

Anthropogenic aerosol forcing of Atlantic tropical storms

Nick DUNSTONE

The Met Office Hadley Centre, UK, nick.dunstone@metoffice.gov.uk

D. M. Smith, L. Hermanson, R. Eade, B. B. B. Booth

Presenter : Rosie Eade, The Met Office Hadley Centre, UK, rosie.eade@metoffice.gov.uk

The frequency of North Atlantic tropical storms (TS) varies markedly on decadal timescales, with profound socio-economic impacts. Understanding the causes and physical processes is critical for predicting future changes, which are currently highly uncertain. Climate models reproduce the observed variability when forced by observed sea surface temperatures, but the relative influences of natural variability and external forcing factors, including greenhouse gases, dust, sulphate and volcanic aerosols on sea surface temperatures and hence TS are highly uncertain. Standard climate model experiments do not enable the relative importance of different factors to be determined. Here we use a new experimental design, together with existing simulations, to show robust modelling evidence that anthropogenic aerosols suppressed TS frequency since 1860 and increased their frequency since 1980. One model with a comprehensive treatment of aerosol effects (HadGEM2ES) also reproduces the observed multi-decadal variability of TS frequency remarkably well through shifts in the Hadley circulation. These results raise the possibility that external factors, particularly anthropogenic aerosols, could be the dominant cause of TS variability on multi-decadal timescales, and highlights the potential importance of anthropogenic aerosol mitigation scenarios on TS frequency in the coming decades.