

## Accessing data via OPeNDAP

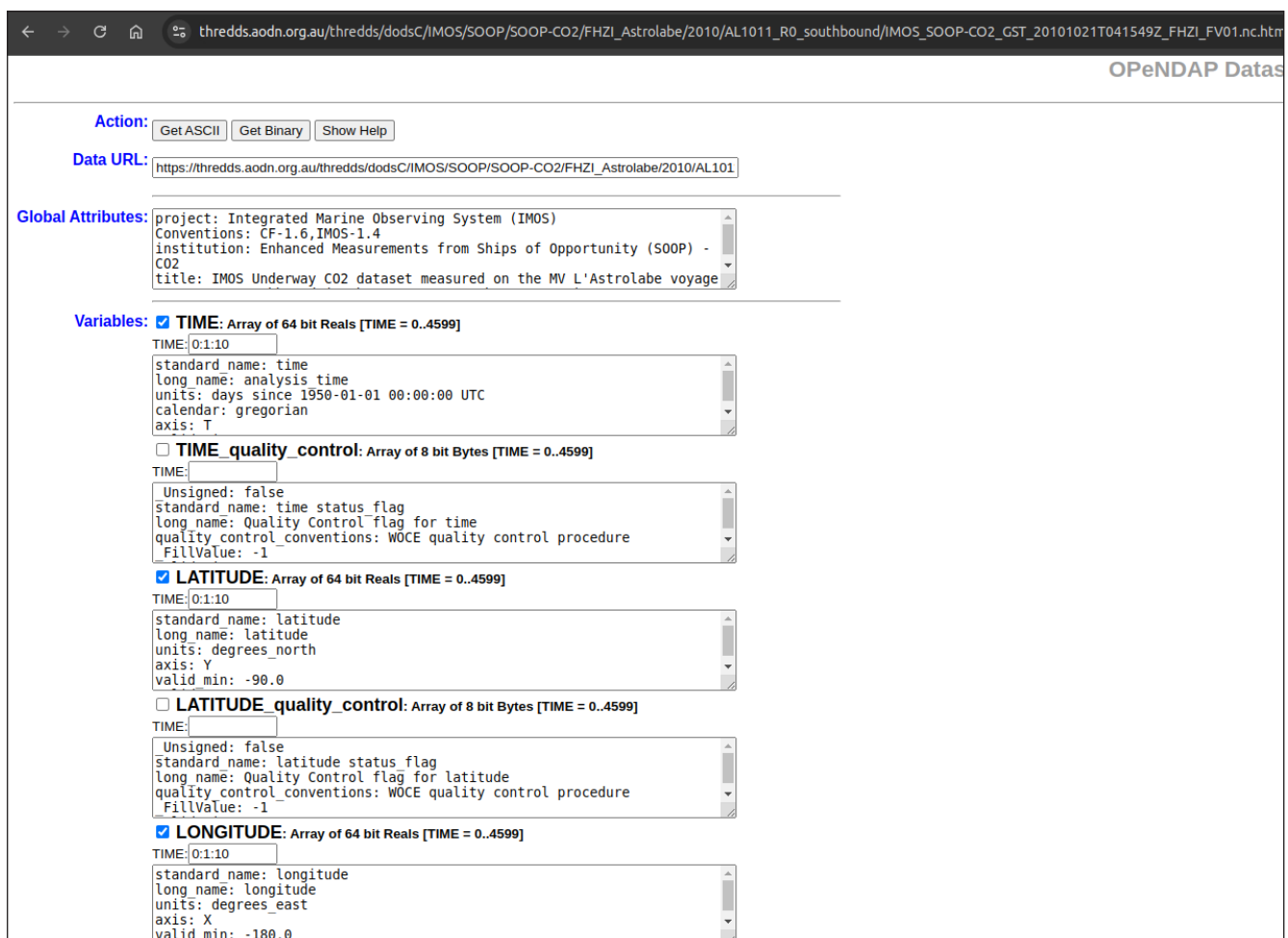
OPeNDAP is the name of the protocol used to download or transfer the files. As well as being the protocol for transfer, it offers an interface (data access form) with the ability to view information about the data before downloading and to specify subsets of the data for download.

The OPeNDAP dataset Access Form shows the global attributes and the variables in a netCDF file.

Each variable in the dataset is described with variable attributes.

- Global attributes apply to the whole data set  
E.g. name of the project under which the data was collected
- Variable attributes describe individual variables  
E.g. name of the variable, units the variable was measured in

By adding an extension to the URL (e.g. .dds, .das or .info) users will be presented with different views of the information included in the dataset.



The screenshot shows a web browser window displaying the OPeNDAP Data Access Form. The browser address bar shows the URL: `thredds.aodn.org.au/thredds/dodsC/IMOS/SOOP/SOOP-CO2/FHZI_Astrolabe/2010/AL1011_R0_southbound/IMOS_SOOP-CO2_GST_20101021T041549Z_FHZI_FV01.nc.htm`. The page title is "OPeNDAP Data".

**Action:**

**Data URL:**

**Global Attributes:**

```
project: Integrated Marine Observing System (IMOS)
Conventions: CF-1.6,IMOS-1.4
institution: Enhanced Measurements from Ships of Opportunity (SOOP) - CO2
title: IMOS Underway CO2 dataset measured on the MV L'Astrolabe voyage
```

**Variables:**

- TIME:** Array of 64 bit Reals [TIME = 0..4599]  
TIME: 0:1:10  
standard name: time  
long name: analysis time  
units: days since 1950-01-01 00:00:00 UTC  
calendar: gregorian  
axis: T
- TIME\_quality\_control:** Array of 8 bit Bytes [TIME = 0..4599]  
TIME:   
Unsigned: false  
standard name: time status flag  
long name: Quality Control flag for time  
quality\_control\_conventions: WQCE quality control procedure  
FillValue: -1
- LATITUDE:** Array of 64 bit Reals [TIME = 0..4599]  
TIME: 0:1:10  
standard name: latitude  
long name: latitude  
units: degrees\_north  
axis: Y  
valid\_min: -90.0
- LATITUDE\_quality\_control:** Array of 8 bit Bytes [TIME = 0..4599]  
TIME:   
Unsigned: false  
standard name: latitude status flag  
long name: Quality Control flag for latitude  
quality\_control\_conventions: WQCE quality control procedure  
FillValue: -1
- LONGITUDE:** Array of 64 bit Reals [TIME = 0..4599]  
TIME: 0:1:10  
standard name: longitude  
long name: longitude  
units: degrees\_east  
axis: X  
valid\_min: -180.0

## OPeNDAP Dataset Access Form

The OPeNDAP Dataset Access Form enables the user to subset the file using a particular variable. The subsetting function is particularly useful when a data file is very large.

The OPeNDAP data access form offers options to view metadata and visualize the full dataset or a subset in various formats. These options are accessible through specific URL extensions, such as [list of URL extensions]. By default, the OPeNDAP form uses the .html extension, which provides a link to a Dataset Access form. For a complete dataset description, use the .info extension.

To subset a variable:

1. Tick the box next to the variable name in the 'Variables' section of the page for the variables that you wish to view.
2. Enter the range of the variables using the syntax "Start:step:end". See figure below with an example of subset, with only the ten first values included in the dataset of the TIME, LATITUDE, LONGITUDE variables.

The figure below is the result of the action of clicking on the get ASCII button while asking for a sub-set of the data file.

```
Dataset {
  Float64 TIME[TIME = 11];
  Float64 LATITUDE[TIME = 11];
  Float64 LONGITUDE[TIME = 11];
} IMOS/SOOP/SOOP-CO2/FHZI_Astrolabe/2010/AL1011_R0_southbound/IMOS_SOOP-
CO2_GST_20101021T041549Z_FHZI_FV01.nc;
-----
TIME[11]
22208.177650462963, 22208.178518518518, 22208.179560185185, 22208.18042824074, 22208.181296296298,
22208.182164351852, 22208.18320601852, 22208.184074074074, 22208.18494212963, 22208.185810185187,
22208.186851851853

LATITUDE[11]
-42.88242, -42.88241, -42.8824, -42.88239, -42.88239, -42.88238, -42.88238, -42.88239, -42.88239,
-42.8824, -42.88239

LONGITUDE[11]
147.34076, 147.3408, 147.34081, 147.34081, 147.34079, 147.34081, 147.34078, 147.34079, 147.34079,
147.34077, 147.34077
```

## OPeNDAP http protocol

OPeNDAP uses standard HTTP protocol for data access and subset across the internet.

Data are requested using a URL. The URL is created by appending the protocol, the machine name, the OPeNDAP server, the directory, the netCDF filename and an extension together.

### URL extensions:

- .html** A web-based form that will help to build an OPeNDAP URL
- .dds** Data descriptor structure
- .das** Data attribute structure
- .info** A readable version of .dds and .das combined
- .ascii** An ascii (text) representation of the data
- .dods** The actual data in a binary structure
- .ver** Returns OPeNDAP server version – useful for seeing what features are available
- “/”** A way of obtaining a listing of OPeNDAP accessible files at a site

The figure below shows the dataset when **.dds** is appended to the end of the URL. The .dds extension provides a description of the variables.

```
Dataset {
  Float64 TIME[TIME = 4600];
  Byte TIME quality_control[TIME = 4600];
  Float64 LATITUDE[TIME = 4600];
  Byte LATITUDE quality_control[TIME = 4600];
  Float64 LONGITUDE[TIME = 4600];
  Byte LONGITUDE quality_control[TIME = 4600];
  Float64 TEMP[TIME = 4600];
  Byte TEMP quality_control[TIME = 4600];
  Float64 TEMP_2[TIME = 4600];
  Byte TEMP_2 quality_control[TIME = 4600];
  Float64 PSAL[TIME = 4600];
  Byte PSAL quality_control[TIME = 4600];
  Float64 WSPD[TIME = 4600];
  Byte WSPD quality_control[TIME = 4600];
  Float64 WDIR[TIME = 4600];
  Byte WDIR quality_control[TIME = 4600];
  Float64 Press_Equil[TIME = 4600];
  Byte Press_Equil quality_control[TIME = 4600];
  Float64 Press_ATM[TIME = 4600];
  Byte Press_ATM quality_control[TIME = 4600];
  Float64 xCO2EQ_PPM[TIME = 4600];
  Byte xCO2EQ_PPM quality_control[TIME = 4600];
  Float64 xCO2ATM_PPM[TIME = 4600];
  Byte xCO2ATM_PPM quality_control[TIME = 4600];
  Float64 xCO2ATM_PPM_INTERPOLATED[TIME = 4600];
  Byte xCO2ATM_PPM_INTERPOLATED quality_control[TIME = 4600];
  Float64 fCO2SW_UATM[TIME = 4600];
  Byte fCO2SW_UATM quality_control[TIME = 4600];
  Float64 fCO2ATM_UATM_INTERPOLATED[TIME = 4600];
  Byte fCO2ATM_UATM_INTERPOLATED quality_control[TIME = 4600];
  Float64 DfCO2[TIME = 4600];
  Byte DfCO2 quality_control[TIME = 4600];
  Float64 LICORflow[TIME = 4600];
  Byte LICORflow quality_control[TIME = 4600];
  Float64 H2OFLOW[TIME = 4600];
  Byte H2OFLOW quality_control[TIME = 4600];
  Byte SUBFLAG[TIME = 4600];
  String TYPE[TIME = 4600];
} IMOS/S00P/S00P-CO2/FHZI_AstroLabe/2010/AL1011_R0_southbound/IMOS_S00P-CO2_GST_20101021T041549Z_FHZI_FV01.nc;
```

The figure below presents the view of the dataset seen by appending **.das** to the end of the URL. The **.das** extension provides the structure of the attributes.

```
Attributes {
  TIME {
    String standard_name "time";
    String long_name "analysis time";
    String units "days since 1950-01-01 00:00:00 UTC";
    String calendar "gregorian";
    String axis "T";
    Float64 valid_min 0.0;
    Float64 valid_max 999999.0;
    String ancillary_variables "TIME_quality_control";
  }
  TIME_quality_control {
    String Unsigned "false";
    String standard_name "time status flag";
    String long_name "Quality Control flag for time";
    String quality_control_conventions "WOCCE quality control procedure";
    Int16 FillValue -1;
    Byte valid_min 2;
    Byte valid_max 4;
    Byte flag_values 2, 3, 4;
    String flag_meanings "good questionable bad";
    String references "Pierrot,D. et al. 2009, Recommendations for Autonomous Underway pCO2 Measuring Systems and Data Reduction Routines, Deep-Sea Research II, doi:10.1016/j.dsr2.2008.12.005";
    String ancillary_variables "SUBFLAG";
  }
  LATITUDE {
    String standard_name "latitude";
    String long_name "latitude";
    String units "degrees_north";
    String axis "Y";
    Float64 valid_min -90.0;
    Float64 valid_max 90.0;
    Float64 FillValue -999.0;
    String reference_datum "geographical coordinates, WGS84 projection";
    String ancillary_variables "LATITUDE_quality_control";
  }
  LATITUDE_quality_control {
    String Unsigned "false";
    String standard_name "latitude status flag";
    String long_name "Quality Control flag for latitude";
    String quality_control_conventions "WOCCE quality control procedure";
    Int16 FillValue -1;
    Byte valid_min 2;
    Byte valid_max 4;
    Byte flag_values 2, 3, 4;
    String flag_meanings "good questionable bad";
    String references "Pierrot,D. et al. 2009, Recommendations for Autonomous Underway pCO2 Measuring Systems and Data Reduction Routines, Deep-Sea Research II, doi:10.1016/j.dsr2.2008.12.005";
    String ancillary_variables "SUBFLAG";
  }
  LONGITUDE {
    String standard_name "longitude";
    String long_name "longitude";
    String units "degrees_east";
    String axis "X";
    Float64 valid_min -180.0;
    Float64 valid_max 180.0;
  }
}
```

The figure below presents the view of the dataset by appending **.info** to the end of the URL.

Dataset Information
<p><b>project:</b> Integrated Marine Observing System (IMOS)</p> <p><b>Conventions:</b> CF-1.6,IMOS-1.4</p> <p><b>institution:</b> Enhanced Measurements from Ships of Opportunity (SOOP) - CO2</p> <p><b>title:</b> IMOS Underway CO2 dataset measured on the MV L'Astrolabe voyage AL1011_R0_southbound ( Hobart, TAS to Hobart, TAS )</p> <p><b>date_created:</b> 2016-12-08T04:21:42Z</p> <p><b>abstract:</b> This dataset contains underway CO2 measurements collected by CSIRO onboard the MV L'Astrolabe during the voyage AL1011_R0_southbound. The cruise departed from Hobart, TAS on the 21-Oct-10 and arrived in Hobart, TAS on the 27-Oct-10.</p> <p><b>source:</b> ship observation</p> <p><b>keywords:</b> Oceans&gt;Ocean Temperature&gt;Sea Surface Temperature ;Oceans&gt;Salinity/Density&gt;Salinity ;Oceans &gt;Ocean Chemistry &gt;Carbon Dioxide ;pCO2&gt;Carbon Dioxide&gt;Underway System&gt;Fugacity ;Atmosphere &gt;Atmospheric Pressure &gt; Atmospheric Pressure</p> <p><b>platform_code:</b> FHZI</p> <p><b>vessel_name:</b> L'Astrolabe</p> <p><b>cruise_id:</b> AL1011_R0_southbound</p> <p><b>netcdf_version:</b> 3.6</p> <p><b>naming_authority:</b> IMOS</p> <p><b>cdm_data_type:</b> Trajectory</p> <p><b>geospatial_lat_min:</b> -63.52533</p> <p><b>geospatial_lat_max:</b> -42.88203</p> <p><b>geospatial_lon_min:</b> 145.58588</p> <p><b>geospatial_lon_max:</b> 158.97045</p> <p><b>geospatial_vertical_min:</b> 0.0</p> <p><b>geospatial_vertical_max:</b> 0.0</p> <p><b>time_coverage_start:</b> 2010-10-21T04:15:49Z</p> <p><b>time_coverage_end:</b> 2010-10-27T09:18:48Z</p> <p><b>data_centre:</b> Australian Ocean Data Network (AODN)</p> <p><b>data_centre_email:</b> info@aodn.org.au</p> <p><b>principal_investigator:</b> Tilbrook, Bronte, CSIRO ; Akl, John, CSIRO; Neill, Craig, CSIRO</p> <p><b>institution_references:</b> <a href="http://www.imos.org.au">http://www.imos.org.au</a></p> <p><b>author:</b> Akl, John, CSIRO</p> <p><b>citation:</b> The citation in a list of references is: IMOS, [year-of-data-download], IMOS Underway CO2 dataset measured on the MV L'Astrolabe voyage AL1011_R0_southbound, [data-access-URL], accessed [date-of-access]</p> <p><b>acknowledgement:</b> Any users of IMOS data are required to clearly acknowledge the source of the material in the format: "Data was sourced from the Integrated Marine Observing System (IMOS) - IMOS is supported by the Australian Government through the National Collaborative Research Infrastructure Strategy (NCRIS) and the Super Science Initiative (SSI).</p>