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Southern Ocean dynamic, circulation, and role on climate

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The Southern Ocean regulates the global climate by controlling heat and carbon exchanges between the atmosphere and the ocean. Rates of climate change on decadal time scales ultimately depend on oceanic processes taking place in the Southern Ocean, yet too little is known about the underlying processes, and about its circulation. Limitations come both from the lack of observations in this extreme environment and its inherent sensitivity to intermittent small-scale processes that are not captured in current Earth system models. In this talk, I will present an overview of the important recent advances in our understanding of the Southern Ocean physics, ranging from (i) new understanding of small-scale transcient processes, such as ocean (sub)mescale or atmopsheric storms, impact on upper ocean ventilation and air-sea fluxes, to (ii) long term change in Southern Ocean structure, from the surface to the abysses, and via (iii) investigation of processes controling Maud Rise polynya events, decadal variability of heat and carbon storage, and large-scale atmospheric feedback.