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C20C - Climate of the 20th Century: A multi-model effort to detect and attribute trends in weather risk

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Communication and understanding of the effects of climate change, potential redress of anthropogenically-induced damage, and forthcoming funding mechanisms and decisions for adaptation activities could all benefit from attribution statements of how anthropogenic emissions have altered the probabilities of various damaging weather events. Often there is demand for attribution statements, relatively soon after a particularly damaging instance of extreme weather, and therefore there is interest in exploring the extent to which such statements can be provided in real time or near-real time in a service-oriented framework. A number of recent studies have examined various methods and case studies. However, in such a new field there are a number of major scientific questions which remain largely unaddressed. This poster outlines a major international project with the aim of improving our understanding of these scientific issues. The ~30 participating modelling centres in C20C will run moderate (~50 member) initial condition ensembles of the 1960-present period with atmospheric models forced with observed sea surface temperatures, sea ice concentrations, land use change, and radiative forcings. Parallel ensembles will then be run under a scenario of the climate that might have been had anthropogenic activities never interfered with the climate, by reducing anthropogenic radiative forcings to pre-industrial levels and altering the observed sea surface conditions by the amount attributable to the historical anthropogenic forcing. Various realisations of this counterfactual scenario will sample uncertainty in the estimates of the attributable sea surface warming. Estimates of the degree to which anthropogenic emissions have altered the probabilities of various weather events can then be made through comparison of the frequencies of such events in the two scenarios. This project should provide a first solid understanding of the absolute and relative importance of atmospheric model reliability, atmospheric model design, natural variability in sea surface conditions, and attributable warming estimation to the quantification of attributable weather risk. It should also allow a characterisation of the relative contributions of the various thermodynamic and dynamic processes, and where appropriate impact response processes, to attributable risk for a variety of event types, thus adding further understanding of the robustness of the attribution statements.