

Dear Annalisa, dear Cai,

Please find below our responses (in blue font) to the comments from CLIVAR SSG and USCLIVAR members.

We hope we have addressed the reviewer comments adequately and that the revised proposal has improved as a result.

Best regards,

Ingo Richter and Noel Keenlyside

### **Comments from CLIVAR SSG members:**

An overall strong proposal on a very important issue, which offers much potential; this is a well written proposal and addresses a topic that is in need of attention from the climate community. Large diverse team spanning across geographies/gender/expertise/panels.

Thank you for your encouragement.

Work plan is clear but could be considered too ambitious. They actually propose to have some kind of MIP project (?).

While the proposed RF focus is not the same as a model intercomparison project, coordinated GCM experiments are certainly an important part of it. We agree that the goals are ambitious but given that a number of groups have already pledged participation, and given that the RF members span a wide range of expertise, we are hopeful that we will be able to make substantial progress toward our goals.

This proposed RF is global in scope, aligned with CLIVAR goals for seasonal-to-interannual prediction and the role of ocean processes in climate variability; has a clear, detailed and achievable working plan and terms of reference, involving both models and data; includes some capacity building and a good geographical distribution of team members with reasonable gender ratio.

Thank you for your encouragement.

Very interesting but too much limited to the modeling point of view. May be a little bit early when most groups are still running the CMIP6 simulations and different MIPs didn't produce their major manuscript to ask for additional coordinated experiments. The plans are too much on modelling side and not well connected. Finally, with regard to existing activity in CMIP6: Is it really needed that all groups do the same sensitivity experiments? The objective related to observations is somewhat unclear.

We have expanded the working plan for the proxy component (C) to include observations and to point out linkages to the modeling component. We hope that this also clarifies the objectives of the observational analysis.

CMIP6 does not include seasonal predictions and does not target tropical basin interaction. We therefore believe that the proposed experiments do not overlap with CMIP6 activities. Furthermore, we will coordinate with major modeling centers to avoid any duplication of effort.

Having a consistent set of experiment specifications is highly desirable to ensure comparability of results. We recognize, however, that some flexibility regarding experimental protocol will be necessary.

Interesting but could be more compelling.

We cannot be sure which particular aspects the reviewer wished to see improved but hope that the strengthened linkage between the observational and modeling components has made the proposal more compelling.

TBI should look into the 3 regional initiatives that WCRP is planning and see where it can collaborate, for example could provide input to the Third Pole Initiative (where CORDEX and GEWEX are playing a leading role at this point); and can also (with the Monsoon Panel) contribute to ANDEX (**on this point**: several SSG members pointed out that ANDEX may be a better choice, while TPI is too outside the proposed TBI scope; considering the limited resources to core projects, this linkage should be made somewhere, because it may be the best chance to have WCRP buy-in).

It is clear that TBI should have a connection to monsoon and decadal variability. Also I wondered about the involvement of other CLIVAR panels and RF's. e.g. the Monsoons Panel, and Indian Ocean Panel. I note that ocean salinity is becoming increasingly a tool for thinking about and predicting rainfall over land (see papers by Ray Schmidt and/or Caroline Ummenhofer). So I am suggesting tuning TBI proposal, and cross checking Monsoon and Indian Ocean Panels.

Thank you for these suggestions. Collaboration and coordination with other panels and initiatives is certainly a very good idea. On the other hand, it is not clear at the moment, which form of interaction would be seen as most appropriate by CLIVAR (e.g. joint panel membership vs. attendance of panel meetings). Annalisa Bracco advised us to wait until this issue has been resolved with the Joint Scientific Committee (JSC) of WCRP. In the meantime we have contacted Germán Poveda and René Garreaud of the ANDEX panel to express our interest in collaboration and are awaiting their response.

We will interact with other CLIVAR panels such as the Atlantic Regional Panel (through joint membership of several TBI members), the Indian Ocean Regional Panel (which TBI member Roxy Koll is co-chair of), the Pacific Regional Panel (through member Andrew Wittenberg, who has expressed his interest in TBI), and the Indian Monsoon Panel (through TBI member Ingo Richter, who collaborates with panel member H. Annamalai via the JAMSTEC-IPRC Collaboration Research project).

### **Comments from USCLIVAR members:**

Tonny Lee (SSC Chair): I have a comment about the prospectus (more from a science perspective as opposed to a programmatic perspective from US CLIVAR SSC): The proposed effort has a strong modeling emphasis that aims to address pan-tropical atmospheric teleconnections. But pan-tropical interaction also involves Indo-pacific oceanic connection via the Indonesian throughflow (ITF). The prospectus didn't even mention this

despite the many recent publications about the importance of the ITF (e.g., associated with the “global warming hiatus”). Perhaps there is an implicit assumption that the climate models will have good representation of the ITF and its associated transport of heat and freshwater that modulate climate variability and potentially the pan-tropical atmospheric teleconnection, which is clearly not substantiated. One of my 2010 papers compared the ITF estimated from 14 ocean reanalysis products with ITF observations, showing most of them performed poorly, and there is large discrepancies among them (let alone climate models). How climate models represent the water cycle in the maritime continent region that influences the Indo-Pacific interaction is another missing element in the prospectus.

If the prospectus includes the Indo-Pacific oceanic connection and maritime continent ocean-atmosphere-land interaction as part of the pan-tropical interaction studies, ITF expertise is needed in the team. Janet Sprintall (US CLIVAR PSMIP, and International CLIVAR PRP until 2019) would be a good addition.

Thank you for pointing us to this particular oceanic pathway. We now mention both the Agulhas leakage and the ITF as targets of the RF activities.

Aneesh Subramanian: I was wondering if the scope of this activity could be extended to subseasonal to seasonal prediction as well or does CLIVAR prefer to keep it to seasonal to decadal? Also, I would be keen on participating in the activities of this RF as I have keen interest in interactions between the Tropical Pacific and Tropical Indian Oceans. I haven't done work in the Tropical Atlantic but would be interested in learning more about it. Please let me know if there is an opportunity to engage with them in any way.

We welcome your participation!

The revised proposal now includes a subseasonal component though we should keep the focus on interannual to decadal to avoid spreading ourselves too thin.

Suggestions for other potential US members:

Andrew Wittenberg (NOAA/GFDL), CLIVAR Pacific panel member until 2021, whose climate modeling expertise complements McPhaden's observational expertise; an extremely responsible panel/committee member. But the currently proposed member list already has a few modelers so they will probably push back on it.

Greg Foltz (NOAA/AOML), tropical Atlantic expertise (observational), complement the expertise of Ping Chang. But they may think McPhaden's expertise is already sufficient.

We agree that Andrew Wittenberg would have been a valuable additional member since this would have provided a direct link to one of the major US modeling centers. We contacted him but, unfortunately, he is already overcommitted with other projects. He expressed a keen interest in RF TBI though and offered to interact through the CLIVAR Pacific Regional Panel. Regarding tropical Atlantic expertise, we believe that the current list of members is sufficient to cover both observational and modeling aspects (Chang, Keenlyside, McPhaden, Okumura, Richter, Tokinaga and others).

### **Inline comments in proposal document**

It would be good to list references for this. TBI does physically influence ENSO as shown in many studies listed above, yet translating that to mitigating the spring predictability barrier is not obvious.

We have included several references on this.

Could we list some of the work done on AMOC and ENSO variability?

e.g. Alyssa R. Atwood, David S. Battisti and Cecilia Bitz on how AMOC relates to ENSO in paleo records and CESM modeling studies?

Also, is the focus of this CLIVAR RF purely on ENSO or would MJO and tropical waves also fall under this TBI topic?

The influence of the AMOC on ENSO includes substantial extratropical contributions and occurs on multi-decadal time scales, neither of which are the focus of TBI. That said, we certainly do have an interest how mean state changes (such as those associated with the AMOC) modulate TBI. This is now explicitly mentioned in the revised proposal and linked to the analysis of proxy records.

To the extent that it helps elucidating the mechanisms of seasonal to multi-annual basin interaction, we believe that subsesaonal variability is a topic of interest to this RF. We have included this component in the revised proposal. As for subseasonal basin interaction as a topic in its own right, the relatively slow response of the ocean to atmospheric forcing makes it difficult to envision how a genuine two-way interaction between basins could occur on these short time scales.

The S2S database could be listed here. Also, NMME SubX could be listed. [if focus is broadened to subseasonal timescales]

We have included [links to those databases](#).