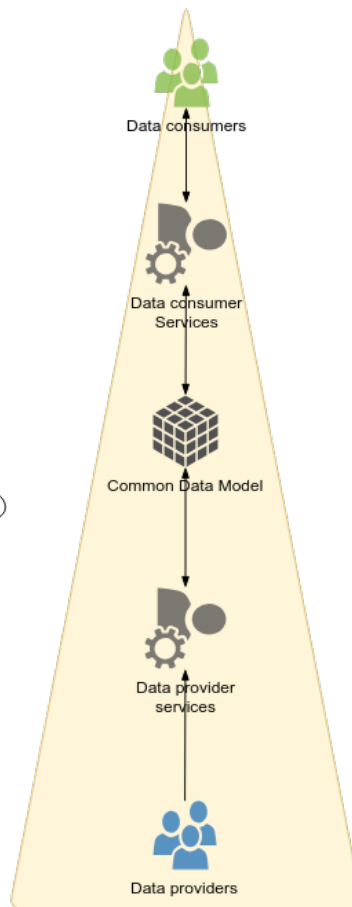
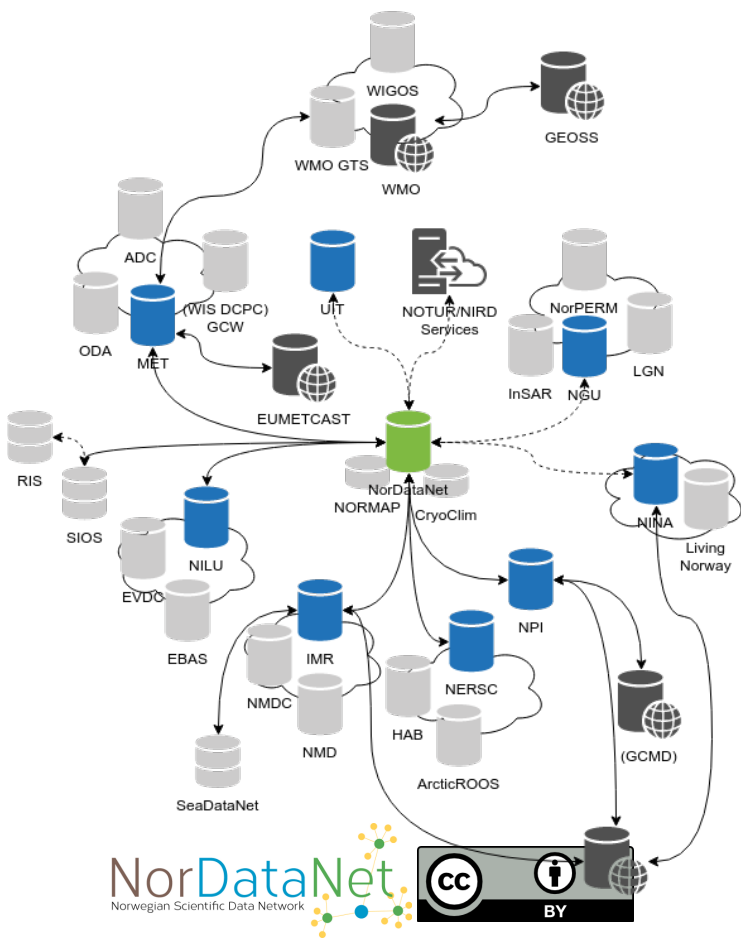


A low-poly, geometric illustration of an iceberg floating in a blue sea under a grey sky. The iceberg is composed of many triangular facets in various shades of blue. The water surface is indicated by a horizontal line, with the top of the iceberg above it and the much larger submerged part below. The sky is a solid, light grey color.

Norwegian Scientific Data Network Services for providers and consumers

Øystein Godøy, Stein Tronstad, Torill Hamre,
Markus Fiebig, Helge Sagen and Lara Ferrighi

Norwegian Scientific Data Network - NorDataNet



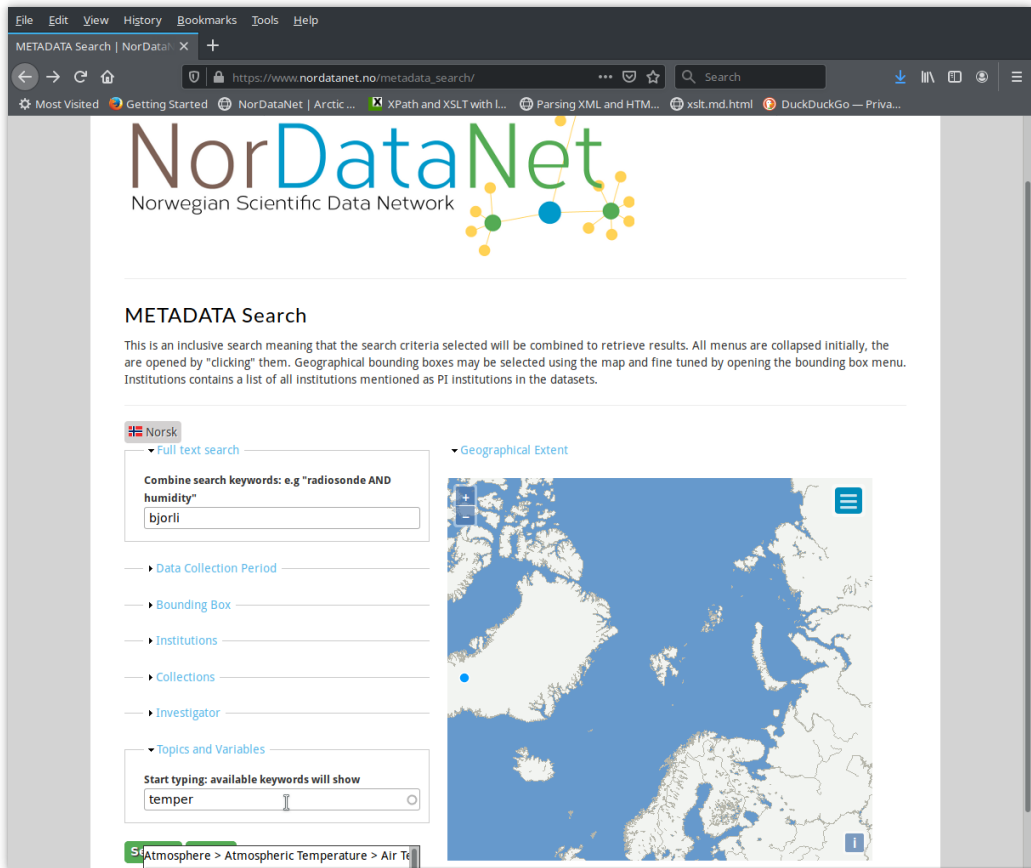
- A distributed data management network
- Development funded by the Research Council of Norway (RCN)
- Activities are supporting other efforts like Svalbard Integrated Arctic Earth Observing System, WMO Global Cryosphere Watch, Year of Polar Prediction, ...
- Building on existing data centres nationally and the legacy of IPY
 - Originally focused on geoscientific data
 - But requested by RCN to think interdisciplinary
- Adding previous efforts like NORMAP and CryoClim as collections
 - Preparing integrations with the National Ground Segment for Satellite data
- Discovery metadata are harvested into a unified catalogue using
 - OAI-PMH, OGC CSW, (OpenSearch – only testing)
- Moving towards standardised data hosted by core partners
 - Actionable data as basis for user oriented services
 - Externally harvested information may be of any kind
 - Strong focus on NetCDF-CF wherever possible to achieve FAIR data

Types of metadata for datasets

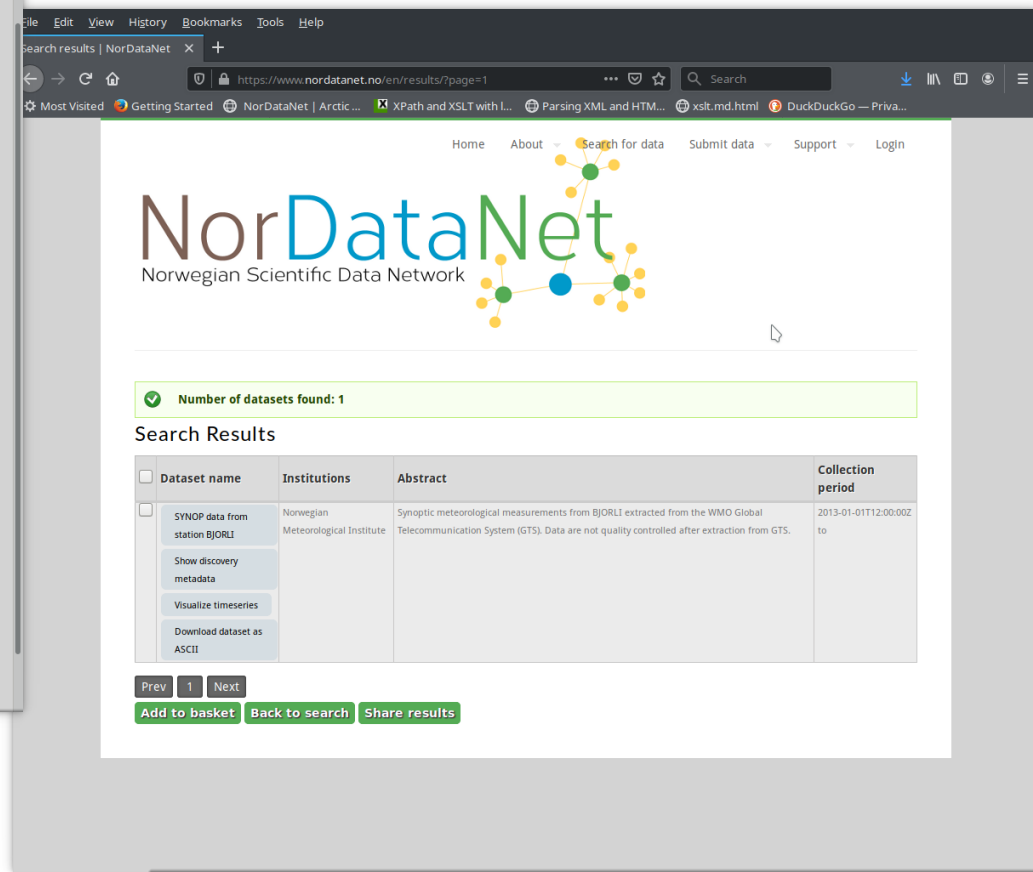
| Type | Purpose | Description | Examples |
|------------------------|--|--|---|
| Discovery metadata | Used to find relevant data | Discovery metadata are also called index metadata and are a digital version of the library index card. It describes who did what, where and when, how to access data and potential constraints on the data. It shall also link to further information on the data like site metadata. | ISO19115 (converted to MMD) GCMD DIF (converted to MMD) ACDD (converted to MMD) MMD (used by NorDataNet) |
| Use metadata | Used to understand data found | Use metadata are describing the actual content of a dataset and how it is encoded. The purpose is to enable the user to understand the data without any further communication. It describes content of variables using standardised vocabularies, units of variable, encoding of missing values, map projections etc. | Climate and Forecast Convention BUFR GRIB DwCA |
| Configuration metadata | Used to tune portal services for datasets for users. | Configuration metadata are used to improve the services offered through a portal to the user community. This can be e.g. how to best visualise a product. | MMD (used by NorDataNet) |
| Site metadata | Used to understand data found | Site metadata are used to describe the context of observational data. It describes the location of an observation, the instrumentation, procedures etc. To a certain extent it overlaps with discovery metadata, but more so it really extends discovery metadata. Site metadata can be used for observation network design. | WIGOS OGC O&M |

Overview

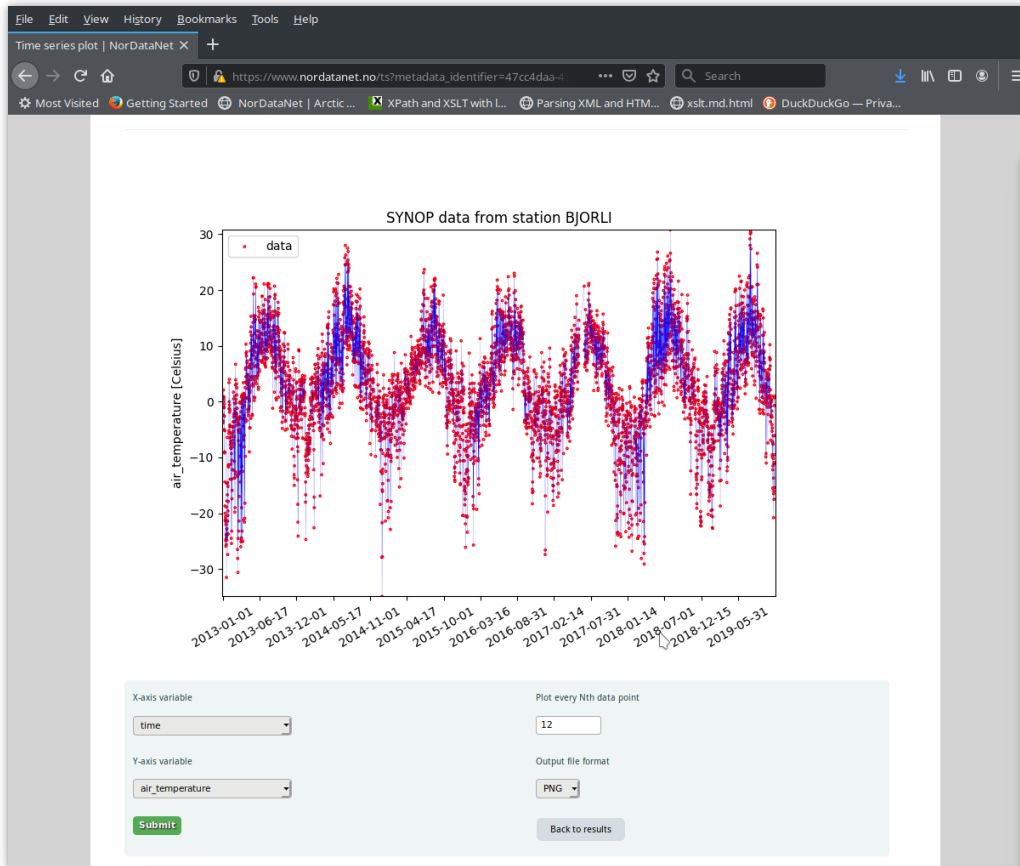
- Trying to identify which services to offer to users (data providers and data consumers)
 - Simplifying their work
 - Showing the benefit of structured data management
 - But slow uptake in user communities
 - Need to interact better with user communities
 - Exploring interactions between research and operational services
- Primary focus on Findable, Accessible, Interoperable, Reuseable
 - Data for services, easy integration in VREs
- Modular approach
 - Ideally connecting functional components with OGC WPS
- Currently offering
 - A unified search interface
 - On the fly visualisation and transformation of data depending on FAIRness and protocols
 - Using OPeNDAP, OGC WMS and OGC WPS
 - Compliance checker for NetCDF-CF
 - Joint with SIOS and Nansen Legacy
 - Conversion tool for NetCDF-CF
 - Joint with SIOS and NMDC
- Ongoing work
 - Integration with Norwegian Infrastructure for Research Data
 - Joint with Nansen Legacy and SIOS InfraNOR
 - Improving visualisation and transformation of NIRD hosted datasets
 - Improving data documentation support to data providers
 - Improving visualisation services



Screenshot examples of existing functionality - search



Visualisation and transformation of timeseries



ASCII data download | NorDataNet

https://www.nordatanet.no/csv?metadata_identifier=47cc4daa-4

| <input type="checkbox"/> | Standard name | Units |
|--------------------------|------------------------------|--------------------------------|
| <input type="checkbox"/> | air_pressure | hPa |
| <input type="checkbox"/> | air_pressure_at_sea_level | hPa |
| <input type="checkbox"/> | air_temperature | Celsius |
| <input type="checkbox"/> | dew_point_temperature | Celsius |
| <input type="checkbox"/> | precipitation_amount | kg m-2 |
| <input type="checkbox"/> | relative_humidity | percent |
| <input type="checkbox"/> | sea_surface_temperature | Celsius |
| <input type="checkbox"/> | thickness_of_snowfall_amount | cm |
| <input type="checkbox"/> | time | days since 1970-01-01 00:00:00 |
| <input type="checkbox"/> | wind_from_direction | degree |
| <input type="checkbox"/> | wind_speed | m s-1 |
| <input type="checkbox"/> | wind_speed_of_gust | m s-1 |

Output format: CSV

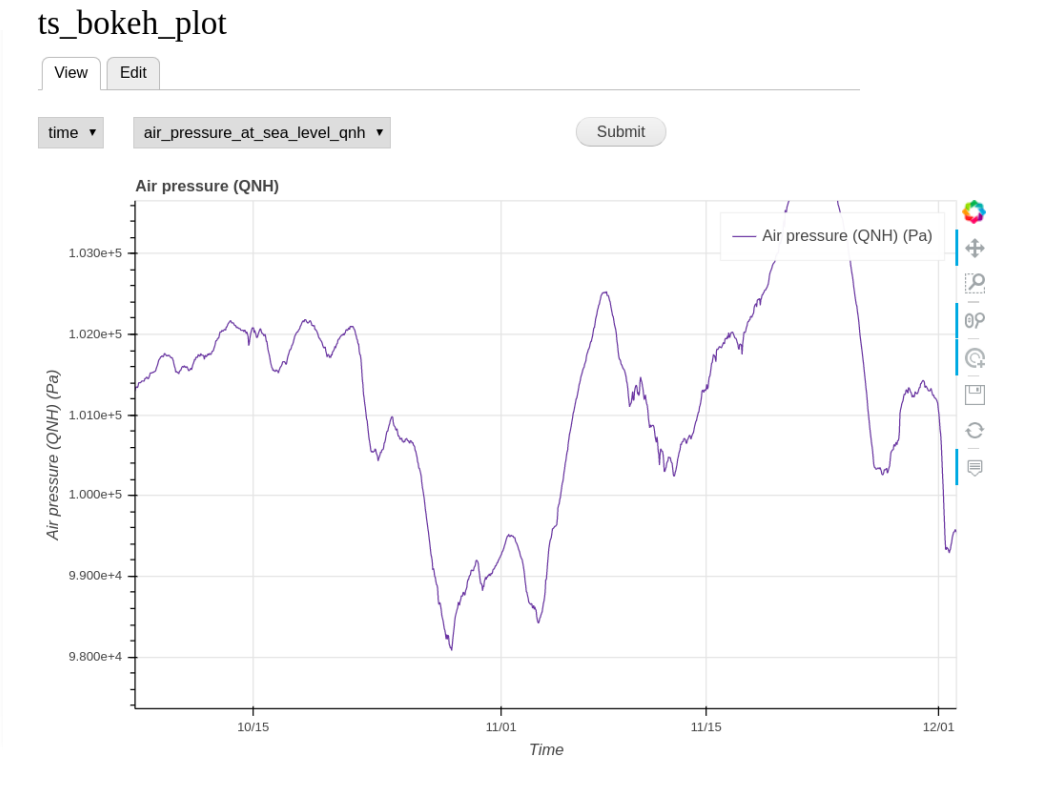
Submit

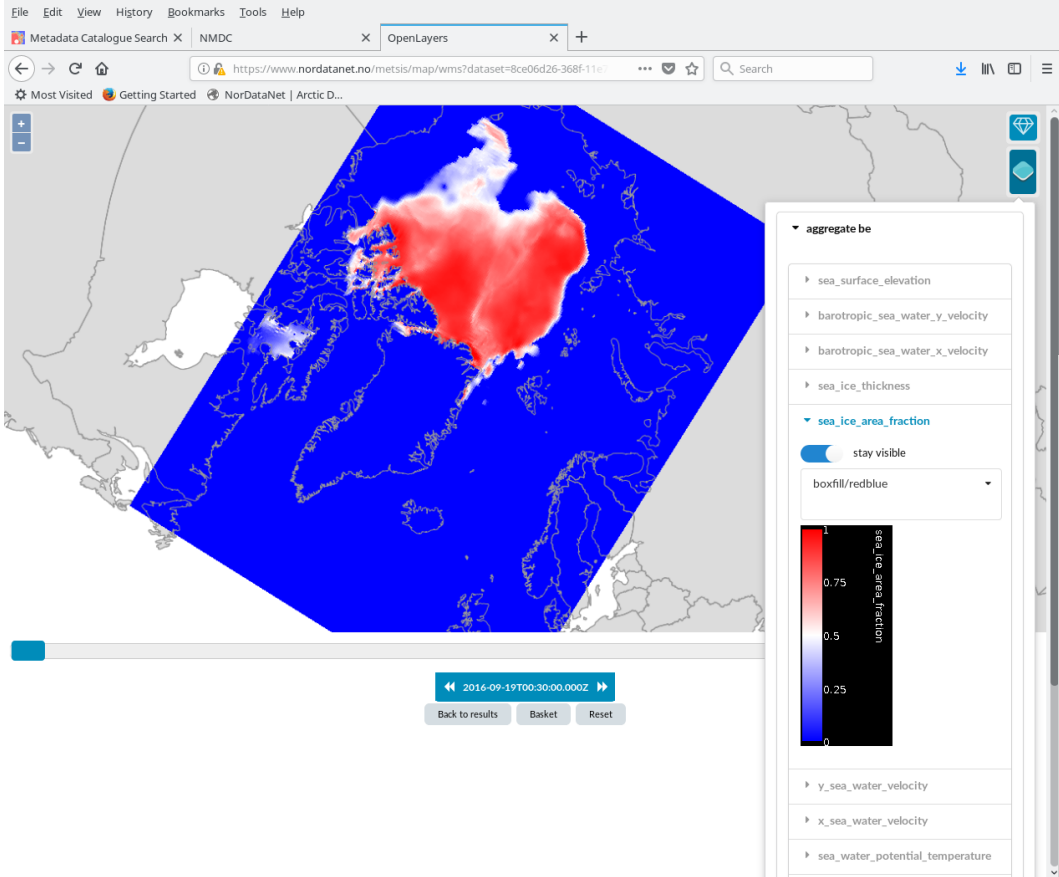
Back to results

Time Series plotting – new dynamic presentation

| | | | |
|--------------------------|---|------------------------------------|--|
| <input type="checkbox"/> | Visualize timeseries Download dataset as ASCII | | |
| <input type="checkbox"/> | Observations from Kongsøya Download data View metadata Visualize timeseries Download dataset as ASCII | Norwegian Meteorological Institute | Quality controlled timeseries from climate consistent following a nu |
| <input type="checkbox"/> | Observations from Karl XII-Øya | Norwegian Meteorological Institute | Quality controlled timeseries from climate consistent following a nu |

Upgrade and extension: Work in progress!





Visualisation and transformation of gridded products

Select temporal extent

Start date

Stop date

Select variables

| <input type="checkbox"/> | Name | Standard name | Long name | Units |
|--------------------------|-------------|---------------------------------|---------------------------------|----------------|
| <input type="checkbox"/> | h | sea_floor_depth_below_sea_level | sea_floor_depth_below_sea_level | meter |
| <input type="checkbox"/> | latitude | latitude | latitude | degree_north |
| <input type="checkbox"/> | longitude | longitude | longitude | degree_east |
| <input type="checkbox"/> | mask | | mask on RHO-points | |
| <input type="checkbox"/> | aice | sea_ice_area_fraction | fraction of cell covered by ice | |
| <input type="checkbox"/> | hice | sea_ice_thickness | average ice thickness in cell | meter |
| <input type="checkbox"/> | salinity | sea_water_salinity | salinity | 1e-3 |
| <input type="checkbox"/> | temperature | sea_water_potential_temperature | Sea water potential temperature | Celsius |
| <input type="checkbox"/> | u | x_sea_water_velocity | Sea water x velocity | meter second-1 |
| <input type="checkbox"/> | ubar | barotropic_sea_water_x_velocity | Barotropic sea water x velocity | meter second-1 |
| <input type="checkbox"/> | v | y_sea_water_velocity | Sea water y velocity | meter second-1 |
| <input type="checkbox"/> | vbar | barotropic_sea_water_y_velocity | Barotropic sea water y velocity | meter second-1 |
| <input type="checkbox"/> | zeta | sea_surface_elevation | Sea surface height above geoid | meter |

Select map projection

x-axis from:

NorDataNet
Norwegian Scientific Data Network



2 of 2 matches

File Edit View History Bookmarks Tools Help

How to encode data | GCV x NIRD · Documentation | Si x Research Data | Sigma2 x +

https://www.sigma2.no/content/research-data

Most Visited Getting Started NorDataNet | Arctic ... XPath and XSLT with I... Parsing XML and HTM... xslt.md.html DuckDuckGo — Priva...

UNINETT sigma2 Services Access Support International Outreach Search

About

Research Data

Scientific Research Data represent and provide huge resources for the scientific communities and for the innovation of the society in its whole. To facilitate the researching process, IT services must be available to support researchers at any stage of the research data life cycle, from the early stages of the project planning, throughout the entire project lifetime and beyond.

```

graph TD
    DA[DATA ARCHIVING] --> DP[DATA PROCESSING]
    DP --> RP[RESEARCH DATA]
    RP --> DC[DATA COLLECTING]
    DC --> DP
    DC --> DA
    
```

NIRD is the new **National e-Infrastructure for Research Data**, owned and operated by Uninett Sigma2. NIRD provides a flexible and secure facility for storing research data and offers software tools and applications to collect, store, process such data, high performance computing systems and on-demand computing resources to meet the researchers needs and enable them to tackle their scientific challenges.

Services

- Generic services
- Computational Services (HPC)
- Research Data
- Sensitive Data Services

Shortcuts

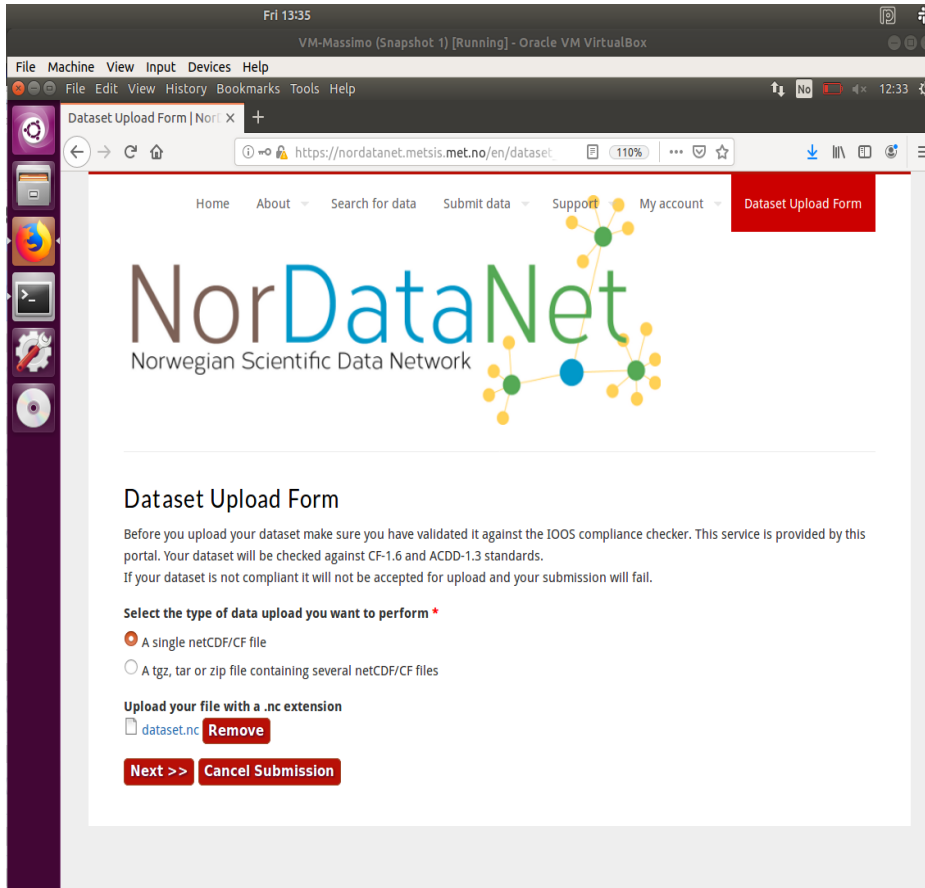
- Hardware Live status
- Metacenter opslog
- Procurements
- Research Data Archive
- Training
- User documentation

Get access

- Apply for HPC resources
- Apply for storage resources
- Apply for AUS resources
- Apply for user accounts

Integration with national storage resources, using a service oriented approach

Upload Interface to expose data from NIRD archive (1)



- The user has the possibility to upload a single dataset in NetCDF/CF format.
- A group of files (tgz/zip file) containing NetCDF/CF files.
- The NetCDF files must follow the CF/ACDD conventions in order to be able to extract the correct metadata from the dataset.
- Validation tools for NetCDF/CF are integrated in the work flow.

Upload Interface to expose data from NIRD archive (2)

The screenshot shows a web browser window displaying the 'Dataset Upload Form' on the NorDataNet website. The page features the NorDataNet logo and navigation links. A green success message indicates that the dataset 'dataset.nc' is compliant with CF and ACDD standards. Below this, the 'Dataset Upload Form' section provides instructions and a table of extracted metadata for the file 'dataset.nc'.

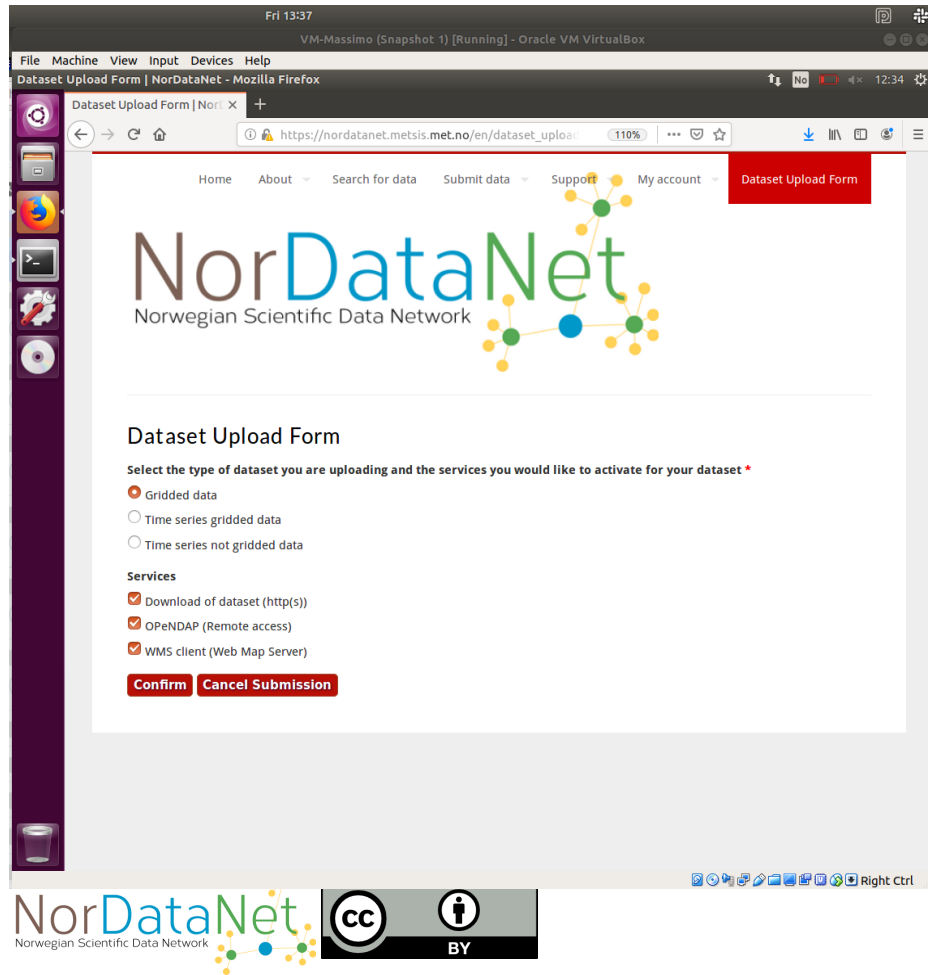
Metadata for: "dataset.nc"

| Metadata Key | Metadata value |
|----------------------------|--|
| metadata_identifier | Not available |
| title | Title of my Dataset |
| abstract | Observations of temperature in tall masts made by Kjeller Vindteknikk for the E39 bridge project in Western Norway |
| metadata_status | Active |
| dataset_production_status | Not available |
| collection | ADC |
| last_metadata_update | 2019-10-02 |
| temporal_extent_start_date | 2019-10-01 |
| temporal_extent_end_date | 2019-10-09 |
| iso_topic_category | Not available |

The footer of the page includes the NorDataNet logo, a Creative Commons Attribution (CC BY) license icon, and a 'Right Ctrl' keyboard indicator.

- When submitting the dataset, it will be checked with respect to be CF/ACDD conventions.
- If these tests are passed, metadata are extracted and prepared to be sent to NIRD.
- The user can also check that the metadata extracted are correct and if not cancel the submission.

Upload Interface to expose data from NIRD archive (3)



- Depending on the type of data submitted the user can decide with type of services needed by NIRD to expose the dataset
- Data download (HTTP)
- OPeNDAP (remote access)
- OGC WMS (map visualization)

Bottlenecks

- Interoperability at the data level
 - Need to engage data providers and data centres (varying degree of adherence to standards)
 - Need tools helping them
- Application of controlled vocabularies and proper identification of which controlled vocabularies
- Interaction with data providers in academia
 - Understanding emerging requirements from funding agencies on free and open data
- The Catch 22 of users not finding, then not submitting data resulting in no data found
- Provision of useful tools for the user community – hard to get feedback

