

# NEMO-ERSEM

Progress and plans in assessing N  
flows/impacts in base year and for  
scenarios

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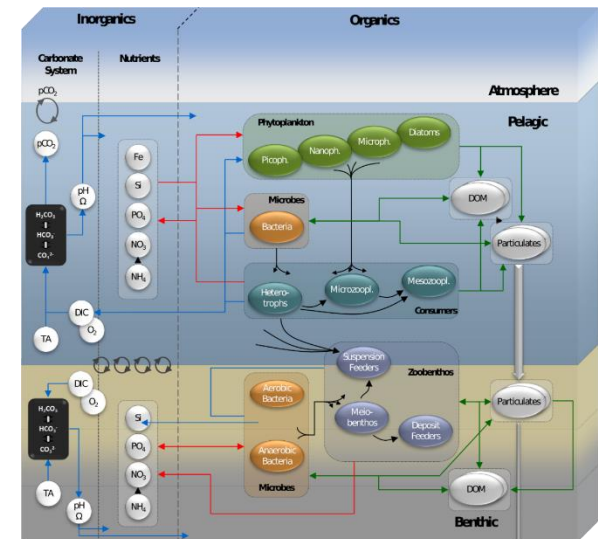
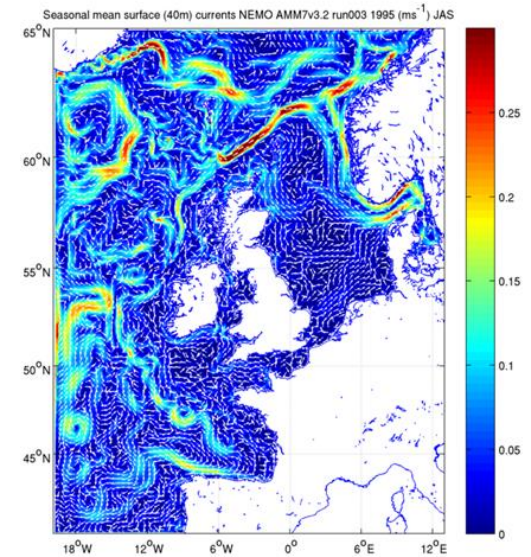


Input from: Sarah Wakelin, Yuri  
Artioli + Shelf Seas  
Biogeochemistry and NEMO teams

- NEMO
  - Global and regional ocean circulation model

Provides ocean physics to:

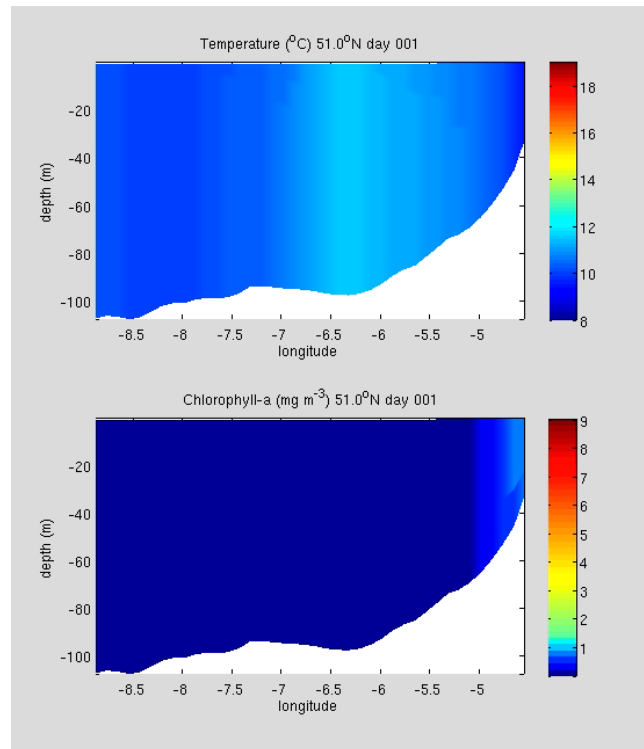
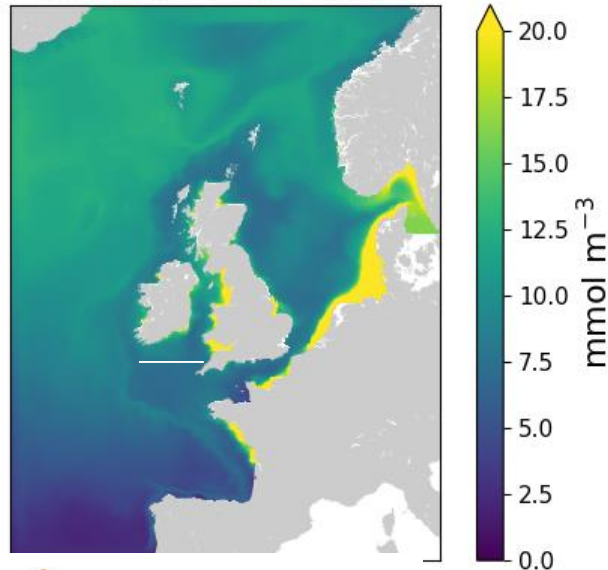
- ERSEM (Earth and Regional Seas Ecosystem Model)
  - Lower to mid trophic levels marine food-webs and their biogeochemistry.
  - Multiple elements: C, N, P, Si, (Fe).
  - Able to define relatively complex ecosystems in both pelagic and benthic environments.
  - Complex N cycle, including  $N_2O$



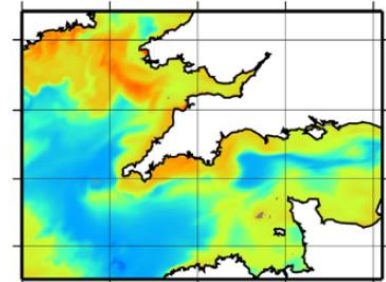
# NEMO-ERSEM

High resolution temporal (daily – monthly) and spatial information (1.5-10km) on state variables and fluxes

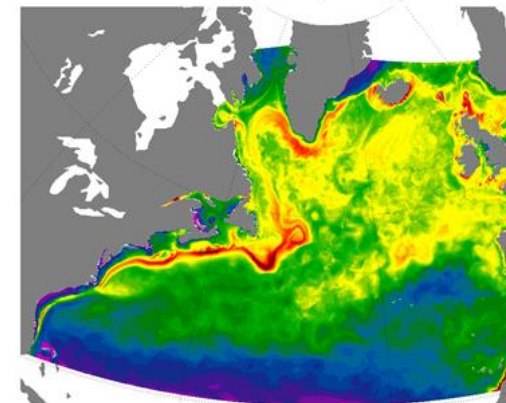
surface winter DIN  
average 1996-2015



15/04/2014 CS 1.5km



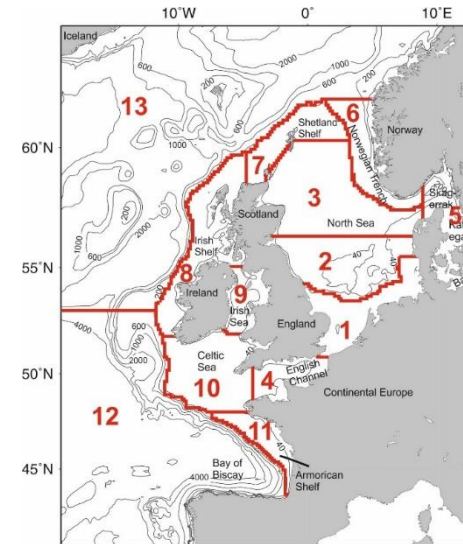
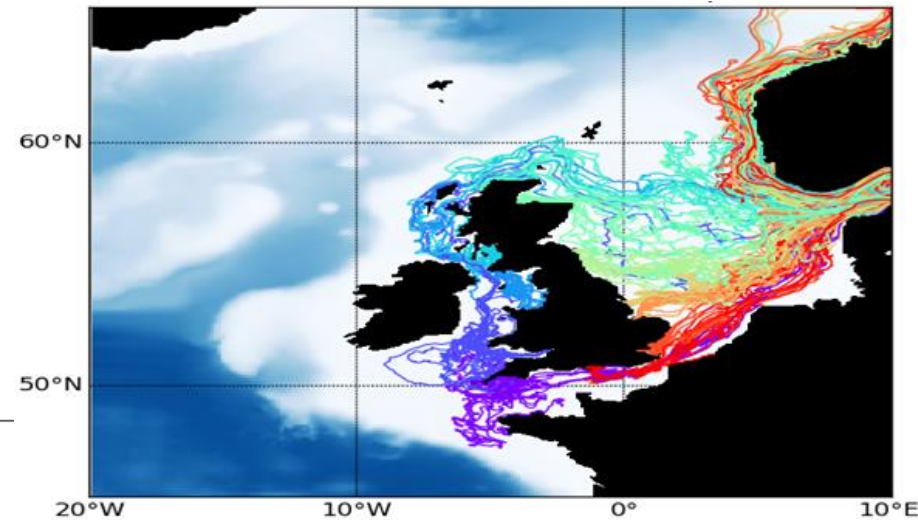
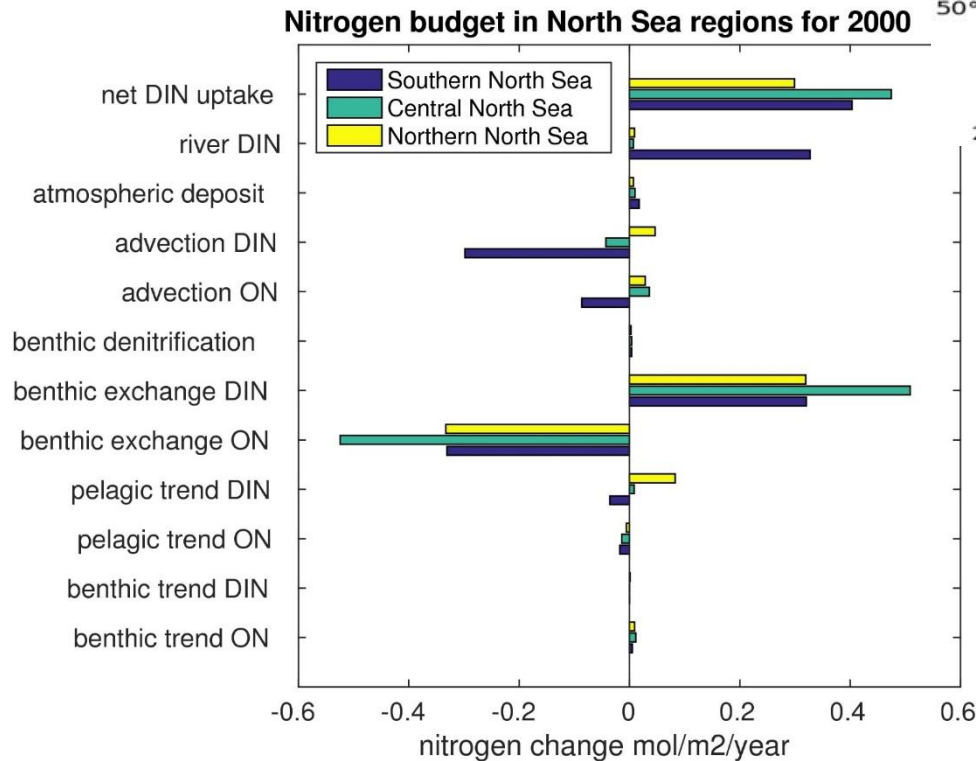
Net PP 1993  $\text{gC/m}^2/\text{y}$  - NNA\_R12



## Model Output

# NEMO-ERSEM

## North Sea N Budget



## Model Output

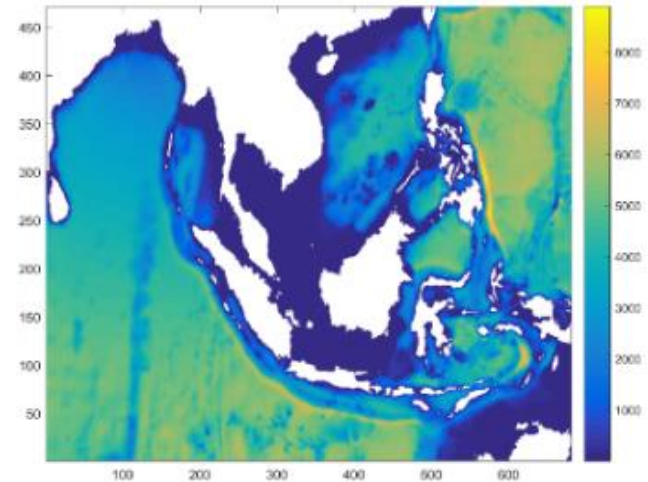
Joint A1.5 & A2.1 meeting  
Wageningen, June 2017

## Current NEMO-ERSEM domains

- existing and under development

### ERSEM

- **European Shelf (7km, 1.5km)**
- North Atlantic (9km)
- **SE Asia (9km)**
- Black Sea
- Global 1°
- N impacts on netPP, O<sub>2</sub>, HABs, ecosystem structure, and HTL production
- Shelf-ocean transport/impact at basin scale.
- Consequences for fisheries, aquaculture, tourism, biodiversity, carbon sequestration



New SE Asia NEMO-ERSEM model

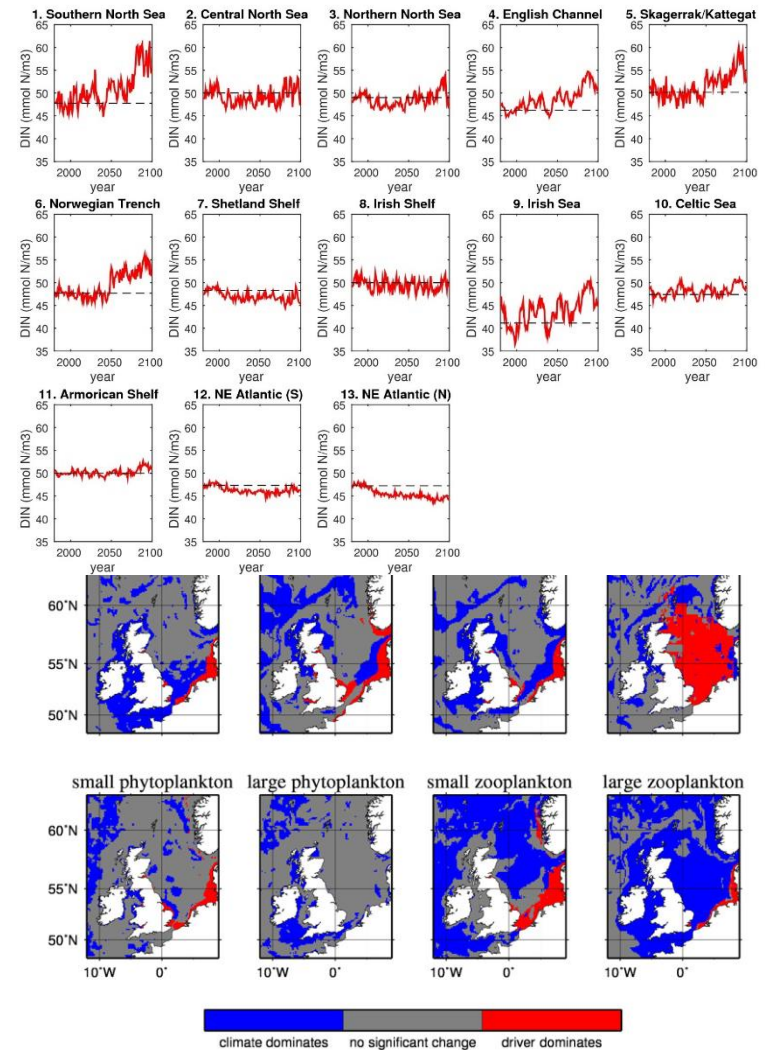


Plans assessing N  
flows/impacts base year

Joint A1.5 & A2.1 meeting  
Wageningen, June 2017



- Future climate simulations
  - CMIP5 and CMIP6 in forced mode
- Nutrient management scenarios
- Combined management and climate scenarios
  - E.g. surface ocean N climatic decreases v's anthropogenic N increases



Plans scenario studies  
on assessing N flows

Joint A1.5 & A2.1 meeting  
Wageningen, June 2017



- MEDUSA (Model of Ecosystem Dynamics, nutrient Utilisation, Sequestration and Acidification)
  - Intermediate complexity biogeochemistry model
  - Designed to enable centennial scale and high resolution global biogeochemical simulations
  - Marine Ecosystem component of UKESM, UK's contribution to CMIP6
  - No River nutrient input yet, but these are planned
  - Coupled to 1°, 1/4° and 1/12° global NEMMO

