

A service for publishing sensors on the web using OGC and W3C standards

LOUISE DARROCH, ALEXANDRA KOKKINAKI, JUSTIN BUCK, THOMAS
GARDNER, RAY CRAMER, JULIE COLLINS, EMMA SLATER, CIERAN
BRAZIER, GWENAELLE MONCOIFFÉ

BRITISH OCEANOGRAPHIC DATA CENTRE (BODC)
NATIONAL OCEANOGRAPHY CENTRE (NOC)



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What is SWE and SSN?

- Standards and ontologies for making sensors discoverable, accessible and usable via the Web

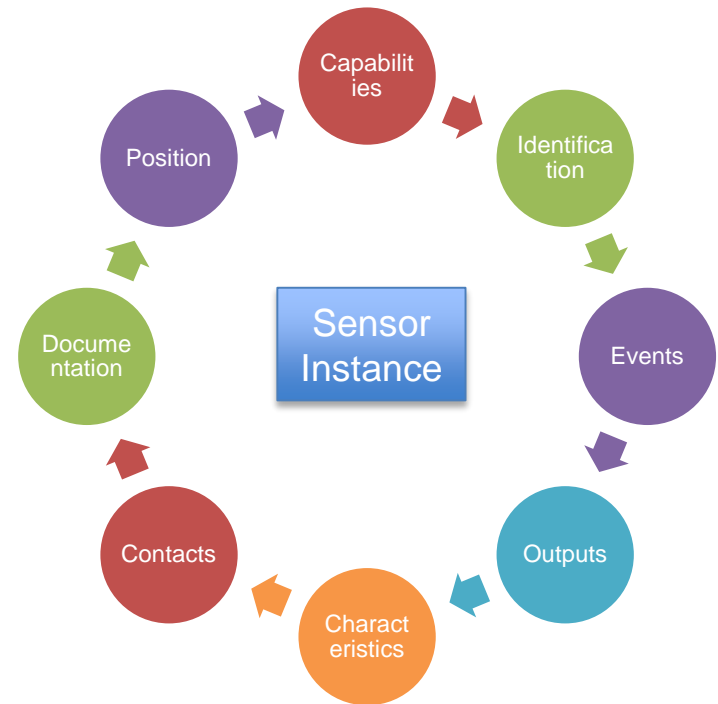


Semantic Sensor Network (SSN) Ontology

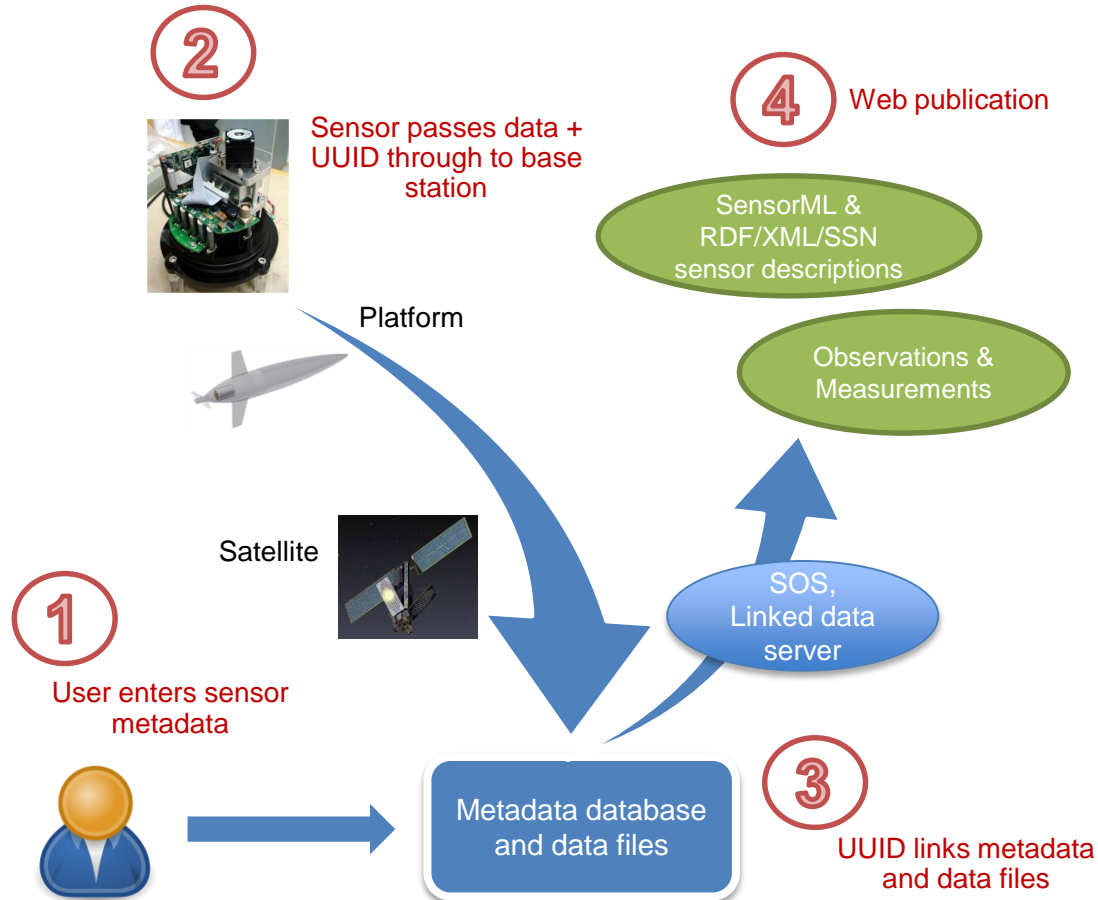


Sensor Web Enablement (SWE)

- Describe sensors - fitness
- Machine readable
- Automate workflows
- Shared between global nodes



BODC Marine Linked Systems



EU Oceans of Tomorrow

- Resolve Sensor Web Publications
- Helped cut down transmission costs
- Used a resolvable Universally Unique Identifier (UUID)

http://linkedsystems.uk/system/instance/TOOL0969_1234/current/

Portal

<https://linkedsystems.uk/erddap/InstancesHome.html>

ERDDAP
Easier access to scientific data

ERDDAP > SenseOCEAN

BODC Instance Form
The gateway to publishing on the Sensor Web

Register Register contact information for a platform or sensor unit (instance)
Instance Add information about a sensor or platform unit (instance)
Search Search, link and edit sensor and platform units (instances)

How to use the form

Register → Add contact details → Add Instance (Add a sensor unit, Add a platform unit) → Add unique IDs to data → Link Sensor ↔ Link Platform → Publish on the Sensor Web (SensorML, Linked Data, O & M)

Search (above Link Sensor and Link Platform)
Add an event (Deployment, Calibration)

Sensor and platform model names and attributes must be pre-registered at BODC

This form was created by SenseOCEAN and the British Oceanographic Data Centre (BODC).
If you require help or would like to pre-register a model please email (thogaz@noc.ac.uk).

SenseOCEAN **British Oceanographic Data Centre** **National Oceanography Centre** **NERC** SCIENCE OF THE ENVIRONMENT

ERDDAP, Version 1.72
[Disclaimers](#) | [Privacy Policy](#) | [Contact](#)

- Register metadata
- Obtain your UUID

Portal

<https://oceanids.ml/>

The screenshot displays the Oceanids Portal interface. The top navigation bar includes 'HEALTH', 'SCIENCE', 'PLAN', and 'DIALOGS'. The main content area is split into two panels. The left panel, titled 'Map', shows a map of the North Sea region with bathymetry contours and labels for 'Orkney Islands', 'Shetland Islands', and 'North Sea'. A blue line indicates a survey track. The right panel, titled 'Aanderaa Oxygen Optode 4330 F (Serial: 807)', displays sensor details and a table of parameters.

Sensor details

- Serial: 807
- UUID: TOOL1248_807
- Model: Aanderaa Oxygen Optode 4330 F
- Start Date: 03-JUL-18
- Visible: true

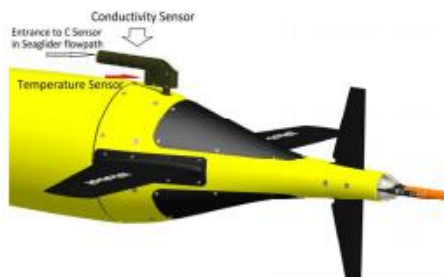
Parameters

Name	Units
OXYTAAOP	UPAA
OXYSOP01	UPCT
OXYCPHTC	UAAA
OXYCPHAC	UAAA
DOXYAAOP	UPDX

Examples of SWE SensorML (sensor)

http://linkedsystems.uk/system/instance/TOOL1188_0226/current/

Sea-Bird CT Sail CTD



```
<sml:PhysicalSystem xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:swe="http://www.opengis.net/swe/2.0"
xsi:schemaLocation="http://www.opengis.net/swe/2.0 http://schemas.opengis.net/swe/2.0/sweDescribeSensor.xsd http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorml/2.0/sensorml.xsd http://www.isotc211.org/2005/gmd http://schemas.opengis.net/iso/19139/20070417/gmd/gmd.xsd http://www.isotc211.org/2005/gco
http://schemas.opengis.net/iso/19139/20070417/gco/gco.xsd http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd" gml:id="TOOL1188_0226">
  <gml:description>Seaglider CT sail 0226</gml:description>
  <gml:identifier codeSpace="uniqueID">TOOL1188_0226</gml:identifier>
  <sml:Keywords>
    <sml:KeywordList>
      <sml:keyword>Pres_Z</sml:keyword>
      <sml:keyword>CTDCond</sml:keyword>
      <sml:keyword>WC_temp_CTD</sml:keyword>
      <sml:keyword>SigTheta</sml:keyword>
      <sml:keyword>P_sal_CTD</sml:keyword>
    </sml:KeywordList>
  </sml:Keywords>
  <sml:identification>
    <sml:IdentifierList>
      <sml:Identifier>
        <sml:Term definition="TOOL1188_0226">
          <sml:label>UUID</sml:label>
          <sml:value>TOOL1188_0226</sml:value>
        </sml:Term>
      </sml:Identifier>
      <sml:Identifier>
        <sml:Term definition="http://vocab.nerc.ac.uk/collection/W07/current/IDEN0006/">
          <sml:label>Short Name</sml:label>
          <sml:value>Seaglider CT sail 0226</sml:value>
        </sml:Term>
      </sml:Identifier>
      <sml:Identifier>
        <sml:Term definition="http://vocab.nerc.ac.uk/collection/W07/current/IDEN0002/">
          <sml:label>Long Name</sml:label>
          <sml:value>Seaglider CT sail 0226</sml:value>
        </sml:Term>
      </sml:Identifier>
    </sml:IdentifierList>
  </sml:identification>
  <sml:validTime>
    <sml:TimePeriod gml:id="validityPeriod">
      <gml:beginPosition>2018-04-30</gml:beginPosition>
      <gml:endPosition>Indeterminate</gml:endPosition>
    </sml:TimePeriod>
  </sml:validTime>
  <sml:history>
    <sml:Eventlist/>
  </sml:history>
  <sml:outputTypeOf xlink:title="Sea-Bird_Scientific_Unpumped_Seaglider_CT_sail" xlink:href="http://linkedsystems.uk/system/prototype/TOOL1188/">
  </sml:outputTypeOf>
  <sml:outputList>
    <sml:output name="P_sal_CTD">
      <swe:Quantity definition="http://vocab.nerc.ac.uk/collection/P01/current/PSALST01/">
        <swe:uom code="UCUMCODE" xlink:href="http://vocab.nerc.ac.uk/collection/P06/current/UUUU"/>
        <swe:Quantity/>
      </sml:output>
    <sml:output name="WC_temp_CTD">
      <swe:Quantity definition="http://vocab.nerc.ac.uk/collection/P01/current/TEMPST01/">
        <swe:uom code="UCUMCODE" xlink:href="http://vocab.nerc.ac.uk/collection/P06/current/UPAA"/>
        <swe:Quantity/>
      </sml:output>
    </sml:outputList>
  </sml:outputList>
</sml:PhysicalSystem>
```

Examples of SWE SensorML (platform)

http://linkedsystems.uk/system/instance/B7600002_SG616/current/

Kongsberg Maritime Seaglider M1 glider



```
<?xml version="1.0" encoding="UTF-8" ?>
<PhysicalSystem xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gmd="http://www.isotc211.org/2005/gmd" xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:sml="http://www.opengis.net/sensorml/2.0" xmlns:xlink="http://www.w3.org/1999/xlink" xmlns:gml="http://www.opengis.net/gml/3.2" xmlns:swe="http://www.opengis.net/swe/2.0"
xsi:schemaLocation="http://www.opengis.net/swe/2.0 http://schemas.opengis.net/swe/2.0/sweDescribeSensor.xsd http://www.opengis.net/sensorml/2.0
http://schemas.opengis.net/sensorml/2.0/sensorml.xsd http://www.isotc211.org/2005/gmd http://schemas.opengis.net/iso/19139/20070417/gmd/gmd.xsd http://www.isotc211.org/2005/gco
http://schemas.opengis.net/iso/19139/20070417/gco/gco.xsd http://www.opengis.net/gml/3.2 http://schemas.opengis.net/gml/3.2.1/gml.xsd" gml:id="B7600002_SG616">
  <description>Kate_Stansfield</description>
  <gml:identifier codeSpace="uniqueID">B7600002_SG616</gml:identifier>
  <sml:keywords>
    <sml:KeywordList>
      <sml:Keyword>sub-surface gliders</sml:Keyword>
    </sml:KeywordList>
  </sml:keywords>
  <sml:identification>
    <sml:IdentifierList>
      <sml:identifier>
        <sml:Term definition="B7600002_SG616">
          <sml:label>UUID</sml:label>
          <sml:value>B7600002_SG616</sml:value>
        </sml:Term>
      </sml:identifier>
      <sml:identifier>
        <sml:Term definition="http://vocab.nerc.ac.uk/collection/W07/current/IDEN0002/">
          <sml:label>Long Name</sml:label>
          <sml:value>Kate_Stansfield</sml:value>
        </sml:Term>
      </sml:identifier>
      <sml:identifier>
        <sml:Term definition="http://vocab.nerc.ac.uk/collection/W07/current/IDEN0009/">
          <sml:label>WMO Platform Number</sml:label>
          <sml:value>6801541</sml:value>
        </sml:Term>
      </sml:identifier>
      <sml:identifier>
        <sml:Term definition="http://vocab.nerc.ac.uk/collection/W07/current/IDEN0006/">
          <sml:label>Short Name</sml:label>
          <sml:value>kate-stansfield</sml:value>
        </sml:Term>
      </sml:identifier>
      <sml:identifier>
        <sml:Term definition="http://vocab.nerc.ac.uk/collection/W07/current/IDEN0005/">
          <sml:label>Serial Number</sml:label>
          <sml:value>SG616</sml:value>
        </sml:Term>
      </sml:identifier>
    </sml:IdentifierList>
  </sml:identification>
  <sml:classification>
    <sml:ClassifierList>
      <sml:classifier>
        <sml:Term>
          <sml:label>PLATFORM_FAMILY</sml:label>
        </sml:Term>
      </sml:classifier>
    </sml:ClassifierList>
  </sml:classification>
  <sml:validTime>
    <sml:TimePeriod gml:id="validityPeriod">
      <sml:beginPosition>2017-06-13</sml:beginPosition>
      <sml:endPosition>Indeterminate</sml:endPosition>
    </sml:TimePeriod>
  </sml:validTime>
</PhysicalSystem>
```

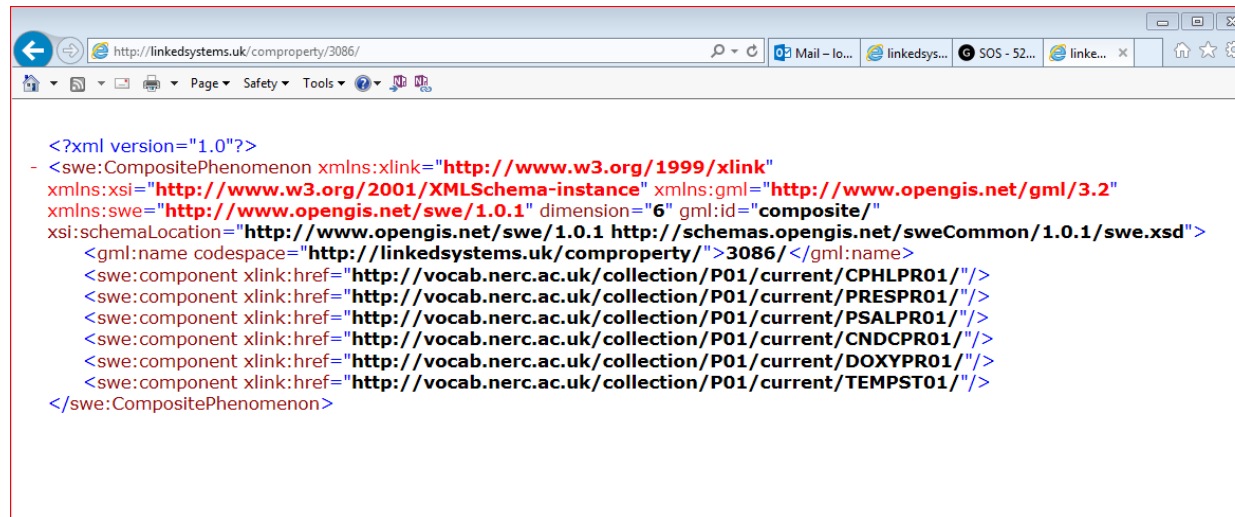


OGC Observations & Measurements (O&M)



- Models sensor observations
- Sensors generate 'lots' of data 'values'
- BODC file-based data repository
- Point to whole files with many parameters

OGC Observations & Measurements (O&M)



```
<?xml version="1.0"?>
- <swe:CompositePhenomenon xmlns:xlink="http://www.w3.org/1999/xlink"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:gml="http://www.opengis.net/gml/3.2"
  xmlns:swe="http://www.opengis.net/swe/1.0.1" dimension="6" gml:id="composite/"
  xsi:schemaLocation="http://www.opengis.net/swe/1.0.1 http://schemas.opengis.net/sweCommon/1.0.1/swe.xsd">
  <gml:name codespace="http://linkedsystems.uk/comproperty/">3086/</gml:name>
  <swe:component xlink:href="http://vocab.nerc.ac.uk/collection/P01/current/CPHLPR01/"></swe:component>
  <swe:component xlink:href="http://vocab.nerc.ac.uk/collection/P01/current/PRESPR01/"></swe:component>
  <swe:component xlink:href="http://vocab.nerc.ac.uk/collection/P01/current/PSALPR01/"></swe:component>
  <swe:component xlink:href="http://vocab.nerc.ac.uk/collection/P01/current/CNDCPR01/"></swe:component>
  <swe:component xlink:href="http://vocab.nerc.ac.uk/collection/P01/current/DOXYPR01/"></swe:component>
  <swe:component xlink:href="http://vocab.nerc.ac.uk/collection/P01/current/TEMPST01/"></swe:component>
</swe:CompositePhenomenon>
```

Solution:

- 'Out-of-band' principle
- Point to external data file
- Compound observed properties (e.g. temperature+salinity)

OGC Observations & Measurements (O&M)

<https://linkedsystems.uk/52n-sos-webapp/client>


```
{
  "request" : "GetObservation",
  "version" : "2.0.0",
  "service" : "SOS",
  "observations" : [
    {
      "type" : "http://www.opengis.net/def/observationType/OGC-OM/2.0/OM_TextObservation",
      "identifier" : "1226291",
      "procedure" : "http://linkedsystems.uk/system/instance/TOOL0022_1226291/",
      "offering" : "http://linkedsystems.uk/system/offering/TOOL0022_1226291/",
      "observableProperty" : "http://linkedsystems.uk/comproperty/71336/",
      "featureOfInterest" : {
        "identifier" : {
          "codespace" : "http://www.opengis.net/def/nil/OGC/0/unknown",
          "value" : "87/"
        },
        "name" : {
          "codespace" : "http://www.opengis.net/def/nil/OGC/0/unknown",
          "value" : "87/"
        },
        "geometry" : {
          "type" : "Point",
          "coordinates" : [
            49.1192,
            -16.4935
          ]
        }
      },
      "phenomenonTime" : [
        "2004-06-22T22:00:00.000Z",
        "2005-07-08T09:45:00.000Z"
      ],
      "resultTime" : "2005-07-08T09:45:00.000Z",
      "result" : "https://www.bodc.ac.uk/data/open_download/series/1226291/odvnc/"
    }
  ]
}
```

https://linkedsystems.uk/52n-sos-webapp/service?service=SOS&version=2.0.0&request=GetObservation&procedure=http://linkedsystems.uk/system/instance/TOOL0022_1226291/

- Link to one click download
- BODC data search portal

National Oceanographic Database (NODB) data series

Search [help](#)

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Date range | Data type | Parameter | Data collections | Project | Cruise | Site | Platform | Instrument | Water depth
Instrument depth | Country | Originator | Data availability | File format

Start date: Jun 1842 | End date: Jan 2018

Update

Results table

[Add selected to basket](#) [View basket](#)

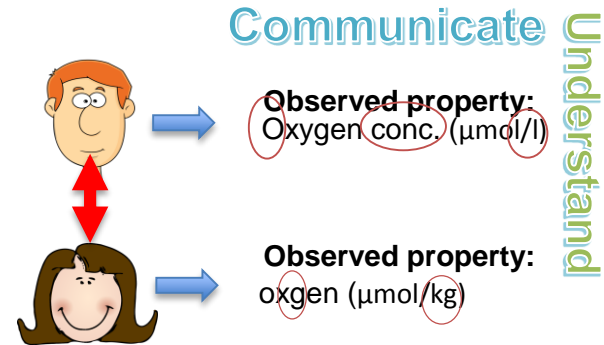
Found 118310 | Showing (1 - 300) | 1 2 3 4 | [Next](#) > [Last](#) >

Select	Download	Data availability	Data collections	Project	Cruise	Site	Data type	Latitude	Longitude
<input type="checkbox"/>	ASCII Binary	Unrestricted	36 North Project oceanographic data	36 North	RRS Charles Darwin cruise CD171	-	Water sample data	36.23083	-69.14067
<input type="checkbox"/>	ASCII Binary	Unrestricted	36 North Project oceanographic data	36 North	RRS Charles Darwin cruise CD171	-	Water sample data	36.32367	-69.74067
<input type="checkbox"/>	ASCII Binary	Unrestricted	36 North Project oceanographic data	36 North	RRS Charles Darwin cruise CD171	-	Water sample data	36.49667	-70.00633

"result" : "http://doi.org/10.5285/50d3f084-5a80-53dc-e053-6c86abc0a7a2"

Controlled vocabularies

- Enhance semantic interoperability
- SWE Marine Profiles
- NERC Vocabulary Server (NVS 2.0)



Property values

Observable property: Collections P01, P07
Instrument Type: Collection L05
Platform Type: Collection L06
Platform/device models: Collections L22, B76
Roles: Collections G04, C86
Feature of Interest: Collection C19
Manufacturer: Collections L35, C75

Property definitions

SensorML Events: Collection W03
SensorML Capabilities: Collection W04
SensorML Characteristics: Collection W05
SensorML Classifications: Collection W06
SensorML Identifications: Collection W07
SensorML Contacts: Collection W09
SWE O&M: Collection W09
SWE Data interface types: W10

NERC Vocabulary Server (NVS 2.0)

https://www.bodc.ac.uk/resources/products/web_services/vocab/



Simple Knowledge Organisation System



<http://vocab.nerc.ac.uk/collection/P01/current/TEMPPR01/>

NVS Editor

VocabEditor Client (version 1.0)

Edit options [help](#)

All items from the list you selected are displayed below for your consideration. You may opt to insert new entries and modify or deprecate existing items.

Selected list : W55
Pending updates : None

Options: [Single insert](#) | [Bulk update](#) | [Modify](#) | [Deprecate](#) | [List options](#)

Select	Key	Short name	Definition	Modified
<input type="checkbox"/>	CHAR0003	height	The measured extent (distance) from the base to the top of an object.	2016-07-20 15:00:13.0
<input type="checkbox"/>	CHAR0006	Data storage	The capacity or memory space of a device or system.	2016-07-20 15:00:13.0
<input type="checkbox"/>	CHAR0009	Electrical current type	The kind of electron flow through a conductor (i.e. direct current, alternating current).	2017-12-08 11:35:26.0
<input type="checkbox"/>	CHAR0008	Input power range	The amount of electricity fed into a system.	2017-12-08 11:35:26.0
<input type="checkbox"/>	CHAR0010	Data storage type	Recording media that are used to retain digital data.	2017-12-08 11:35:26.0

Edit



NVS Search Tool

Vocabulary search [help](#)

Simple search for vocabularies

Advanced search for vocabularies

Simple search within a vocabulary

Advanced search within a vocabulary

Click search button with empty search string to get list of all available concepts

Search text: collection ID: [Search](#)

Options: [Collections library](#)

A01	A02	A03	A04	A05	B02	B03	B04	B05	B06	B07	B09	B11	B12	B20
B21	B22	B39	B75	B76	C00	C10	C16	C37	C18	C19	C30	C31	C32	C33
C34	C35	C36	C37	C38	C39	C40	C41	C43	C45	C46	C47	C48	C59	C60

Search



NVS Vocabulary Builder

P01 Chemical Entity Parameter Code Builder [help](#)

Preferred label:

Concentration not specified of oxygen (O2 CAS 7782-44-7) per unit volume of the water body (disolved plus reactive particulate phase)

Found 17 exact matches

Found 0 close matches

- ✓ Select a measurement property
- ✓ Select a measurement statistical qualifier
- ✓ Select a chemical substance
- ✓ Select a measurement-matrix relationship
- ✓ Select a matrix

Build

<https://www.bodc.ac.uk/resources/vocabularies/>

Incorporate ERDDAP

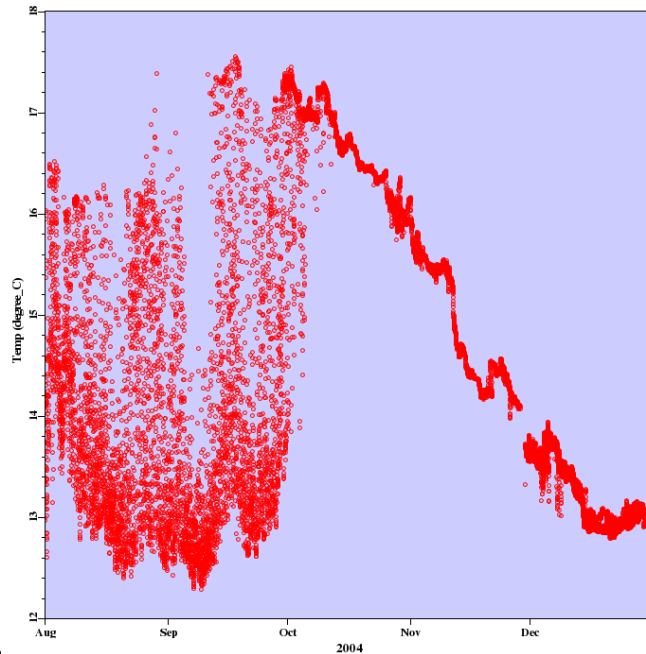


ERDDAP

Easier access to scientific data

ERDDAP > [tabledap](#) > Make A Graph

Dataset Title: **SeaDataNet NETCDF TIMESERIES Climate Forecast 1.6, GENERATED BY THE BODC UNDER MATLAB** [✉](#) [RSS](#)



- Data file server
- Aggregates and sub-sets data
- Use parameter subsets in SOS calls



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SeaDataNet NETCDF TIMESERIES Climate Forecast 1.6, GENERATED BY THE BODC UNDER MATLAB
(PREXMCAT=0, PREXMCAT=100)
Data courtesy of BODC

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PID for instrument instances WG

<https://github.com/rdawg-pidinst/schema/blob/master/schema.rst>

Metadata Schema for the Persistent Identification of Scientific Measuring Instruments

ID	Property	Obligation	Occ	Definition	Allowed values, constraints, remarks
1	Identifier	M	1	Unique string that identifies the instrument instance	PIDINST
1.1	identifierType	M	1	Type of the identifier	Controlled list of values: PIDINST
2	LandingPage	M	1	A landing page that the identifier resolves to	URL
3	Name	M	1	Name by which the instrument instance is known	Free text
4	Owner	M	1-n	Institution(s) responsible for the management of the instrument. This may include the legal owner, the operator, or an institute providing access to the instrument.	
4.1	ownerName	M	1	Full name of the owner	Free text
5	Manufacturer	M	1-n	The instrument's manufacturer(s) or developer. This may also be the owner for custom build instruments	
5.1	manufacturerName	M	1	Full name of the manufacturer	Free text
6	Description	R	0-1	Technical description of the device and its capabilities	Free text

Thank you



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