

Eastern Boundary Upwelling Systems (EBUS) Research Focus

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RF overview

The EBUS RF began in October 2015 with a scoping workshop in Ankara, Turkey and the submission of an original EBUS RF prospectus in April of 2016. Progress continued, with a RF meeting in Qingdao in September 2016 and the outline of a collaboration with OMDP on exploring the upwelling dynamics in forced global ocean simulations. However, concern for the potential overlap with activities of other groups in the research community and changes to the leadership and membership of the group necessitated shifts in the focus of the efforts. A plan for revisions to the group to address these concerns was submitted to the SSG in November of 2017, and after encouragement from the SSG, the RF group membership was revised in April and May of 2018. The RF group submitted a revised prospectus in June of 2018. The planned ending date of the RF group is January 2020.

The activities of the group are on schedule. A first meeting of the reconfigured RF group took place December 9, 2018, prior to the annual assembly of the AGU in Washington, DC. The key agenda item for this meeting was the preparation of a syllabus and teaching schedule for a July 2019 summer school on EBUS that took place in Trieste, Italy. The school was a success, and the presence of many RF members was leveraged to hold a workshop in the two days following the school.

In addition to capacity building, the current goals of the RF group are two-fold: to develop research recommendations for synergistic activities between the modeling and observational communities, and to improve the quantification of potential impacts of climate change on the marine ecosystem and the potential consequences on their dependent societies.

We think it is important to point out that the reconfiguration of the RF, which includes many new members, has been inevitable associated with a spin-up time during which members initiated scientific dialogue and collaborative work with one another. The first even in which a large proportion of the group could meet in person was in fact the Summer School and workshop in Trieste. Both have proven very productive and work on an EBUS review paper which draws in the substantial and diverse expertise of the group members is in progress. In this sense the activity of the group has been very successful, but it must be also acknowledged that this still represents an early stage of the collective and coordinated scientific activity of the RF group.

Achievements for 2018-19

Workshops

The RF group held two workshops in the last year. The first workshop was held December 9, 2018 in Washington, DC, USA and focused primarily on the development of a syllabus and teaching schedule for our July 2019 summer school. An outline of a manuscript, reviews of the IPCC's Special Report on Oceans and Cryosphere (SROCC), and contributions to the OceanObs'19 conference were also discussed. The second workshop took place July 20-21,

2019 in Trieste, Italy following our summer school at ICTP. The focus of this school was a perspectives paper concerning the major research topics that require attention in order to resolve the responses of EBUS to climate change.

Results from workshops

Results from these workshops included review comments on the IPCC SROCC and a draft of a manuscript that we aim to complete submit before the end of the calendar year.

Scientific capacity building and career support

The major activity of the EBUS RF group in the last several months was planning and execution of the summer school held at ICTP. RF group members solicited support from ICTP, WCRP and IOC to support the attendance of early career scientists and students. Participants came from 19 different countries around the world.

Knowledge exchange

The RF group has been active in hosting sessions and endorsing workshop that advance the scientific understanding of EBUS. Specifically, the RF group members organized sessions at the PICES Annual Meeting in Yokohama (October 2018) and organized a workshop on Climate and Ecosystem Predictability in the North Pacific (along with the co-chairs of PICES-CLIVAR Working Group 40) in Qingdao (June 2019). Members of the EBUS RF group will be meeting with CLIVAR Pacific Panel members in October 2019 to further discuss the predictability of variability in upwelling in the Eastern Pacific.

Plans for 2020 and beyond

The key task in early 2020 is publication of the RF group's perspectives paper on EBUS research. This paper will in particular highlight important current research questions on the current knowledge on EBUS and on their future, on some of which group members have initiated active scientific collaboration.

Articles published in 2018/19 as part of RF activities (if any)

As part of the RF activities, members contributed to two broader papers on ocean observations associated with the OceanObs '19 conference:

Stammer et al. 2019. Ocean climate observing requirements in support of climate research and climate information. *Front. Mar. Sci.* 6:444, doi:10.3389/fmars.2019.00444.

Todd et al. 2019. Global perspectives on observing ocean boundary current systems. *Front. Mar. Sci.* 6:423, doi:10.3389/fmars.2019.00423.

Budget and other needs for 2020

Publication fees for a paper developed by the RF group estimated at **2,000 CHF**.

Additionally, we request **6,000 CHF** to support a group meeting in La Jolla, CA to respond to reviewers' comments and revise our manuscript and to discuss on how to continue collaborations with each other and with other groups as the RF concludes. See Annex A detailing this request.

Annex A

Proforma for CLIVAR Research Focus requests for SSG approval for meetings

1. **RF name:** Eastern Boundary Upwelling Systems (EBUS)
2. **Title of meeting or workshop:** Resolving the impact of climate changes on EBUS & 5th Session of CLIVAR Eastern Boundary Upwelling System
3. **Proposed venue:** Scripps Institution of Oceanography, La Jolla, CA
4. **Proposed dates:** Two days preceding or following the AGU/ASLO Ocean Sciences Meeting (so either 14-15 February or 22-23 February)
5. **Proposed attendees, including likely number:** EBUS RF members and potentially two guests (total number likely about 15)
6. **Rationale, motivation and justification, including: relevance to CLIVAR science & WCRP Grand Challenges, and any cross-panel/research foci links and interactions involved:**

The focus of the RF meeting will be composing a response to reviewers and editing our manuscript regarding impacts of large-scale climate anomalies on upwelling processes. This work is critical to CLIVAR's aim to understanding the drivers of regional climate phenomena that provide predictability on different time scales and to develop and evaluate climate simulations and predictive capabilities. The justification and relevance of this work to CLIVAR is described in more detail in the EBUS RF prospectus that was revised in 2017.

The improved understanding is also relevant to several of the WCRP Grand Challenges including Near-term Climate Prediction, Weather and Climate Extremes, and Carbon Feedbacks in the Climate System.

7. **Specific objectives and key agenda items:**

The key objective and agenda item will be revision of our manuscript that highlights the key research areas necessary to resolve the impact of climate change on EBUS.

Second, we will discuss plans to continue collaborations with each other and with other groups as the RF concludes.

8. **Anticipated outcomes (deliverables):** We hope to have a revised manuscript that will have undergone one round of reviews already.
9. **Format:** Group discussions and writing.
10. **Science Organizing Committee (if relevant):** Alban Lazar, Thomas Toniazzo, and Ryan Rykaczewski
11. **Local Organizing Committee (if relevant):** Art Miller and Uwe Send
12. **Proposed funding sources and anticipated funding requested from WCRP:** Partial support for use of the venue will come from the Scripps Institution of Oceanography. We request **6,000 CHF** from WCRP to partially support the participation of RF members.