Progress on NEMO Development Strategy on Ocean Dynamics

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Progress against strategy

Reminder on NDS chapter on ocean dynamics

Focus : *Assessing and improving the representation of the physical processes that affect ocean circulation at resolved scales (in NEMO target applications) .*

Listed priorities

- *Parameterised processes :*
  - mixing in the ocean interior and BBL (inc. overflows)
  - closures for balanced turbulence (meso/submeso, moment./tracers)
- *Resolved processes :*
  - balanced turbulence (+ inc. its interaction with topography)
  - fast barotropic motions (inc. tides) (propagation, dissipation)
  - internal waves and internal tides (propagation, dissipation)
  - more generally, assessing fast (<1d) processes down to km scale

(OSBL processes are discussed in NEMO Air-Sea Interactions WG)

Progress against strategy

Reminder on NDS chapter on ocean dynamics

Specific actions proposed in NDS

a. setting-up working groups for **assessing the representation of specific physical processes** and for proposing improvements

b. using idealised test cases for **documenting the impact of new developments to NEMO** on (resolved) physical processes

c. consolidating **NEMO online diagnostics** as a tool for developing physically consistent closures

d. improve the **liaison with NEMO users community** in order to expand the community of process-oriented NEMO users (demonstration cases, project endorsement, dev. outside ST)

Working groups

assessing the representation of specific physical processes and proposing improvements

- The chapter's **scope is very large**, so that setting-up a single WG for all the physical processes is difficult
- Developing new parameterisations is generally more a topic for **scientific collaborations** than open "panel" discussions
- In mid 2019, we have decided to focus in priority on
  - **eddy closures** for 1°-1/4° global ocean models
  - **tides and fast barotropic motions** in regional and global models
- A group on **tides led by F. Dupont** has been set-up, clarifying that there is no "big" issue with tides in NEMO, this group will carry on its activities in 2021
- But slower progress on setting-up a **group on eddy closures.** Still looking for a co-chair for this group.

Idealized test cases

monitor the impact of new developments to NEMO on resolved physical processes

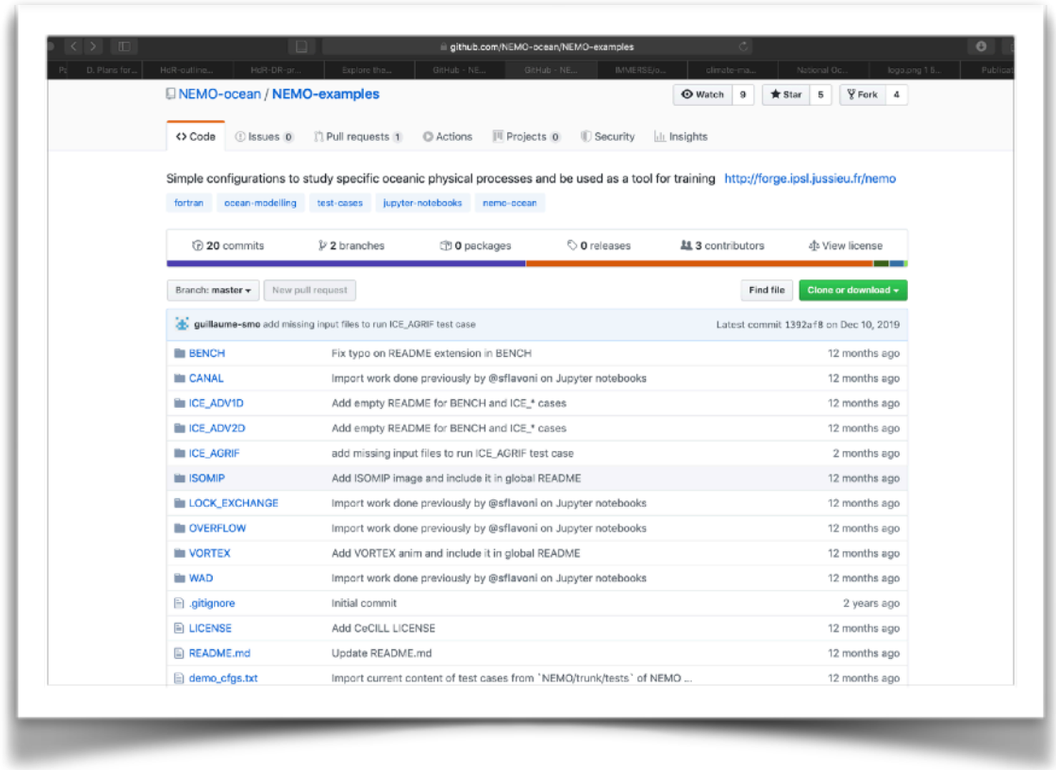
- A Github repos for **collecting and documenting test cases** has been established in 2018; now includes 11 test cases.
- Many dev. actions of 2020 WP are associated with dedicated test cases for **illustrating their impact** on model solutions
- The approach to **collection/distribution** of NEMO test cases should probably be clarified (duplication, responsibilities)
- Test-cases have probably not been developed enough from a process validation perspective (in **liaison with subgroups**)
- But overall, **good progress** (see for instance the overflow test case on the next slide)

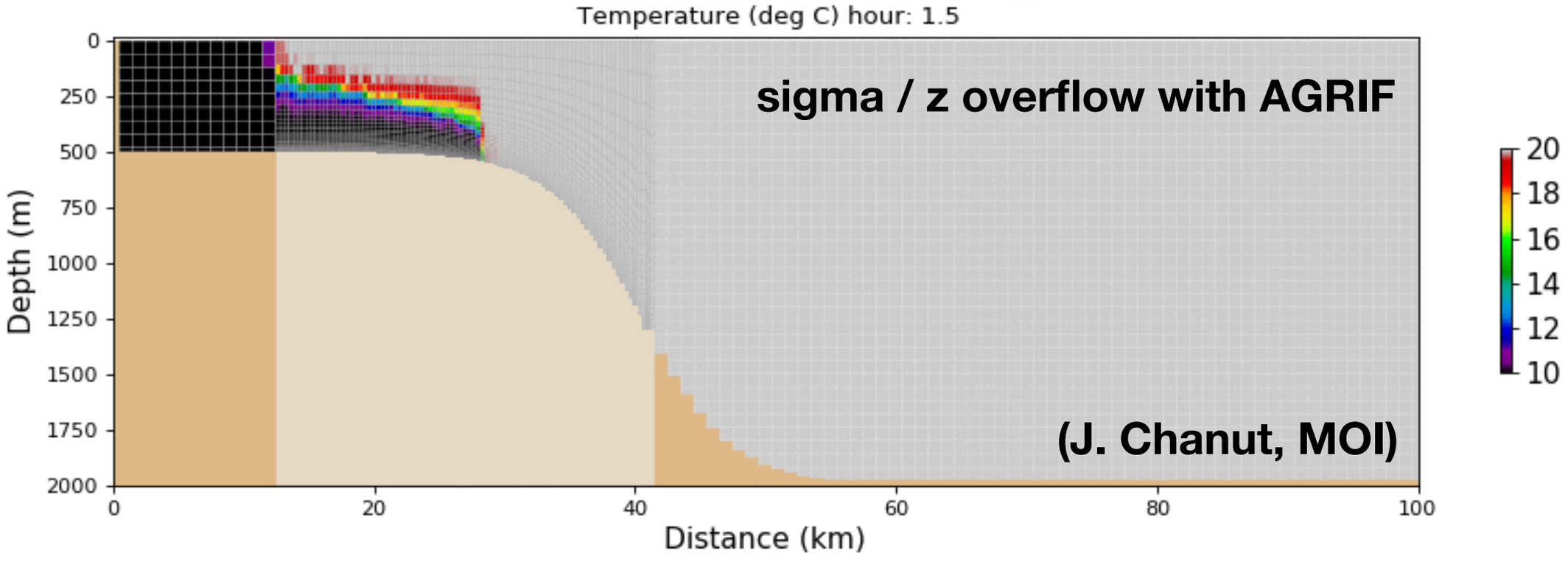
Progress against strategy

Idealized test cases

Ambition :

- each NEMO dev. comes with a test-case
- gathered in a dedicated GitHub repo
- to be used for teaching and outreach
- also used for continuous integration
- test-cases are turned into boolean tests





Progress against strategy

On-line diagnostics

- No progress against the strategy

Liaison with process oriented users

broaden the community of process-oriented NEMO users (demonstration cases, project endorsement, dev. outside ST)

- implementing **idealised experiments with NEMO** is now objectively easier than in 2017
- IMMERSE will deliver in 2022 **outreach material** for show-casing how NEMO can be used for process oriented studies
- good articulation established with D. Marshall on **GEOMETRIC**
- but still no clear "**endorsement**" mechanism for NEMO
- no real contribution to NEMO dev from **outside NEMO ST**.

Summary of successes and issues

Successes

- good progress on implementing the strategy with respect to idealised test cases but we will need to monitor this carefully in the future
- the representation of km scale processes should (in principle) be assessed thoroughly through IMMERSE WP6
- A subgroup on tides and fast barotropic motions is up and running

Issues

- we don’t have a working group in charge of implementing the strategy on ocean dynamics
- slow progress in setting up subgroups so that :
  - it is not clear how existing test-cases actually cover the range of processes we want to represent with NEMO;
  - no real progress on online diagnostics
- identifying co-chairs and initiating subgroups takes time and JLS is probably too busy with other things…
- improving the liaison with process oriented users is a slow process. Not sure we are approaching this question adequately.