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Dust Observations for Models: Project Overview

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Climate and weather prediction hinge on numerical models. Most of the climate models included in the Coupled Model Intercomparison Project 5 (CMIP5) and which will underpin the Intergovernmental Panel for Climate Change 5th Assessment Report (IPCC AR5) include a dust module because dust is known to play an important role in the Earth system. However dust emission schemes in climate models are relatively simple and are tuned to represent observed background aerosol concentrations most of which are many thousands of kilometres from source regions. The physics of dust emission in the models was developed from idealised experiments such as those conducted in wind tunnels decades ago. Improvement of current model dust emission schemes has been difficult to achieve because of the paucity of observations from key dust sources. Dust Observations for Models (DO4Models) is a project designed to gather data from source regions at a scale appropriate to climate model grid box resolution. The UK NERC funded project, led by the University of Oxford, aims to: 1) Generate a data set at an appropriate scale for climate models which characterises surface erodibility and erosivity in dust source areas from remote sensing and fieldwork 2) Quantify how observed erodibility and erosivity influence observed emissions at the climate model scale 3) Test, develop and optimise the dust emission scheme for the Met Office regional model (HadGEM3-RA) using this unique dust source area data set 4) Quantify which component(s) of observed erodibility and erosivity, and at what spatial scale, make the largest improvement to physically-based, observationally optimised dust emission simulations in climate models. This paper provides a project overview and some early observational and modelling results from the 2011 field season.