

NEMO Long Term developments

INGV

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In the process of defining the strategic long term evolution of NEMO, three main issues have been identified: Strategic, Scientific and Software Infrastructure.

The Strategic issues have the main objective to improve and strengthen the benefit deriving from the community modelling strategy. This process involves a more detailed definition of the "consortia" approach and shared consortium goals together with a specific effort to address the external users request and potential feedback.

The Scientific issues concern the representation of missing ocean processes and environmental dynamics directly influencing the ocean. In addition a dedicated effort should be focused on the definition of added value on-line diagnostic.

The "Software Infrastructure" issue is mostly related to the interconnection between the NEMO package and the hardware.

In the following list details are provided for each of the above mentioned issues.

Strategic issue

1) Definition of community model

Several individuals interact to develop the numerical modelling tools around a common purpose. In general, a community model should grow organically from the needs of the members and will gradually take shape over time as the community grows.

2) Community configuration

Are the present NEMO configurations adequate for the consortium members? Shall NEMO provide community configurations in addition the reference configurations? All the consortium members are expert in specific areas of the world ocean. Up to now only the ORCA can be considered as a community configuration since it is used by a wide community. All the other configurations are only for testing purposes.

3) Coupling with other models

There is often the need to couple NEMO with other existing models. The coupling interface should be generalized.

4) Training strategy

Dedicate effort in the Training, in order to increase as much as possible to number of NEMO users (and NEMO community configuration users).

5) Publication strategy

Define and support a publication strategy. There is already ongoing work in this direction.

Scientific issues

1) Wave-current interaction.

Support the NEMO-Wave Working Group. Contribute actively to the ongoing scientific discussion on the coupling between wave and primitive equation models, defining a NEMO strategy. Define, if necessary, an additional NEMO component for the wave (i.e. OPA, LIM, TOP, WAVE). Implement the wave-modified primitive equations from the wave-current interaction both for the momentum flux, the vertical mixing and the surface velocities.

2) Hydrological cycle.

The land and ocean coupled hydrological cycle and its representation in the NEMO software package is worth to be investigated. Despite the large variability in the horizontal and temporal scales addressed with NEMO simulations, the land-ocean hydrological cycle is a fundamental process strongly impacting the simulated environment. Depending on the temporal and spatial resolution used it will be necessary to move the boundary between what is parameterized and what is explicitly resolved. Also in this case a new NEMO component could be developed.

3) Mixed layer dynamics considering both Air-Sea Fluxes and mixing parameterizations

One of the major source of errors in present ocean models derives from the representation of air-sea fluxes and their impact on the vertical mixing. Several approaches are currently proposed none of them being general enough. Coherence in the way air-sea exchange and vertical mixing is parameterized should be analyzed.

4) Diagnostics

Model diagnostics is a crucial issue in order to better understand and study the physical processes simulated but also understand the model characteristics that affect different processes. Energy and Vorticity Analysis (EVA) and Multi-Scale EVA (MS-EVA) should be implemented. This tool will allow to immediately understand numerical consistency in the model implementation, define the implementation and developing strategy for a specific configuration and provide the bases for dynamical studies.

Software infrastructure

1) Performance in multi-processors machine should be improved