Subsetting/Aggregation tools for OR&R

Lianyuan Zheng NOS/CO-OPS/OD

U.S. IOOS 2023 DMAC ANNUAL MEETING 09/26/3023

Objectives

NOS OR&R regularly downloads the NOS OFS model output netCDF files (multiple files which include entire model domain, grid metrics and multiple variables) and ingests them to their trajectory model, GNOME, to track the oil spill or polluted materials in the estuaries and coastal regions (for this case, only surface current and wind components are needed). The objectives of subsetting/aggregation tool are:

- Reduce the downloaded file sizes by subsetting on the concerned sub-domain;
- Reduce the downloaded file sizes by including concerned variables only;
- Downloaded one file instead of multiple files;
- Reduce the times to download the multiple files.
- Re-assign the subsetting sub-domain grid node and cell numbers in order starting from 1;
- All tools and codes used to treated the NOS OFS output files can be used in the new output files.

NOS OFS included ROMS- and FVCOM-based models. The ROMS model grid is curvilinear orthogonal grid and it is straightforward to do the subsetting. My presentation will focus on non-overlapping unstructured triangular grid which is used by FVCOM community model.

NOS OFS output fields files format

- NOS OFS outputs either 3D or surface only 2D snapshot netCDF files with hourly interval, which means if you need 120 hours data, you need to download 120 files separately;
- Each OFS netCDF file includes grid metrics, elevation, salinity, temperature, velocity components, wind components, and heat fluxes, etc.;
- Unstructured triangular grid's node and element numbers are assigned globally and their neighboring node and element numbers are not in order which makes the subsetting more challenge.

Subsetting/Aggregation web interface

• CO-OPS ISD developed a subsetting/aggregation web tool interface <u>https://opendap.co-ops.nos.noaa.gov/ofsdataagg/index.html</u>

| ←→C | opendap.co-ops.nos.noaa.gov/ofsdataagg/index.html | | | | | |
|--|---|----------------------|------------------|--------------------|------------------------------|----------------------|
| Work_related | 📙 Ofs 📙 Codin | g 📙 Calander 📙 other | 📙 ROMS 📃 F77_Cod | e 📙 Imported 📙 O&M | 📀 KML, KMZ Viewer w 😒 NECOFS | S S BUFR TABLE B - W |
| OFS Data Aggregation and Sub-Setting 🌍 | | | | | | |

OFS Data Request

Request a subset of Operational Forecast System (OFS) data via subsetting and aggregation.

1. Select a model

2. Select a date/time range (max. 4 days of data)

3. Select data profile (surface only or 3D profile)

4. Select a polygon (subset of model grid) - click on polygon or rectangle icon located at upper-left corner of the model domain window

5. Select data variables of interest (elevation, temperature, salinity, velocity)

6. Enter your email address

An email will be sent when your data are available for download.

Select a Model -

For full access to all of CO-OPS Model Data, please see our THREDDS Server. For more information on our Operational Forecast Systems, please see https://tidesandcurrents.noaa.gov/models.html.

For questions, please contact the NOCMP Program at: nos.co-ops.modelingteam@noaa.gov.

Subsetting/Aggregation web interface (cont.)

- It asks for the following information that are required for Fortran code inputs:
 - 1. NOS OFS (NGOFS2)
 - 2. Time windows (maximum 4 days) (2 days)
 - 3. Surface 2D only or 3D profile (surface 2D)
 - 4. Rectangle or polygons (can be up to 20 vertices) to enclose the concerned sub-domain (decagon)
 - 5. Interested oceanic variables (elevation, salinity, temperature and current components)
 - 6. Requester's email address (lianyuan.zheng@noaa.gov)



Results

Based on above inputs, there are 84 files are fallen into the requested time window. Because it requests surface only, the NGOFS2 surface fields files are collected to do the subsetting/aggregation. It takes about two minutes to generate the subsetting/aggregation file and takes less than one minute to download the generated netCDF file to save on local server.

The finalized file has a size of 142 Mb. For each NGOFS2 surface fields file, it has 117 Mb so 84 files have total size of 9792 Mb. In this example, the subsetting/aggregation web tool can save 98.5% total file size and will also save times to download 84 separated files.

Are the subsetting/aggregation results correct?

• Grid



• Elevation



• Surface Temperature



• Surface Salinity



Conclusions

NOS CO-OPS successfully developed a subsetting/aggregation web tool. Based on the concerned sub-domain's size and the number of requested oceanic variables, this tool might significantly save the total file size and download times. It will generate a single file with the same format as their original format, making all existing processing codes and scripts be directly applied.

Acknowledgements

- NOS OR&R provided comments and feedbacks which improves this web tool.
- NOS CO-OPS ISD developed the web interface.
- NOS CO-OPS OD Modeling Team testing and validation.
- NOS OCS CSDL Modeling Team testing and validation.