

Realistic greenhouse gas forcing and short term climate forecasts

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The expected greenhouse gas (GHG) concentrations are a key issue in decadal to centennial climate predictions. For short term climate forecasts the persistence of initial conditions has been thought to dominate over the increasing concentration of GHG in the atmosphere. In particular varying GHG concentrations have not been considered to be relevant for seasonal forecasting.

Two sets of probabilistic seasonal forecast runs covering the period from 1958 till 2001 are the basis of this investigation. The forecasts of six months length consist of 9 members and start at the November 1st and May 1st respectively. The first set is equivalent to the currently operational seasonal forecasting system 2 at ECMWF: The GHG concentration is fixed to levels equivalent to 1990. For the second set, the GHG concentration mimics the observed trends over the four decades. Forecasts of near surface temperature are compared to each other and to quasi-observations, i.e. ERA-40 reanalysis data.

The more realistic GHG concentrations improve the seasonal forecast quality and partially surface temperature trends. The impact varies with season and region. Strongest effects are found in the tropics, but the seasonal forecast skills are also modified in some regions of the extra tropics. With increasing lead time, the impact gets stronger for most but not all regions. Consequences for seasonal forecasting but also for the understanding of climate change will be discussed.