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Southern Ocean Carbon and Heat Impact on Climate (SOCHIC): processes and long term change

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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. 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. We address some of these limitations in the European consortium Southern Ocean Carbon and Heat Impact on Climate (SO-CHIC). In this talk, I will present an overview of the important advances we made in the first two years of the consortium, ranging from (i) new understanding of small-scale transient processes, such as ocean (sub)mescale or atmospheric 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 controlling Maud Rise polynya events, decadal variability of heat and carbon storage, and large-scale atmospheric feedback.