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VOCALS/Southeast Pacific science: Sub-grid scale processes of the marine boundary layer cloud-aerosol system

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Climate simulations resolve cloud-aerosol interactions and their role for Earth's climate on spatial scales of 1-3^{o} (~ 100-300 km). With increasing computing power, the resolution of climate simulations will continue to increase. However, the processes that govern marine boundary layer clouds, an important element of the climate system, take place on spatial scales of 10s of meters. Before reaching this resolution, climate simulations will rely on sub-grid scale parameterizations of these processes, and on the insight from highly resolved, local simulations. We give an overview of the marine boundary layer processes that take place below the resolved scale of a climate model, using a new large eddy simulation model with detailed coupling between aerosol, cloud, chemical, and surface processes. The simulations reveal a rich network of interactions between marine boundary layer clouds, dynamics, ocean emissions, gas phase chemistry, and aerosol processes, which is currently not represented in climate simulations. The insights gained from these simulations can be used to improve representation of the marine boundary layer in climate models.