

## **Regimes of aerosol-cloud-precipitation interaction**

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Aerosols are essential to the formation and radiative properties of marine boundary layer liquid clouds. Clouds and precipitation are important for removing aerosol from the boundary layer, and also interact with atmospheric turbulence and convection. These feedbacks make it challenging to model and understand natural aerosol lifecycles over remote ocean regions and how they may be impacted by human activities. They also suggest thinking about low clouds and aerosols as a coupled system which might support preferred regimes. Indeed, some have argued that this system is 'buffered', such that anthropogenic aerosol sources cause an unexpectedly small increase in marine cloud albedo, while others have argued for 'bistability' in which a small aerosol increase can induce a large increase in cloud albedo.

These ideas will be investigated with observational examples and aerosol-coupled large-eddy simulations. Spontaneous formation of long-lived pockets of open cells in marine stratocumulus seems to be one naturally occurring manifestation of stable multiple equilibria. Other possible examples of regime-like behavior in trade cumulus and over the Southern Ocean will be noted. Implications for uncertainties in simulating aerosol-climate change interaction will be discussed.