

LOADING CMEMS DATA OF CURRENTS WITHIN THE OIL SPILL MODEL GNOME

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Activity 4.3 - Deliverable 4.3.1

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The oil spill model GNOME

GNOME (General NOAA Operational Modeling Environment) is a simulation system for modelling released oil trajectories in the marine environment.

This is an Eulerian-Lagrangian 2D model which takes as input any coastline map. Trajectories are determined by processing input data concerning movers (mainly currents, winds, and diffusion) via a 1st-order Runge-Kutta method

$$\Delta x = \frac{u}{\cos(y)} * \Delta t, \Delta y = \frac{v}{111,120.00024} * \Delta t, \text{ and } \Delta z = 0$$

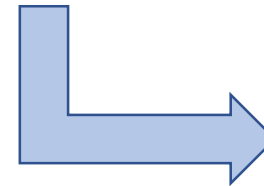
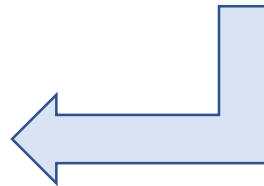
and then by adding together the resulting displacement.

GNOME-based services already provided by CRMA

Map	Winds	Currents
FVG coast	WRF	ROMS
	LAMI	ROMS
North Adriatic	WRF	ROMS
Full Adriatic	WRF	ROMS
	LAMI	ROMS



Multiple data sources



Unique data source

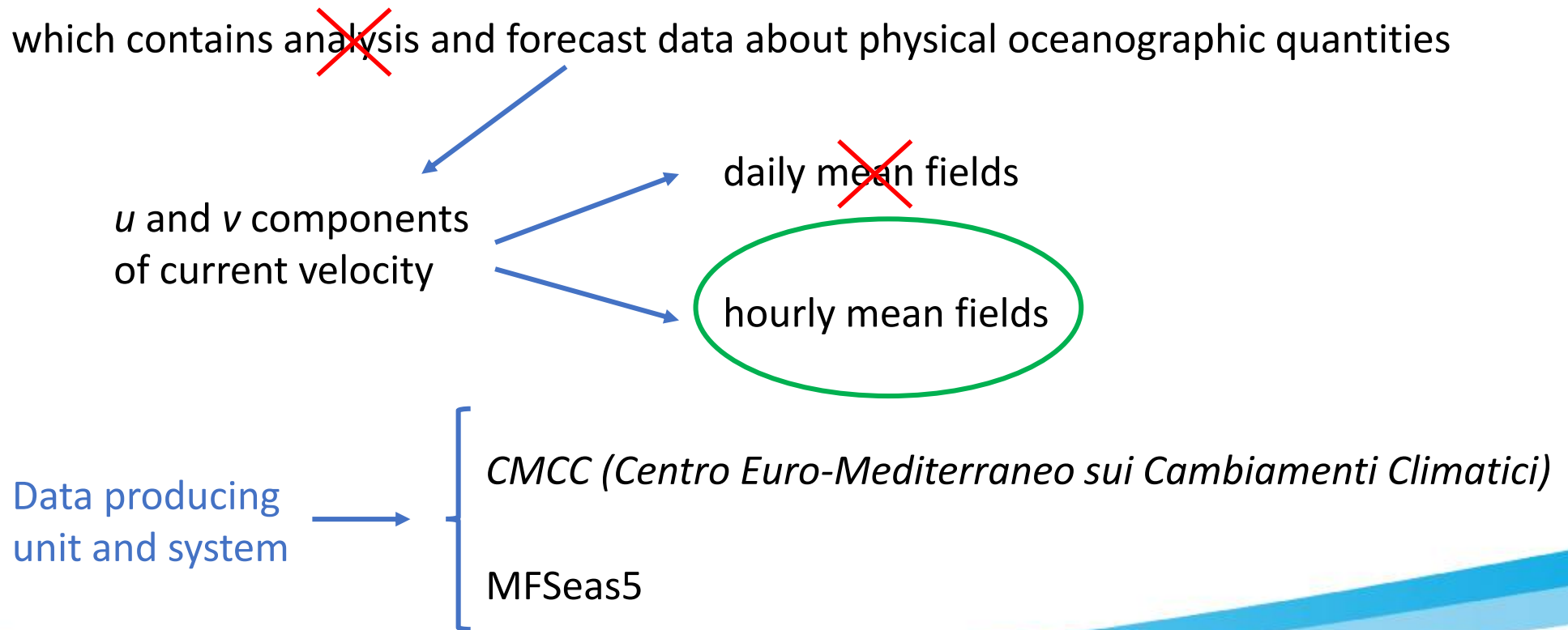


Another source for current data: CMEMS

CMEMS (Copernicus Marine Environment Monitoring Service) issues

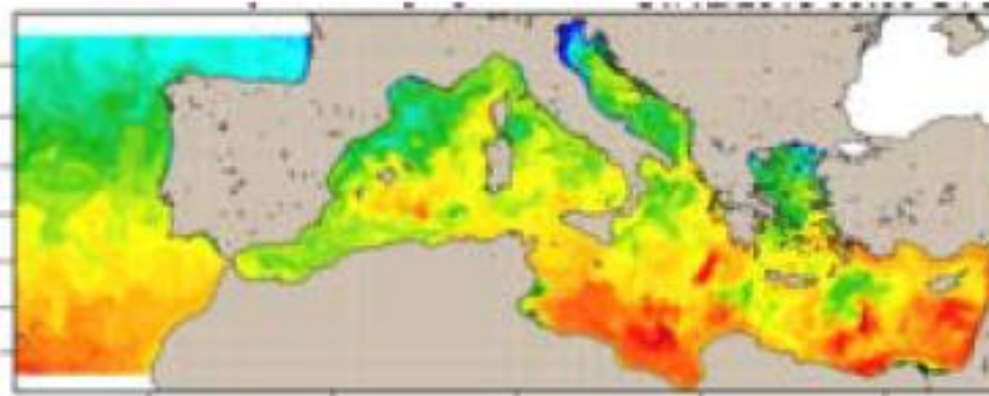
MEDSEA_ANALYSIS_FORECAST_PHY_006_013

which contains ~~analysis~~ and forecast data about physical oceanographic quantities



Short description of the CMEMS product of interest

Domain →

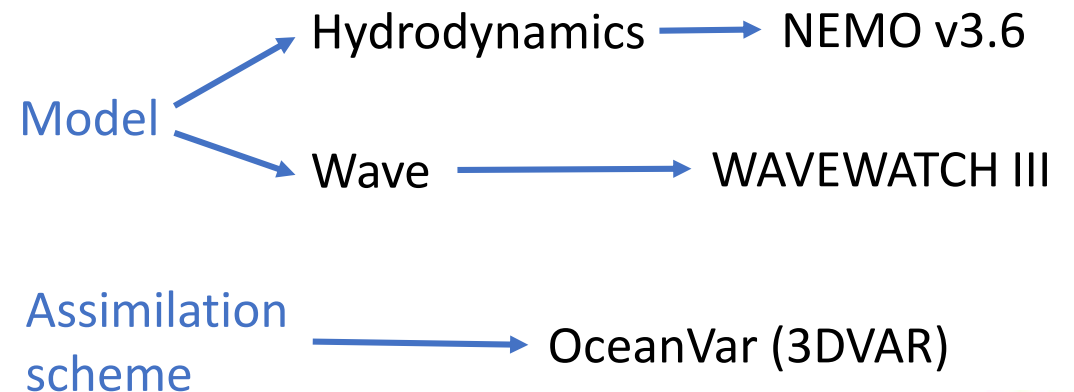


17.29°W – 36.29°E
30.19°N – 45.98°N

Resolution → 1/24° (approx. 4 km)

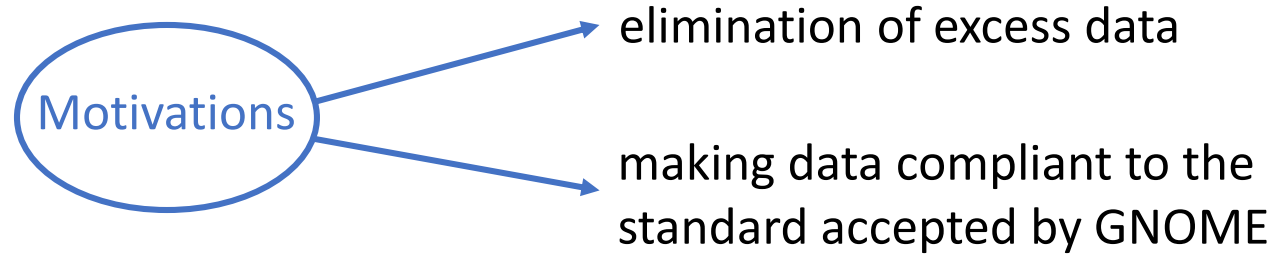
Grid → regular, 1287 x 380 x 141

Issue → daily, 16:00 UTC
120 hours of forecast data

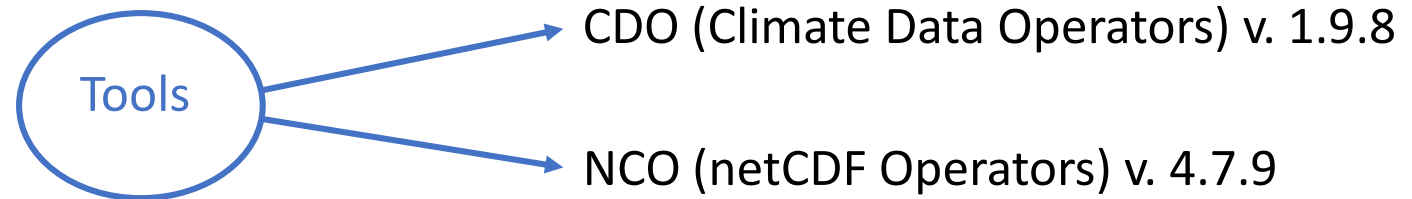


Preparation of CMEMS data for GNOME

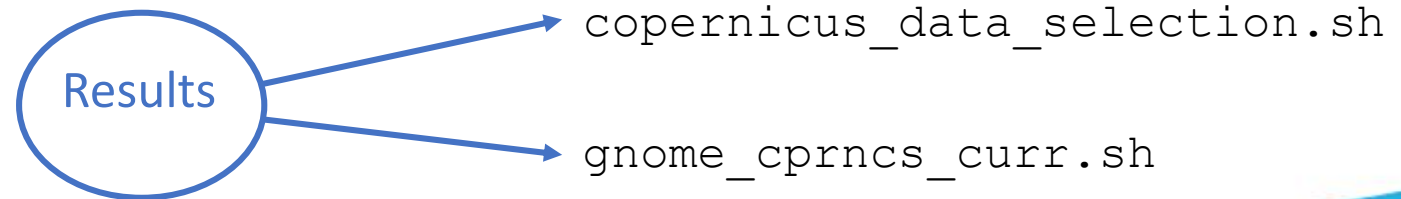
Why?



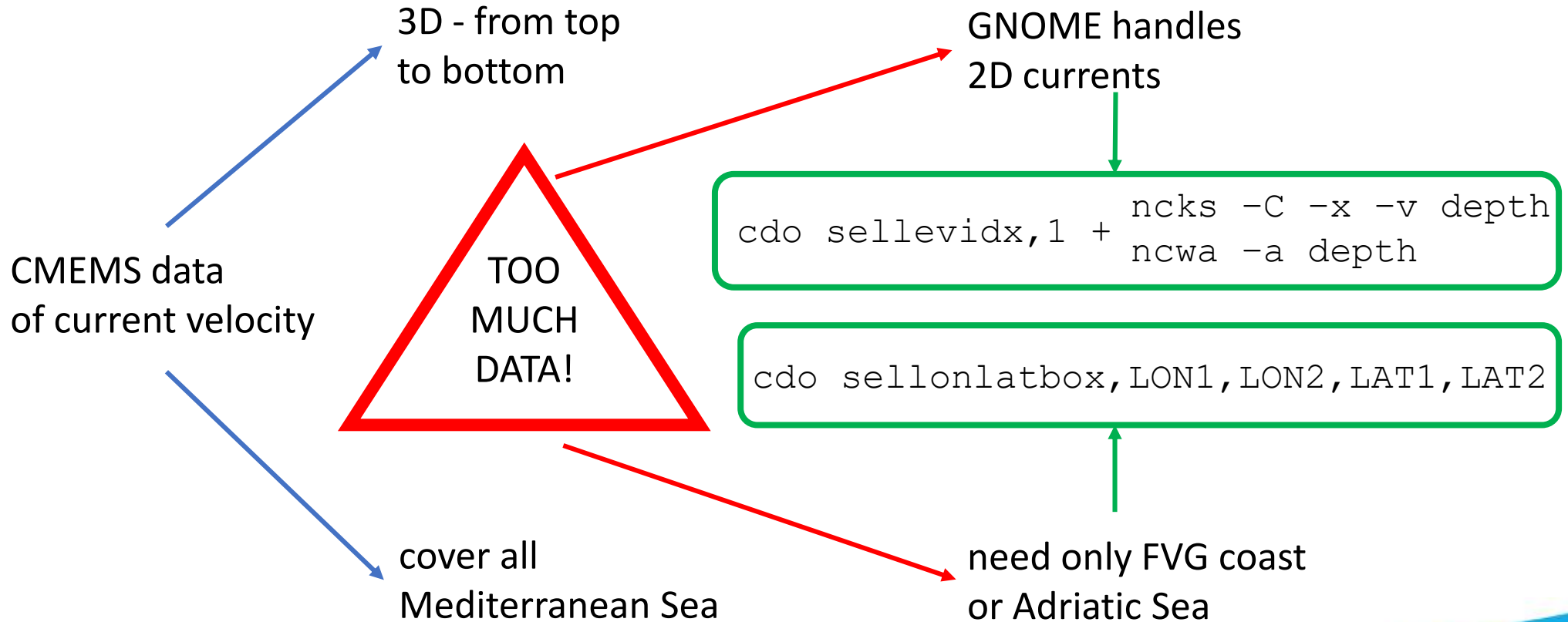
How?



What?



Elimination of excess data



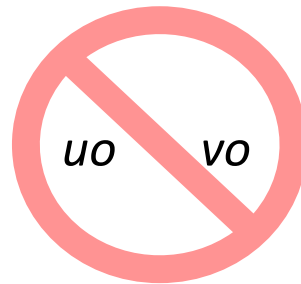
Compliance to GNOME accepted standard

GNOME standard

CMEMS data

Changes to be made

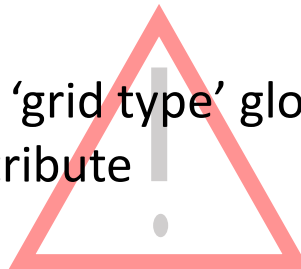
only specific names for u, v components of current velocity



```
cdo -chname,u0,water_u,\  
v0,water_v
```

grid type specified as global attribute

no 'grid type' global attribute



```
ncatted -a "grid_type",global,\  
c,c,"REGULAR"
```


Further compliance problems



GNOME still cannot read CMEMS data...



...and GNOME TechDoc is not helpful anymore



try after try

1)

time values before 01/01/1970 00:00:00 are not accepted...
...but the origin of time axis in CMEMS data is 01/01/1900 00:00:00



2)

only netCDF classic format (CDF-1) is accepted...
...but CMEMS data are in the netCDF-4 (HDF5) format

How to solve those problems

1)

shift the origin of time axis

```
cdo -shifftime,-36524days
```

reset the 'units' time attribute

```
ncatted -a "units",time,m,c,\  
"minutes since 2000-01-01 00:00:00"
```

2)

specify the output format

```
cdo -f nc1 [COMMAND]
```



copernicus_data_selection.sh

From multiple single-day to single multiple-day files

Forecast data issued by CMEMS are divided into 5 single-day datafiles

need to merge

```
cdo mergetime
```

+

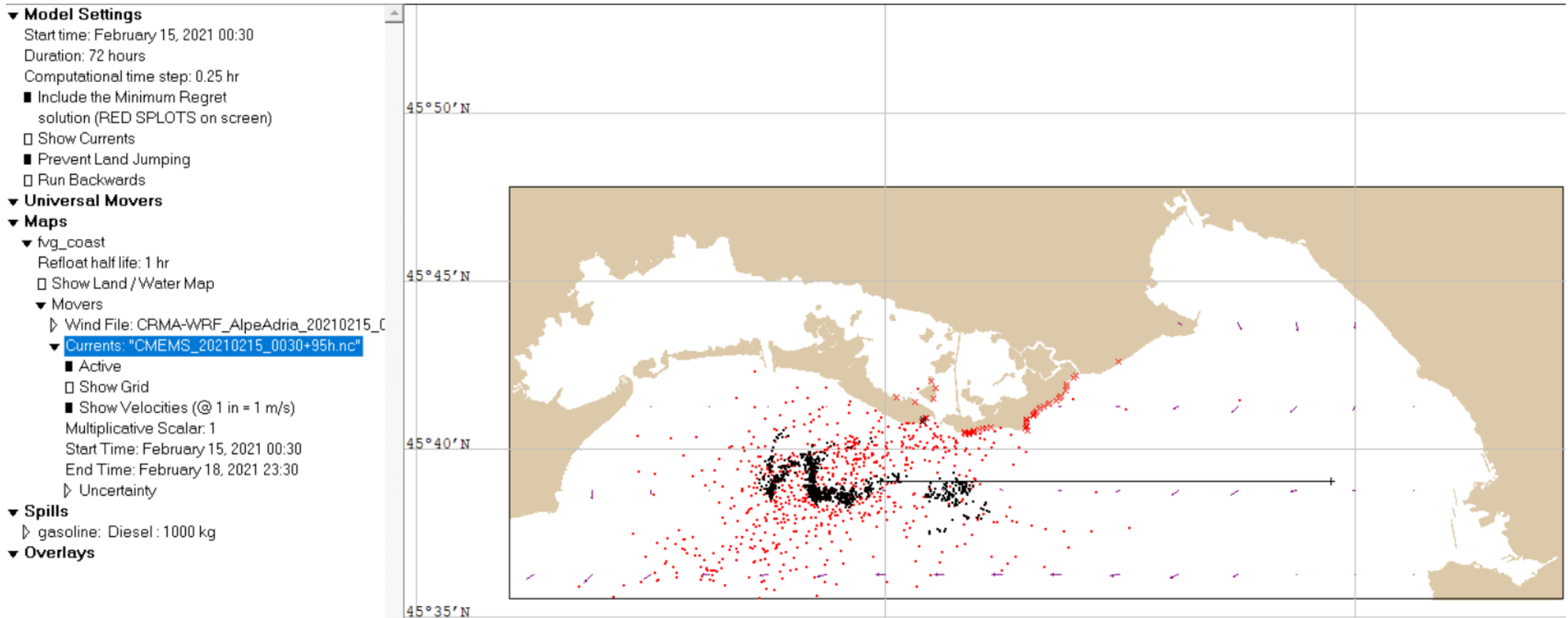
controls on the existence of most recent datafiles

look for data issued the day before when they cannot be found

edit the GNOME command file coherently

```
gnome_cprncs_curr.sh
```

Example: GNOME with CMEMS currents + WRF winds



What comes next?

Near future

New CRMA GNOME-based service with CMEMS currents

Mid-term future

pyGNOME

Long-term future

MEDSLIK-II

References

GNOME model: <https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/response-tools/gnome-suite-oil-spill-modeling.html>

NOAA Office of Response and Restoration: <https://response.restoration.noaa.gov/>

Copernicus Marine Environment Monitoring Service: <https://marine.copernicus.eu/>

WAVEWATCH III model: <https://polar.ncep.noaa.gov/waves/wavewatch/>

NEMO model: <https://www.nemo-ocean.eu/>

OceanVar system: <https://www.cmcc.it/it/models/oceanvar>

Climate Data Operators: <https://code.mpimet.mpg.de/projects/cdo/>

The netCDF Operators (NCO): <http://nco.sourceforge.net/>


pyGNOME: <https://gnome.orr.noaa.gov/doc/pygnome/index.html>

MEDSLIK-II model: <http://www.medslik-ii.org/>

Contacts

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