

Current activities on decadal prediction

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Some current research activities involving the Hadley Centre's DePreSys decadal prediction system (based on the HadCM3 coupled model) were summarised. As part of the ENSEMBLES EU project, two sets of 9 member ensemble decadal hindcasts have been run, started from 1 May and 1 Nov in the years 1991-2001 (22 start dates). These were initialised from analyses of observed ocean temperature and salinity anomalies, and atmospheric temperature, wind and surface pressure anomalies, and included external forcing from projected changes in greenhouse gases, sulphate aerosols, volcanoes and the solar cycle. One set of hindcasts samples initial state uncertainties through lagged start dates, while the other samples uncertainties in atmospheric physical processes through multiple perturbations to a set of uncertain model parameters. These were chosen from a larger set of 17 such "perturbed physics" versions used in centennial climate change simulations, and were selected to sample a range of climate sensitivity values and a range of amplitudes of ENSO variability. For the November start dates, a parallel set of "NoAssim" perturbed physics hindcasts was carried out using the same forcing as the hindcasts, but with no initialisation from observations.

The DePreSys November hindcasts revealed positive skill in most regions for annual mean precipitation and mean sea level pressure one year ahead (average correlations of ~ 0.4), whereas the NoAssim hindcasts revealed no skill on average. In year two the average regional skill in DePreSys was still positive (~ 0.2) for both variables, with the highest values found in tropical and sub-tropical regions. The perturbed physics hindcasts showed greater spread than the perturbed initial condition hindcasts at all lead times, for regional annual means of regional surface temperature, precipitation and mean sea level pressure. The average regional skill of the ensemble mean hindcasts (measured by the mean square skill score) was similar for surface temperature, but better in the case of the perturbed physics ensemble for precipitation and mean sea level pressure. Further analysis is needed to confirm these preliminary results. By studying relationships between near-term hindcast error statistics and simulated climate changes on centennial time scales, it is hoped to investigate "seamless" prediction ideas using the perturbed physics experiments.

A number of current and planned EU projects were summarised, including the ENSEMBLES project in which an expanded set of seasonal, annual and decadal hindcasts is currently in production, covering start dates from 1960-2005. This set of experiments will be used to assess alternative methods for sampling model uncertainties, based on multi-model, stochastic physics and perturbed parameter approaches.