Ben-Gurion University of the Negev
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Stir and mix: studying upper ocean dynamics from theory to application

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Abstract:

Near the ocean surface, mixing and turbulence modulate the transfer of heat, momentum, carbon and other properties, between the atmosphere and the ocean interior. Accurate representation of these processes in General Circulation Models (GCMs) is crucial for simulating atmosphere-ocean interactions. However, all of these processes, generally known as boundary layer turbulence and submesoscale mixing, are on scales smaller than the grid used in GCMs, even at the highest possible resolution. Current submesoscale parameterizations represent the bulk of mixing developed across submesoscale fronts– the sharp interface between waters of different densities– but it has been shown to be too simplistic and unfitting in many circumstances. The presence of turbulence has been missing from these dynamics, and in this talk, I will discuss the long-lasting problem of how to correctly include them.

Building toward a more complete understanding of these processes, a theoretical approach of perturbation analysis is used to include the effects of turbulence as a correction to classic frontogenesis (frontal sharpening) theory. This approach is next extended into a more realistic environment, using a suite of high resolution, turbulence resolving, numerical simulations. It is found that a variety of turbulent processes resulting from winds, waves, convection, and instabilities affect the formation of fronts. Furthermore, this analysis exposes severe limitations in existing techniques to predict potential vorticity dynamics in highly turbulent regimes. Lastly, I will discuss challenges in modifying the submesoscale parameterization to represent the complex interactions with boundary layer turbulence.

Date & Location:

Monday, April 20, 2021, 16:00

https://us02web.zoom.us/j/86848072971?pwd=M1R0MXpzc3cxRGt0ZDJQR3FtS3hEUT09
Meeting ID: 868 4807 2971
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