








# **NetCDF Zarr Viewer**

**A Tool to Explore cloud data**

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**Making public NetCDF/Zarr Data Accessible to Everyone**

# NCZarr Viewer

-  **Load and explore** NetCDF and Zarr datasets
-  **Browse variables** and dimensions through a simple interface
-  **Subset data** by time, space, and other dimensions visually
-  **Visualize results** with interactive plots
-  **Access cloud data** directly from S3 buckets
-  **Work with large datasets** efficiently
-  **Containerized** for easy deployment and sharing

# Architecture Overview

 User Interface →  Dash App →  Data Engine

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 Web Browser  Python Core  Xarray

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 Interactive UI  Data Manager  NetCDF/Zarr

# Technology Stack

- **Frontend:** Dash + Bootstrap Components
- **Data Processing:** Xarray + NumPy
- **File Formats:** NetCDF4, Zarr
- **Visualization:** Plotly, Matplotlib, Cartopy
- **Cloud Access:** S3FS, FSSpec (cloud storage access)
- **Marine Data:** Copernicus Marine Toolbox integration

# Quick Start

```
# Option 1: Use Docker
docker run -p 8050:8050 samfooks/nczarr-viewer:latest

# Option 2: Local development (if you have Python)
git clone [https://github.com/EDITO-Infra/nczarr-viewer)](https://github.com/EDITO-Infra/nczarr-viewer)
cd nczarr-viewer
pip install -r requirements.txt
python run.py
```

**Access at:** <http://localhost:8050>

 **Tip:** Think of this as "R Shiny for NetCDF data" - but already built for you!

## Supported Data Sources

- **ARCO data on EDITO:** ARCO datasets from the EDITO STAC
- **Personal Cloud Storage:** [Minio storage](#) on EDITO
- **Local Files:** NetCDF, Zarr

# Core Features

## Data Exploration

- **Variable Browser:** See all variables, dimensions, and metadata
- **Dimension Handling:** Time, depth, latitude, longitude
- **Data Subsetting:** Interactive selection of regions and time periods

## Visualization

- **Interactive Maps:** Cartopy-based geographic plots
- **Time Series:** Plotly charts for temporal data
- **Statistical Analysis:** Basic stats, and summaries

# Marine Data Examples

## EDITO Integration

- **Biodiversity:** Species distribution data
- **Chemistry:** Water quality parameters
- **Geology:** Seafloor characteristics
- **STAC Access:** Browse collections and datasets

## Copernicus Marine

- **Direct Access:** CMEMS credentials integration (you will need an account)
- **Multiple Formats:** NetCDF, Zarr (and others in future)
- **Real-time Data:** Latest ocean observations



## Performance Features

- **Chunked Processing:** Handle datasets larger than memory
- **Lazy Loading:** Only load data when needed
- **Cloud Optimization:** Efficient S3 data access

# Configuration & Deployment

## Setup

To access CMEMS datasets you may need an account using [Copernicus Marine Toolbox](#)

```
# CMEMS credentials
CMEMS_USERNAME=your_username
CMEMS_PASSWORD=your_password
```

## Docker Deployment

```
docker build -t nczarr-viewer .
docker run -p 8050:8050 nczarr-viewer
```

# Subsetting ARCO Data: Core Concepts

## Multidimensional Data Structure

ARCO Dataset
Variables: temperature, salinity, oxygen, etc.
Dimensions: time, depth, latitude, longitude
Shape: (time: 365, depth: 50, lat: 1800, lon: 3600)

## Subsetting Operations

- **Variable:** Pick specific parameters
- **Temporal:** Select specific dates
- **Spatial:** Choose latitude/longitude boundaries

# Subsetting in Practice

## Example: Extract Surface Temperature for North Sea

```
import xarray as xr

# Load ARCO dataset
ds = xr.open_zarr("s3://arco-data/ocean-temp.zarr")

# Variable: surface temperature
temp_surface = ds['temperature'].sel(depth=0)

# Temporal: August 30
august30_data = temp_surface.sel(
    time='2025-08-30'
)

# Spatial bounds: North Sea region
north_sea = august30_data.sel(
    latitude=slice(51.0, 61.0),      # 51°N to 61°N
    longitude=slice(-5.0, 15.0)     # 5°W to 15°E
```

# Visual Representation

Original: 365×50×1800×3600

↓ Variable selection

Surface: 365×1×1800×3600

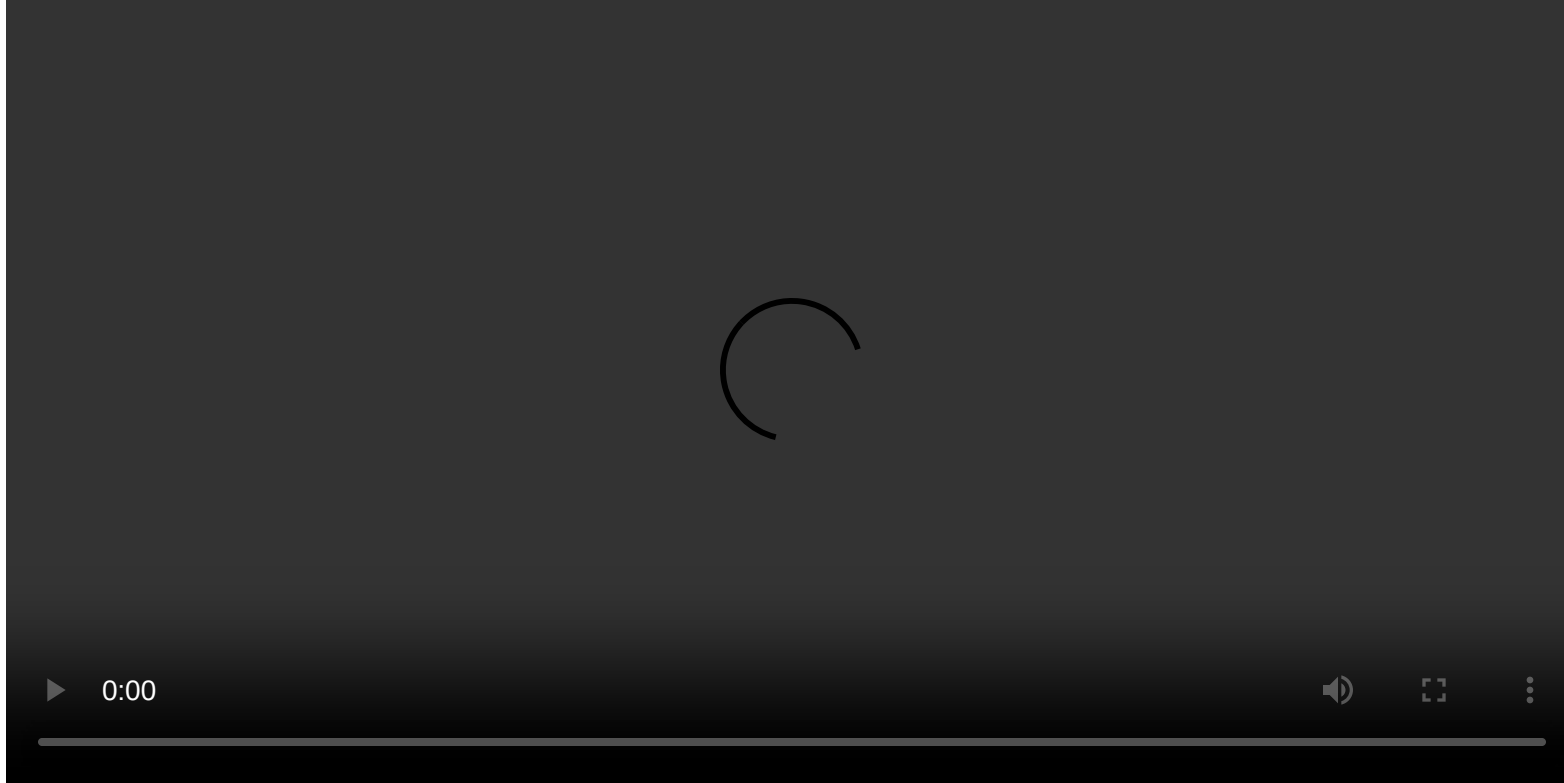
↓ Temporal subset

August 30, 2025: 1×1×1800×3600

↓ Spatial subset

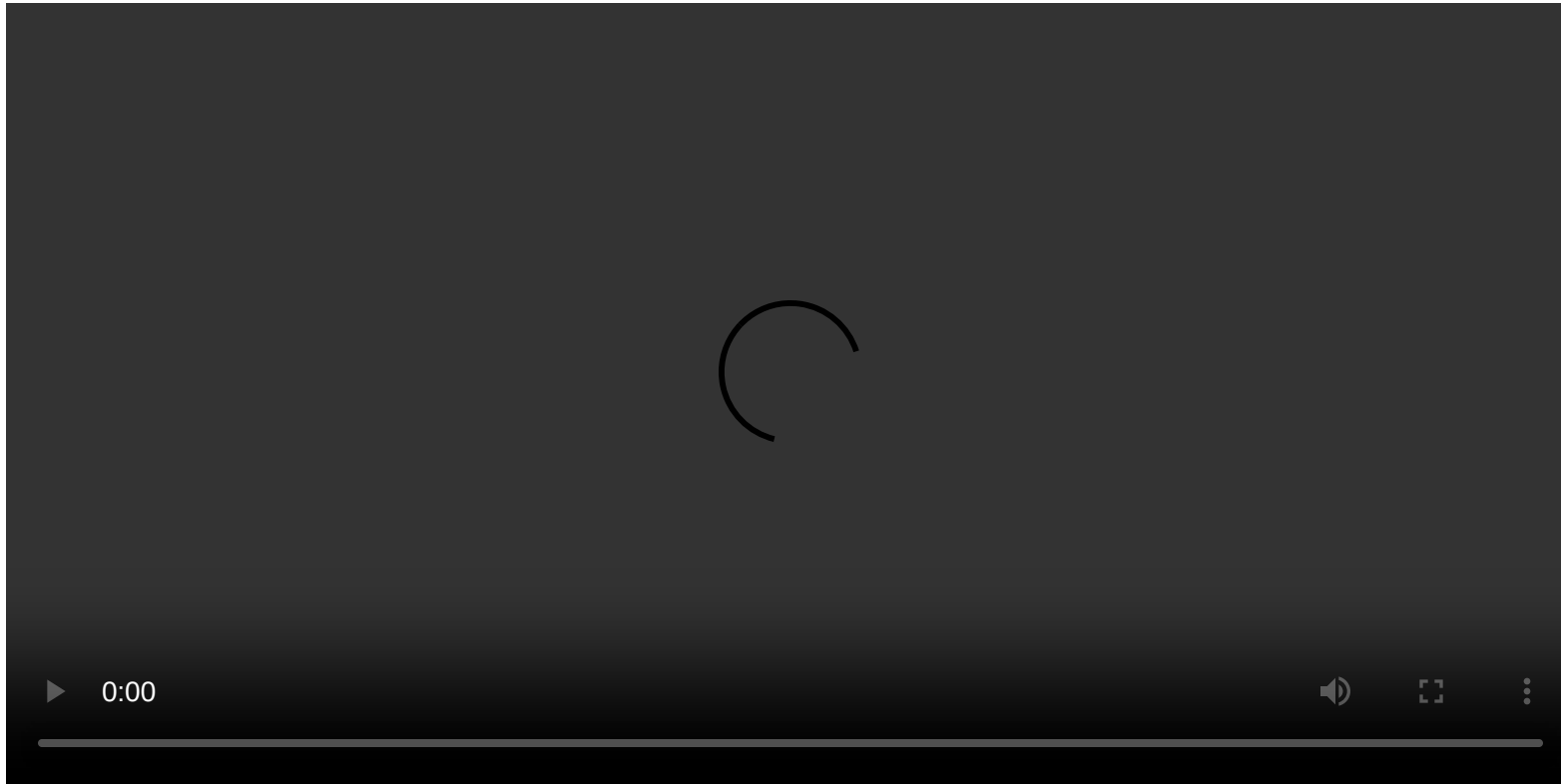
North Sea region: 1×1×100×200

## Use the NCZarr Viewer locally or on EDITO



*Click to play*

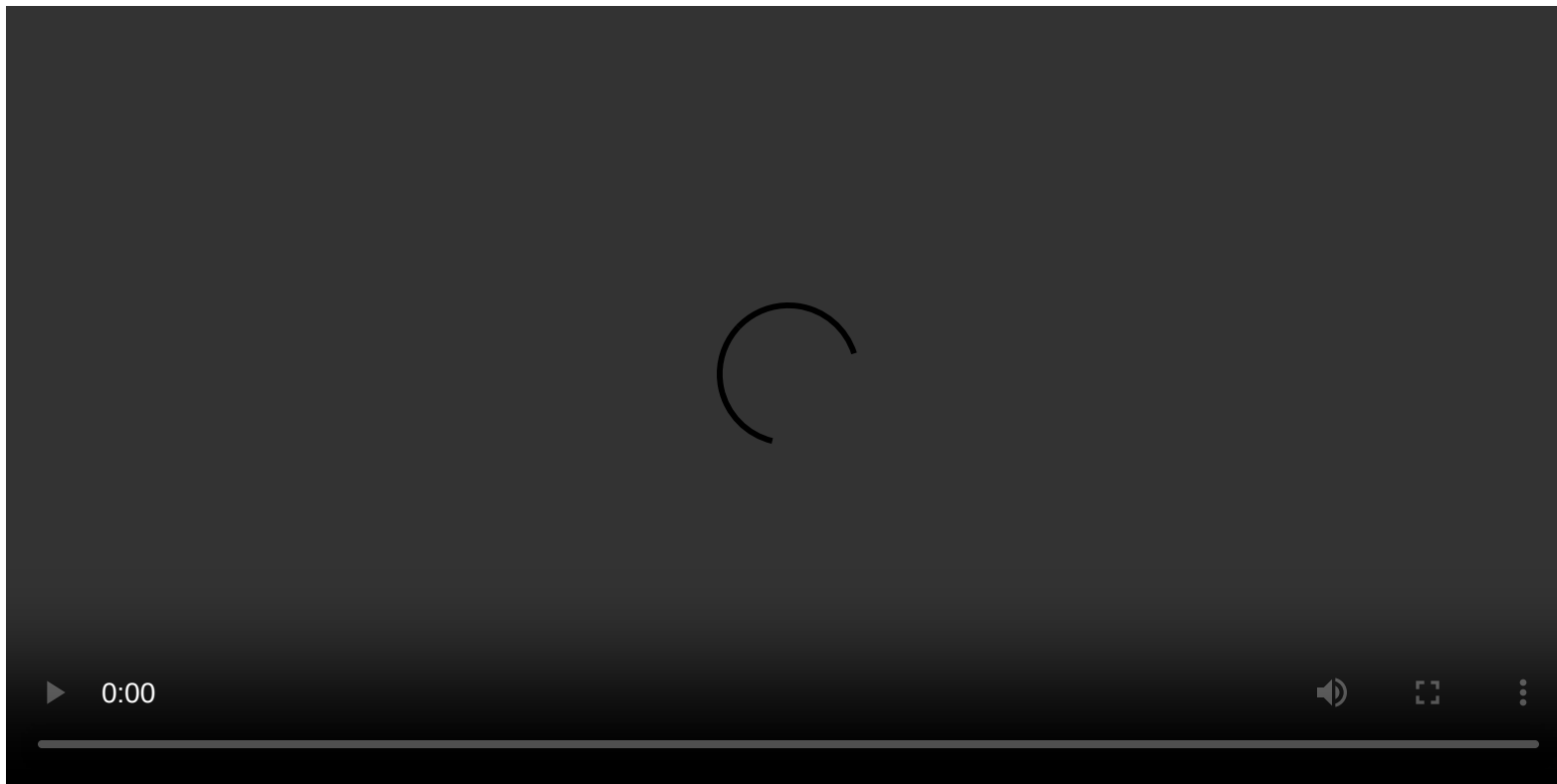
## Explore a NetCDF from your Minio bucket on EDITO



*Click to play*

# Live Demo Time!

Explore CMEMs dataset using zarr link from EDITO STAC



*Click to play*



## **Future Developments**

- **More Interactive Visualization:** More interactive global maps and plots
- **Advanced Analytics:** Statistical modeling tools/plugins
- **New ARCO Data types:** Parquet, Geoparquet
- **Collaboration:** Multi-user editing and sharing

 **Thank You!**

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**GitHub:** <https://github.com/EDITO-Infra/nczarr-viewer>

**Docker Hub:** [samfooks/nczarr-viewer](https://hub.docker.com/r/samfooks/nczarr-viewer)

**Questions?**

