Machine learning aerosol impacts on regional climate change.

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Here we develop a machine learning emulator based on the Norwegian Earth System Model (NorESM) to predict regional climate responses to aerosol emissions and use it to study the sensitivity of surface temperature to anthropogenic emission changes in key policy regions. Aerosol emissions have both an immediate local effect on air quality, and regional effects on climate in terms of changes to temperature and precipitation distributions via direct radiative impacts and indirect cloud-aerosol interactions. Regional climate change depends on a balance between aerosol and greenhouse gas forcing, and in particular extreme events are very sensitive to changes in aerosol emissions. Our goal is to provide a tool which can be used to test the impacts of policy-driven emission changes efficiently and accurately, while retaining the spatio-temporal complexity of the larger physics-based Earth System Model.