

**To: Gokhan Danabasoglu
CESM Ocean Model Working Group Co-Chair)**

Re: Request for information for the next ocean component of the CESM

15 June, 2016

Dear Gokhan,

As I prefaced in a brief email last month, a response to the question “is ROMS suitable as the ocean component of CESM” has to be qualified by acknowledging that ROMS development is not a tightly centralized, structured endeavor.

With regard to many of the high priority *technical* requirements for CESM3, the ROMS family would speak with one voice as to the significant strengths of the underlying computational kernel, vertical coordinates, regional applications, idealized configurations, and post-processing capabilities, but with regard to meeting other more *cultural* requirements in the RFI we are less coordinated.

That said, we at the “myroms.org” branch of the ROMS family have prepared the accompanying technical document outlining existing features and the development path that we ourselves are pursuing. We don’t attempt to speak on behalf of all ROMS co-developers. In terms of future development path we have little sway over their priorities.

Though this might give the appearance that ROMS development is *uncoordinated*, I prefer to think of it as *federated*. By this I mean that vigorous development activity proceeds somewhat independently in distinct silos, but we retain the ability to communicate between groups, share developments, and through intermittent code and algorithm exchange events we bring various branches of the ROMS family back into substantial alignment, before separate development resumes.

The fact that the ROMS developer community is so large, active, creative and competent is one of the great strengths of the project. I don’t think this level of collective activity and the speed at which major developments can be achieved would be possible if code maintenance and update practices were more *imperial* and less *federated*.

While I don’t speak for all ROMS developer branches, I can say that the myroms.org core group loosely coordinated by myself and Hernan Arango at Rutgers University, with Andrew Moore and his colleagues at UC Santa Cruz, is definitely prepared to work in collaboration with the CESM community on a ROMS-CESM effort. We keep abreast of developments by our ROMS brethren and endeavor to fold these in to our own branch when they complement our own priorities and we have available the resources to do so. Aside from myself, all other ROMS developers at Rutgers are entirely grant supported, so our priorities are necessarily driven by those obligations. We receive no core funding for ROMS algorithm development

independent of application projects, nor are we supported to port contributed developer code enhancements, maintain and distribute the source code, write documentation, or organize ROMS user workshops. Yet we have built a spirited user community around the myroms.org user portal (with thousands of registered users) and are committed to sustaining that effort as best we can within our funding and staffing constraints.

I can foresee that ROMS as part of CESM would likely spawn another major developer branch, but this would be a healthy expansion of the enterprise. I have no doubt the wider ROMS developer community is highly supportive of expanding the model's capabilities for use in long-term climate prediction. The many pre-existing ROMS application groups with a coastal ocean and adjacent shelf sea focus would revel in the opportunity to down-scale skillful ROMS coupled climate simulations to regional coastal scales where better understanding of the impacts of climate variability and change is imperative.

With that overview of the scope of what the myroms.org group can offer CESM at this time, I'll quickly address just a few key points in the Request for Information that I feel deserve mention yet are potentially not self evident, and/or might not have been touched upon explicitly in the attached technical document. I have placed my comments under two sub-headings extracted from the RFI.

(1) "The high-priority technical requirements for CESM3 identified through this process will ideally include:"

ROMS is very well advanced with respect to all these dot points, but I will add that with ONR support we (Arango and Moore) are actively updating the ESMF infrastructure of ROMS to enable generic coupling to other ESMF enabled components. To the extent that this enables compatibility with the CESM sea-ice model, then the code is well placed to meet this requirement. Similarly, we presume that the active development of a ROMS interface to DART (also led by Arango and Moore) represents a step toward interfacing with CESM coupled data assimilation systems.

Regarding post-processing, through our engagement with the IOOS Coastal Ocean Modeling Testbed (especially with Rich Signell at USGS) we have embraced the CF-conventions and Common Data Model in configuring ROMS metadata and output, and we are responsive to requests to add capabilities in these respects to expand inter-operability of ROMS with community analysis tools. Just this week we added the metadata to support prototype SGRID conventions for staggered grids, and pushed this to the user community with a code update and release notes for users to experiment.

(2) "[I]t is hoped that an ocean component of the CESM would satisfy most of the following criteria to some degree:"

As I indicated above, with resources to make the collaboration effective and viable the myroms.org group is certainly open to building a partnership with the CESM community. We would hope to build a broad collaboration that entrains other contributing ROMS developers and users globally.

One of the ROMS community's undoubted strengths is its embrace of state-of-the-science parameterizations of ocean physics. Boundary layer processes, vertical turbulence closure, wave-current interaction, ocean optics, physical-biological interaction, circulation-sediment interaction, and many more aspects of ocean dynamics have been incorporated tightly into the ROMS kernel by various developer groups, driven in large part by the emphasis on applications at the coast and/or at very high resolution. Over the coming decade, as coupled climate modeling moves to ever greater resolution and increasingly down-scales toward the coast, the comprehensive representation of ocean physics in ROMS will be an asset to CESM efforts.

Thank you for the opportunity to present these views from the myroms.org group.

Sincerely,

A handwritten signature in black ink, appearing to read "John Wilkin". The signature is fluid and cursive, with a long horizontal stroke at the end.

John Wilkin,

with Hernan Arango and Andrew Moore.