

Atmosphere-Ocean Coupling at (Sub)Mesoscales

25 - 29 September 2023 Lorentz Center@Oort

Description and aims

Our workshop brought together participants in the field of atmospheric and oceanographic sciences, air-sea interaction, Earth observation, and regional and climate modeling. The goal was **to identify emerging grand challenges in (sub)mesoscales air-sea coupling and outline strategies on how imperfect models and intermittent observations can be systematically combined to advance on these challenges.**

During the workshop, participants were given ample opportunity to get to know each other and the different communities and to engage in crash courses in the different disciplines. Participants contributed ideas about key scientific questions (which problems should we solve?) which we collectively (up)voted using the online tool Vevox and discussed during plenary sessions. A similar upvoting exercise was used to discuss which tools we need (and how to solve those?). Breakout sessions were used to write and design a white paper.

Tangible outcome

The workshop was extremely interesting and productive, thanks to the engagement of a very diverse (in field of expertise, career stage, country and gender) group of participants who were actively involved in the discussions and the writing. Discussing openly among the different people with different backgrounds, learning new physical processes, and converging to a common language was highly beneficial for many. During the week we produced i) A ranked list of key scientific questions and problems that we aim to address, which we used to define ii) Four key areas where research could start to focus on, and iii) A proposal for a new definition of scale to use in addressing coupled phenomena in the ocean and in the atmosphere, iv) A list of strategies in observational and modeling approaches that can tackle key research areas. A rough draft (40 pages) of a white paper was written during the workshop that outlined these different results. The white paper is currently edited and will be shared publicly by the end of 2023, and condensed into a shorter paper that we aim to submit to AGU Advances in early 2024.

We also discussed follow-ups for future interactions, including hosting a monthly seminar series online, submitting a working group proposal at the US Climate Variability and Predictability program (CLIVAR) or the Global Energy and Water Exchanges (GEWEX) under the World Climate Research Programme (WCRP), or submitting a COST action (expected deadline Autumn 2024) to help support networking and establishing recurring activities in the shared communities.

Scientific breakthrough

There was no scientific breakthrough in terms of finding indisputable evidence or proof that submesoscale air-sea coupling matters for weather or climate (we could not identify a "smoking gun"). We did however realize that the absence of high-resolution coupled models and observations at the right scales has prevented us from finding such evidence until now. We defined a null hypothesis and a hierarchical approach to finding levels of coupling between the ocean and the atmosphere that would refute that hypothesis.

"Aha" moments

Many participants individually had "Aha" moments in learning about mechanisms that take place on the other side of the fluid interface, and the idea that resonance between the atmosphere and ocean at the right scales can be reinforcing instabilities in the coupled system. We also realized that perhaps we are already seeing evidence in observations, but due to a too coarse resolution of this data we are interpreting it wrongly as coupling at larger scales.

Organization/ Format

The format and setting with offices as well as shared discussion rooms was excellent. There was a very low-key atmosphere, easy travel options, and plenty of help from the LC with practical matters and financials.

Other comments

The boat tour on the Kager lakes was slightly disappointing given that it was already dark when we arrived there. The catered lunches were fantastic, and we would have chosen that option over the canteen lunch for the other days as well, if we had known that the food options at the canteen were often so limited. The cookies could be upgraded, or the LC could offer to cater additional cookies/snacks against additional pricing. The bike rentals were highly appreciated by international participants.

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