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Aerosol radiative forcing of climate change: role of liquid and ice cloud adjustments

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Atmospheric aerosols exert a radiative forcing of climate change by interacting with radiation and clouds. These interactions trigger rapid adjustments in the atmosphere that often modify cloud properties further. Rapid adjustments explain a large fraction of total aerosol radiative forcing uncertainty. Indeed, current physical understanding of adjustment processes is not enough to rule out very strongly negative aerosol radiative forcing. In this talk, I will present recent work on understanding and quantifying aerosol rapid adjustments, with three examples based on different approaches. The first example looks at adjustments in stratocumulus decks in response to aerosol absorption, using Large Eddy simulation. The second example looks at adjustments in liquid cloud water content, using satellite observations. Finally, the third example looks at adjustments in ice water content of cirrus clouds in response to aviation aerosols.

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