sections for 'TYPE OF RESOURCES', 'TOPICS', and 'KEYWORDS'. The main content area displays a grid of dataset cards. The first card is titled 'IMOS SOOP-XBT Upper Ocean Thermal Data collected on the line PX33' and includes a compass rose icon and a description: 'Temperature data from the TOGA/WOCE transect PX33 between Hobart and Macquarie Island has been collected since december 1992 and are ongoing. The transect is repeated'. The second card is titled 'IMOS SOOP Sea Surface Temperature data collected on the Research Vessel...' and includes a compass rose icon and a description: 'Enhancement of Measurements on Ships of Opportunity (SOOP)-Sea Surface Temperature (SST) aims to supply near real-time SST data (within 24 hours) from SOOPs and research Cabrie, Joel'. The third card is titled 'SAIMOS - Biological and Flow Cytometry data collected from CTD' and includes a compass rose icon and a description: 'Flow cytometry data was collected in March 2017, in waters off South Australia. The'. The fourth card is titled 'IMOS - ANMN V Facility' and includes a compass rose icon. At the bottom of the interface, there is a footer with 'Powered by GeoNetwork 3.10.4.0' and various social media and utility icons.

<https://catalogue-123.aodn.org.au/geonetwork/srv/eng/csw>



NEW SEARCH REFINED SEARCH **SEARCH RESULTS** SUMMARY TIMESERIES

Filter search Found 2558610 | Show (1 - 100) | First | Prev | Next | Last

EXPORT RESULT **SAVE QUERY** 

INPUT FIELDS

Free search 

Date search 
From To

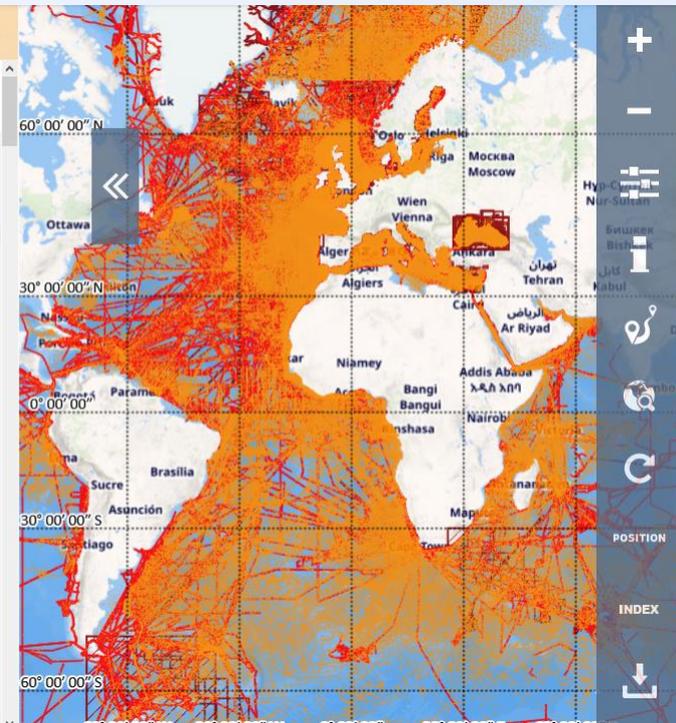
Geographic search 
 
 Search within bounding box

SEARCH **RESET**

SEA REGIONS 

Atlantic Ocean (1098858)

INSTRUMENT / GEAR TYPE	observers
SELECT	<input type="checkbox"/>
DATASET NAME	Halichoerus grypus_2002
COUNTRY	Sweden
START DATE	20020816
INSTRUMENT / GEAR TYPE	observers
SELECT	<input type="checkbox"/>
DATASET NAME	Halichoerus grypus_2002
COUNTRY	Sweden
START DATE	20020811
INSTRUMENT / GEAR TYPE	observers
SELECT	<input type="checkbox"/>
DATASET NAME	Halichoerus grypus_2002
COUNTRY	Sweden
START DATE	20020816



CDI granules



CDI collections

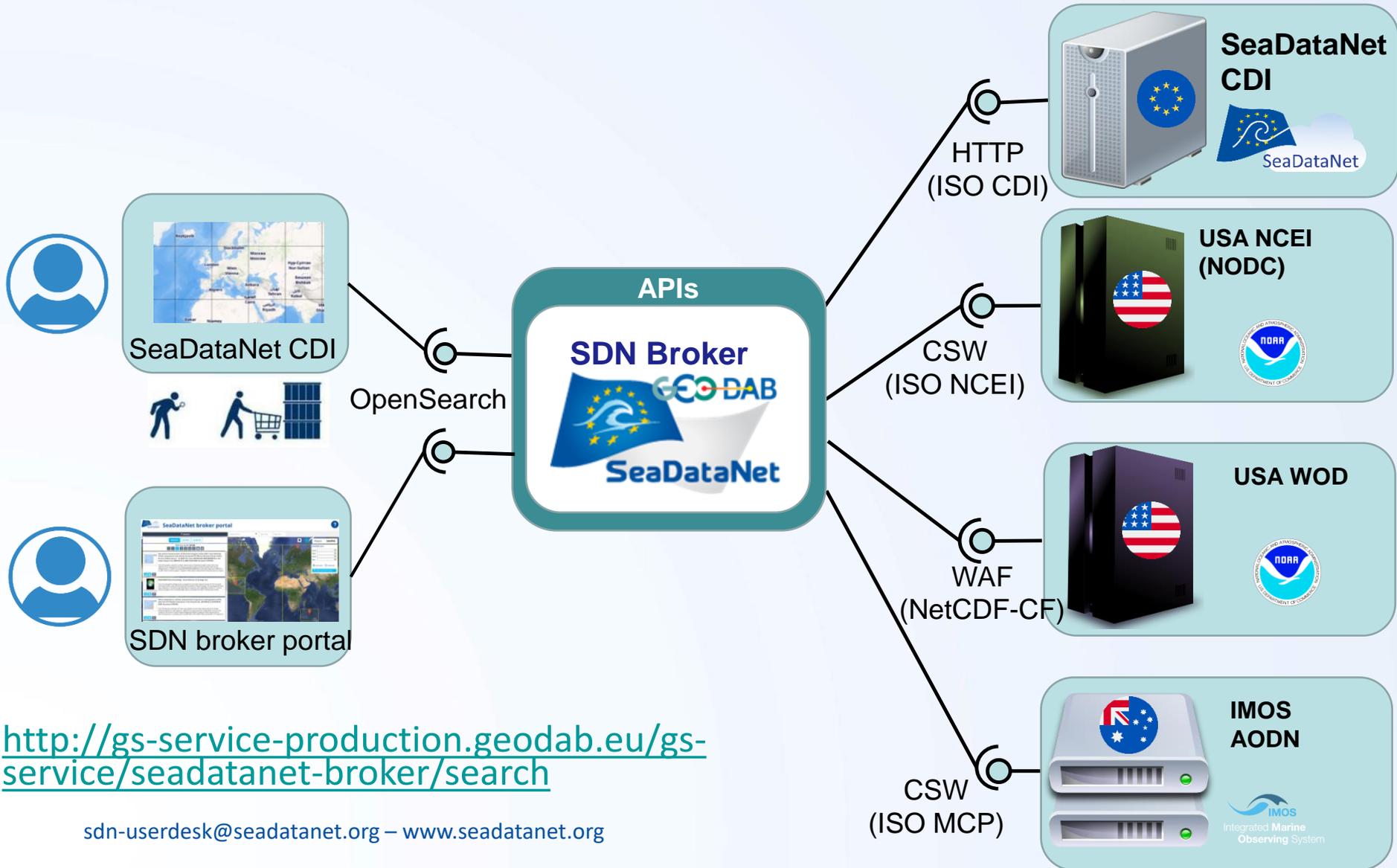
sdn-userdesk@seadatanet.org – www.seadatanet.org

Aggregation service

- 993 dataset collections (aggregated records)



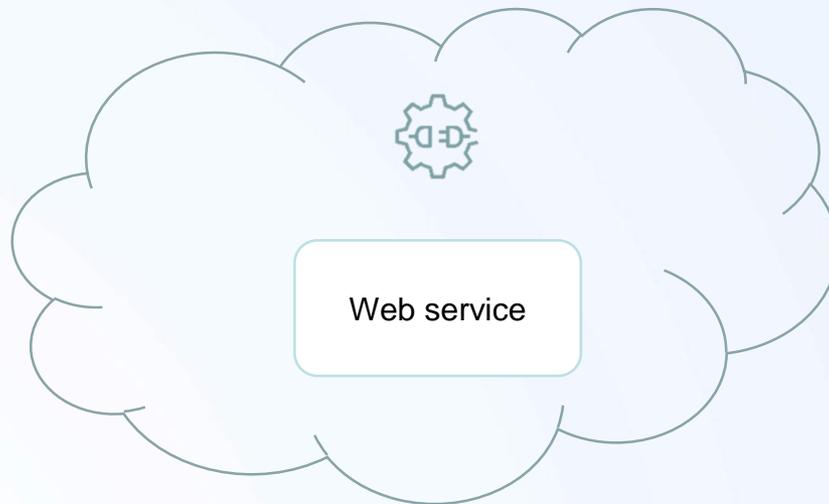
SDN Brokering service



<http://gs-service-production.geodab.eu/gs-service/seadatanet-broker/search>

sdn-userdesk@seadatanet.org – www.seadatanet.org

Production grade deployment... with the cloud



Reliable

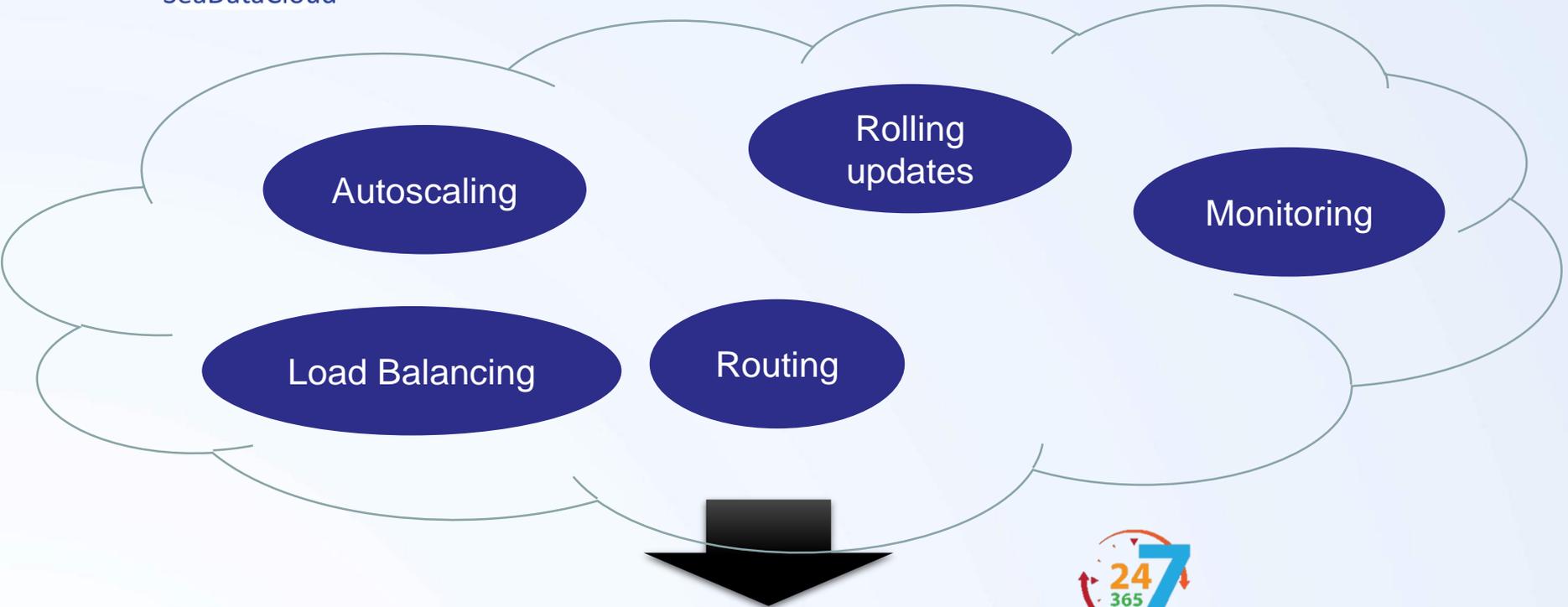


Fast



Optimized

Production grade cloud infrastructure requirements



Production grade system

- High reliability
- High availability
- Resource optimization



Enabling technologies

Autoscaling

Rolling updates

Routing

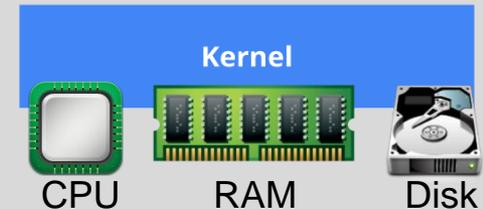
Container orchestration system

Monitoring

Load Balancing



kubernetes



Containerization



Virtualization





Different cloud environments

- Cloud deployment

- Amazon ECS + ECR

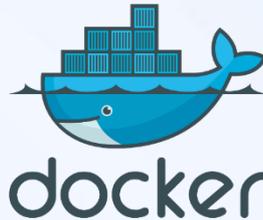
- docker

- EOSC Hub

- kubernetes

- docker

- Copernicus DIAS

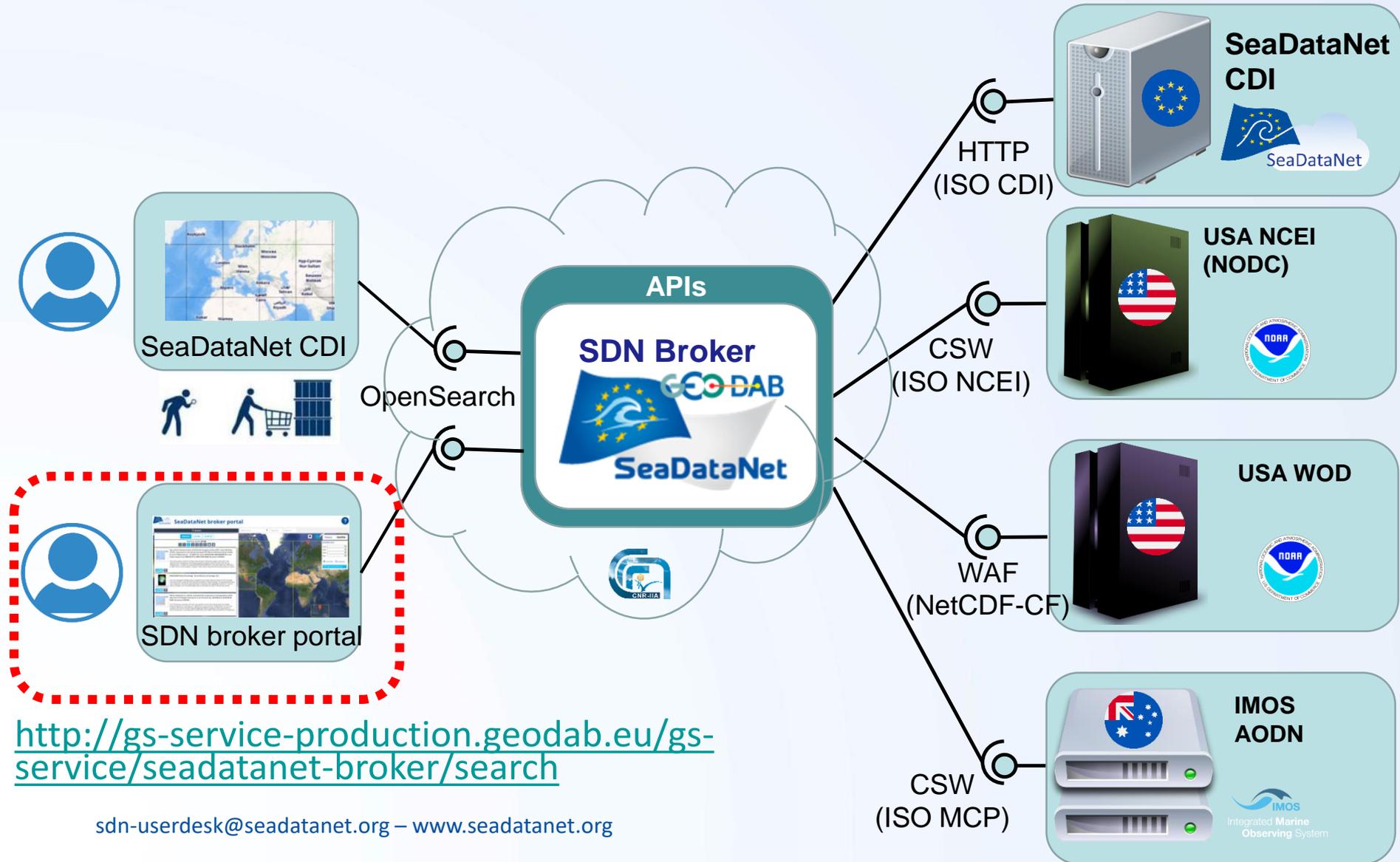


kubernetes

ONDA CREODIAS
sobloo



SDN Brokering service



<http://gs-service-production.geodab.eu/gs-service/seadatanet-broker/search>

sdn-userdesk@seadatanet.org – www.seadatanet.org



SeaDataCloud

SeaDataNet broker portal



SeaDataNet

SeaDataNet broker portal



Query by constraints

- Search terms
- Spatial extent
- Temporal extent
- Sources

Search terms 

South

West

North

East



2020-04-01 | End time |  Advanced

Apr 2020

Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

RESULTS

FILTERS

SOURCES

OUT 1 source selected

- OUT  Australia Ocean Data Network
- IN  SeaDataNet
- OUT  US NODC Collections
- OUT  World Ocean Database

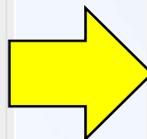
 SEARCH

Filtering of results

Instrument

Attribute

<input type="radio"/> WATER TEMPERATURE	21892
<input type="radio"/> water depth	14626
<input type="radio"/> SALINITY	8260
<input type="radio"/> BAROMETRIC PRESSURE	4406
<input type="radio"/> WIND SPEED	4234
<input type="radio"/> WIND DIRECTION	4163
<input type="radio"/> DISSOLVED OXYGEN	3918
<input type="radio"/> HYDROSTATIC PRESSURE	3524
<input type="radio"/> CONDUCTIVITY	3358
<input type="radio"/> silicate	3337
<input type="radio"/> phosphate	3269
<input type="radio"/> NITRATE	3251
<input type="radio"/> pH	3143
<input type="radio"/> SOUND VELOCITY	3072
<input type="radio"/> DEPTH - OBSERVATION	2983
<input type="radio"/> OXYGEN	2622
<input type="radio"/> AIR TEMPERATURE	2238
<input type="radio"/> WAVE HEIGHT	2183
<input type="radio"/> AIR TEMPERATURE - WET BULB	2159
<input type="radio"/> WAVE PERIOD	2143
<input type="radio"/> TOTAL PHOSPHORUS	2024
<input type="radio"/> SIGMA-T	1980
<input type="radio"/> WEATHER	1920
<input type="radio"/> SEA STATE	1871
<input type="radio"/> cloud amount/frequency	1866
<input type="radio"/> AIR TEMPERATURE - DRY BULB	1842
<input type="radio"/> cloud types	1807



Instrument

Attribute

<input checked="" type="radio"/> phosphate	3269
<input type="radio"/> SALINITY	3218
<input type="radio"/> silicate	3147
<input type="radio"/> WATER TEMPERATURE	3106
<input type="radio"/> NITRATE	3010
<input type="radio"/> DISSOLVED OXYGEN	2835
<input type="radio"/> pH	2562
<input type="radio"/> BAROMETRIC PRESSURE	2021
<input type="radio"/> WIND DIRECTION	2021
<input type="radio"/> WIND SPEED	2012
<input type="radio"/> TOTAL PHOSPHORUS	1990
<input type="radio"/> OXYGEN	1964
<input type="radio"/> AIR TEMPERATURE - WET BULB	1929
<input type="radio"/> WAVE HEIGHT	1911
<input type="radio"/> WAVE PERIOD	1902
<input type="radio"/> SOUND VELOCITY	1901
<input type="radio"/> SIGMA-T	1666
<input type="radio"/> water depth	1664
<input type="radio"/> cloud amount/frequency	1658
<input type="radio"/> WEATHER	1657
<input type="radio"/> AIR TEMPERATURE - DRY BULB	1650
<input type="radio"/> cloud types	1649
<input type="radio"/> SECCHI DEPTH	1643
<input type="radio"/> SEA STATE	1626
<input type="radio"/> WATER COLOR	1601
<input type="radio"/> WIND FORCE	1584
<input type="radio"/> DYNAMIC DEPTH ANOMALY	1565

Source

Organization

Platform

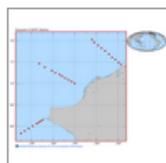
Evaluation of results

Overview

Title

Temporal extent

Spatial extent



Water temperature, salinity, and potential temperature oceanographic profile data from F/V Alaskan Enterprise in the Chukchi Sea, 2010-08-24 to 2010-09-20 (NCEI Accession 0155761)

This CTD data set, consisting of 47 casts, was collected in the Chukchi Sea during the F/V Alaskan Enterprise (AE10-01) cruise, August 24 - September 20, 2010 (cruise ID, CHAOZ 2010). The cruise was funded by DOI Bureau of Ocean Energy Management (BOEM) through the NOAA National Marine Mammal Laboratory. Involved groups included NMML, AFSC, BOEM, PMEL and EcoFOCI. CTD operations:



Abstract

Start time

1988-01-01 00:00:00

End time

1988-12-31 00:00:00



Measurement info: instrument, platform, organization, parameter

More metadata: keywords, formats, links



CTD
Conductivity-Temperature-Depth probe



Alaskan Enterprise
Updated information from ICES for the vessel ALASKAN ENTERPRISE from UNITED STATES(US). Name : ALASKAN ENTERPRISE Country(s) : UNITED STATES(US) (ISO Country Code) Platform Class : 36 Fishing vessel Call Sign : WCY7731 MMSI: 366758570 IMO : 7908079 Commissioned Date : 2007-08 Current Length : 45.7 Built : 1978 Previous Name (Notes): CANYON ENTERPRISE WOD Code: 11174 Notes : Built as ALASKAN ENTERPRISE, became Canyon Enterprise in 2001, became Alaskan Enterprise in 2007 Information Sources: - <http://www.marinetraffic.com/en/ais/details/ships/shipid:426815/mmsi:366758570/imo:7908079> /vessel:ALASKAN_ENTERPRISE - <http://www.shipspotting.com/gallery/photo.php?lid=1159855> - <http://magazines.marinelink.com/Magazines/MaritimeReporter/197809/flash/?page=18> - <https://alaskafisheries.noaa.gov/sites/default/files/appeals/02-0036.pdf> - <http://wireless2.fcc.gov/UlsApp/UlsSearch/license.jsp?licKey=1563803> Confirmed by NOAA on 2016-11-02. Submitted to ICES 2016-07-15



US DOC; NOAA; OAR; Pacific Marine Environmental Laboratory (PMEL)
University of Washington (UW)



SALINITY
SIGMA-T
WATER TEMPERATURE

sdn-userdesk@seadatanet.org – www.seadatanet.org

Keywords Oceanographic geographical features
Vertical spatial coordinates
Chlorophyll pigment concentrations in water bodies
Nitrate concentration parameters in the water column
Phosphate concentration parameters in the water column
Salinity of the water column
Temperature of the water column
Silicate concentration parameters in the water column
Dissolved total and organic nitrogen concentrations in the water column
Dissolved total or organic phosphorus concentration in the water column
Particulate total and organic nitrogen concentrations in the water column
Particulate total and organic phosphorus concentrations in the water column
River flow and discharge
discrete water samplers
water level markers
vessel of opportunity
river station

Formats Ocean Data View ASCII input
Climate and Forecast Point Data NetCDF

Links "<https://cdi.seadatanet.org/search?step=0081104-0371104-0481104-0114-020ds03>"
Description: "Seadatanet CDI v5 portal website"

"<https://geo-service.maris.nl/seadatanet/wms>"
Protocol: "urn:ogc:serviceType:WebMapService:1.1.1:HTTP"
Description: "WMS example url"



Thank you

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fabrizio.papeschi@cnr.it

roberto.roncella@cnr.it

paolo.mazzetti@cnr.it

dick@maris.nl



Further reading & documentation:

<http://www.geodab.net/>

