# Coupling the Coastal and Regional Ocean COmmunity model (CROCO) with the Biogeochemical Flux Model (BFM)
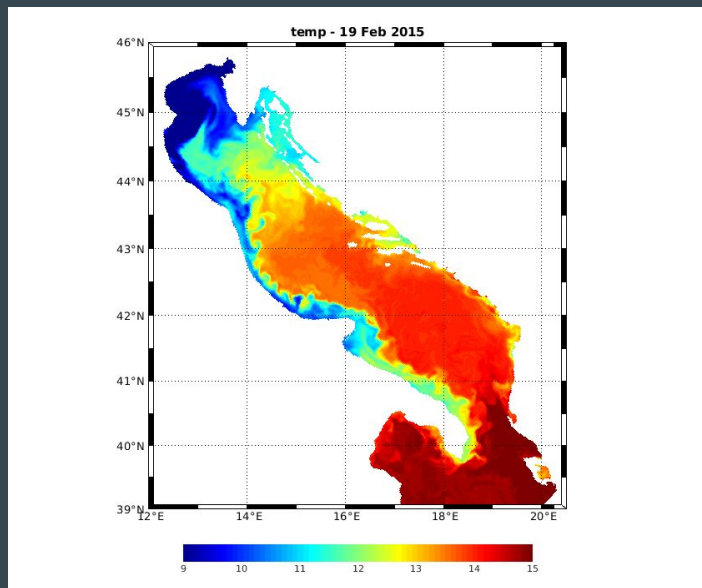
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# CROCO

Terrain following (sigma), non-hydrostatic (optional), croco_tools MATLAB package



32 sigma levels

2 km and 4 km grids

39 freshwater sources

ERA5, MESCAN-SURFEX, COSMO_REA6, ECMWF forecasts

Med MFC physical reanalysis B.C. (CMEMS)

# BFM

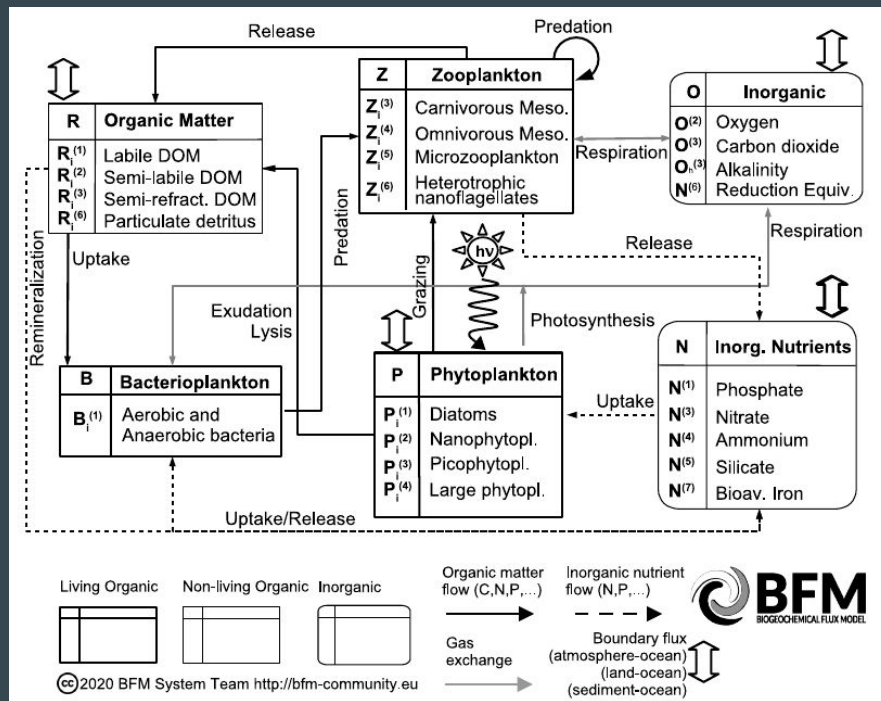Chemical Functional Families (CFF) &
Living Functional Groups (LFG)
CFFs: C, N, P, Si, O, Fe, Chl
Variable stoichiometry

Modular

Used in CMEMS Mediterranean Sea
Biogechemistry Reanalysis

Introduces 58 new variables / tracers



Source: Vichi et al., BFM 5.2 manual, June 2020

# Coupling

CROCO v1.1 + BFM 5.2.0
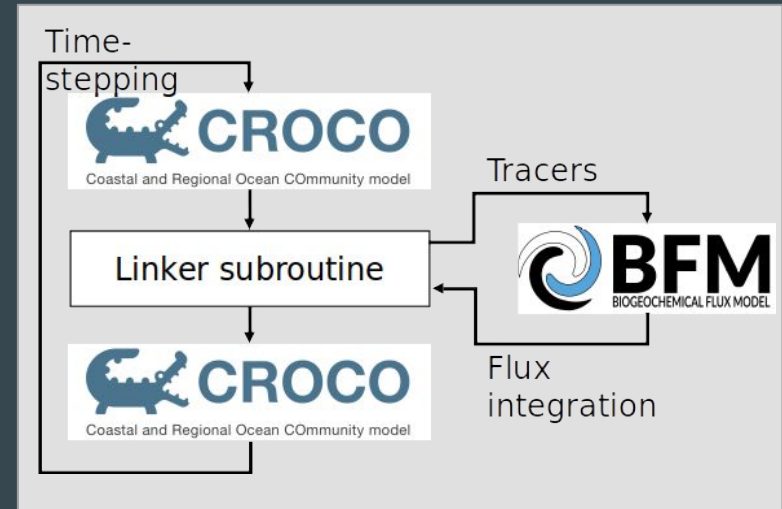
CROCO+PISCES and NEMO+BFM as templates

CROCO computes momentum, mass and heat transport

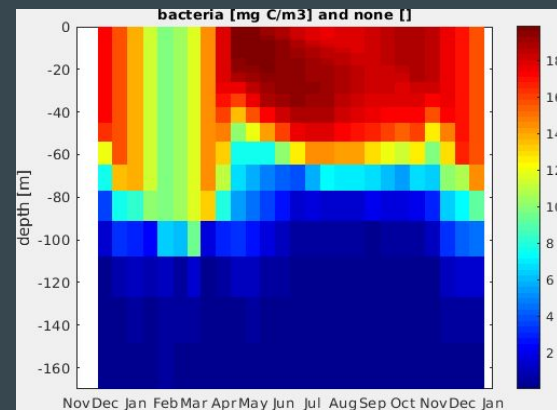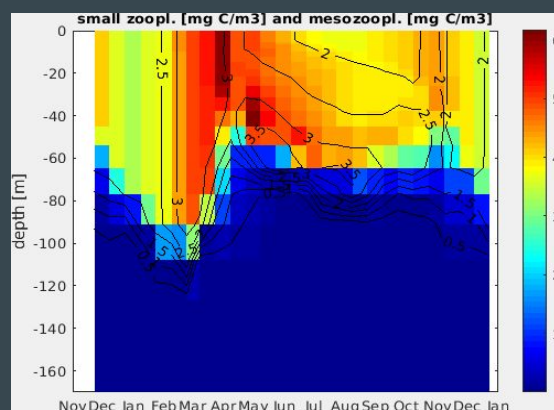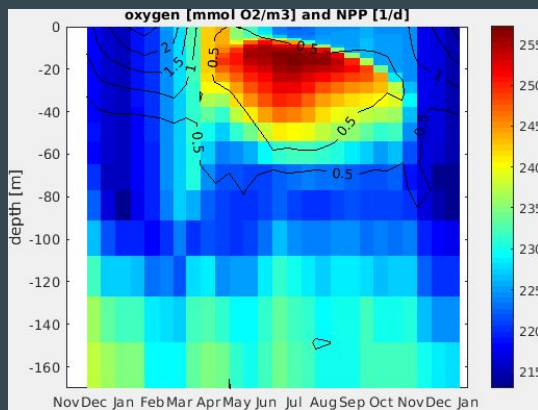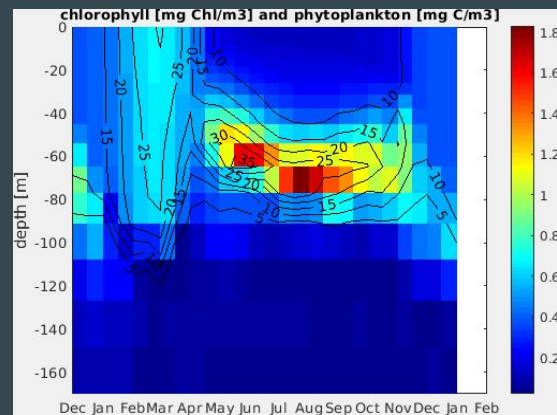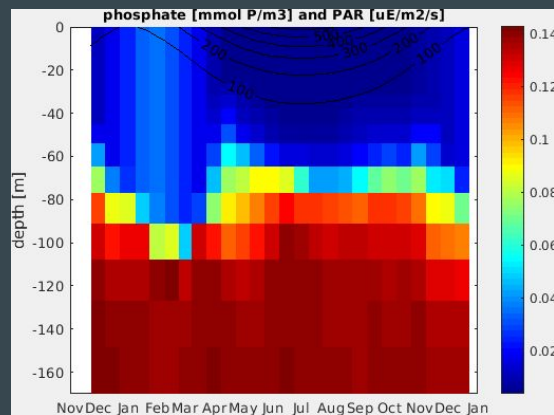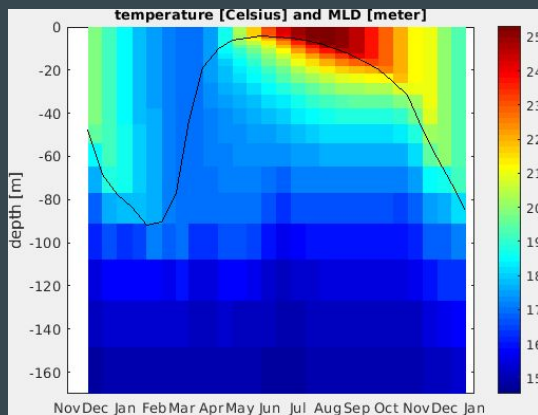Linking subroutine transforms CROCO tracer arrays to BFM format

BFM is run in each ocean point as a batch system

CROCO tracer arrays are updated with BFM results

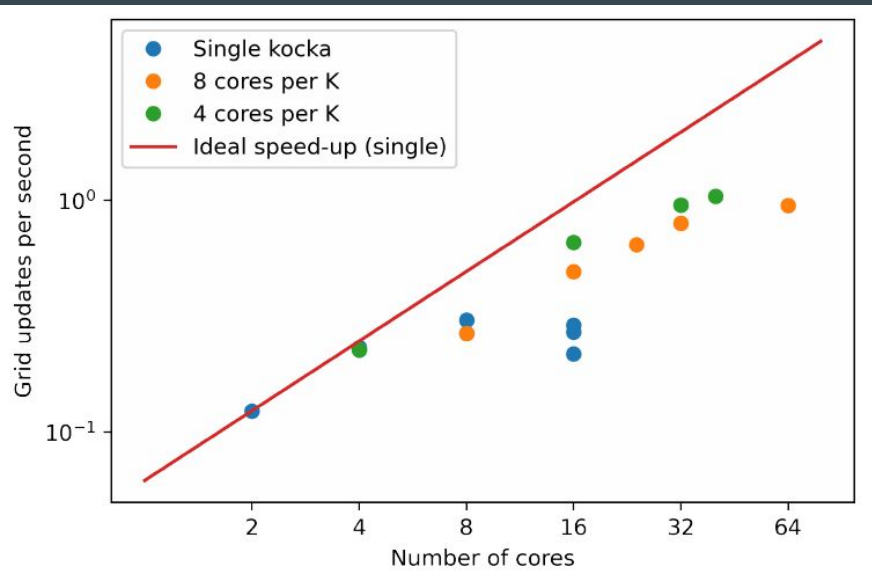CROCO's subroutines are used for data output

# Test basin

# Speed

"Kocka": node
2x Intel Xeon E5520, 4 Cores, 2.27GHz
RAM: 11 GB

LONGTIMESTEP (Cossarini et al., 2017):
LSn = 8 ⇒ 4x speedup of CROCO-BFM
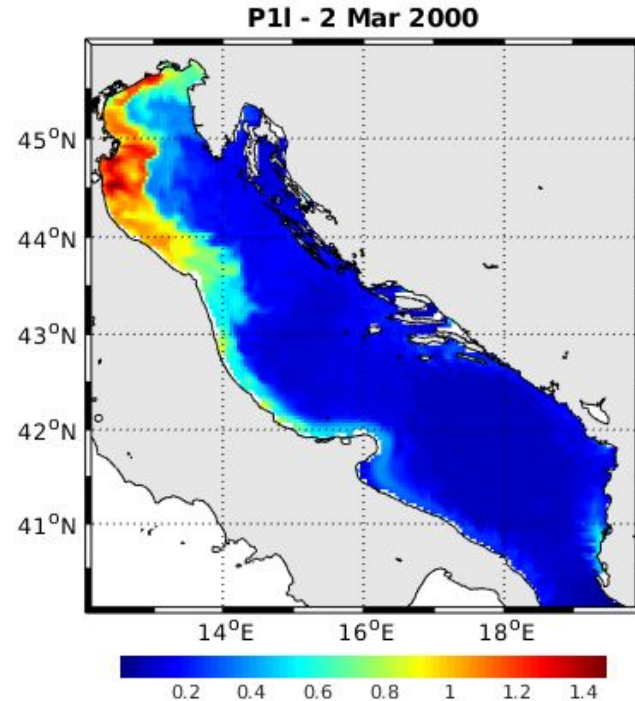
# Adriatic Sea - first run

$\Delta x = 4$ km, $\Delta t = 600$ s
39 rivers
Nutrients: Cossarini et al. (2017)
          Krachler et al. (2005)

Analytical initial and boundary c.
ERA5 atmos. forcing

Longtimestep: LSn = 8
20h/year on 64 cores
3.5h/year CROCO only



P1l - 2 Mar 2000

# To Do

- Much more testing
- Realistic simulations
- Clean up the code
- Make the code publicly available

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