Geophysical Research Abstracts, Vol. 8, 08664, 2006
SRef-ID: 1607-7962/gra/EGU06-A-08664

Assessing the skill of seasonal forecast systems in predicting extreme seasons

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General circulation models (GCMs) are currently the most widely used tools to model weather and climate. Much attention has been paid in evaluating models' ability to predict mean conditions. However, it is extreme weather and climate events that have severe impacts on ecosystems and the human society. For this reason, this paper assesses the performance of three GCMs in predicting extreme temperature and precipitation events for the seasons March-May, June-August, September-November and December-January over a 15-year period 1991-2005. The operational GCMs whose skill is assessed are the European Centre for Medium Range Weather Forecasts (ECMWF) system 2, the NCEP Climate Forecast System (CFS) and the ECHAM 4.5.

The models' skill is expressed in terms of the relative operating characteristic (ROC) and the ranked probability skill score (RPSS). In general, much of the predictive skill for extreme surface (2m) temperatures is confined to the tropical oceans. Over the continents the models generally show low skill in predicting exceptionally warm and cold seasons. However, some areas of positive skill are found albeit confined to narrow regions and to certain seasons. Generally, seasonal predictability of extreme temperatures in the continents is higher during boreal spring than during the other seasons. The models appear to perform relatively poorer with regards to seasonal precipitation extremes.