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Arctic Budget Study of Inter-member Variability using HIRHAM5 Ensemble Simulations

Anja Sommerfeld (1), Oumarou Nikiema (2), Annette Rinke (1), Klaus Dethloff (1), and Rene Laprise (2)

(1) Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research, Potsdam, Germany (anja.sommerfeld@awi.de), (2) Universite du Quebec a Montreal, Montreal, Canada

One of the challenges in evaluating and applying atmospheric regional climate models (RCM) is the non-linear behaviour of atmospheric processes, which is still not well understood. These non-linearities determine the internal variability in the model. Therefore, an ensemble of RCM simulations with different initial atmospheric conditions has been run and a diabatic budget study for potential temperature (*Nikiema et al. 2010*) has been applied to investigate the origin of internally generated variability. Hence, the physical processes associated with diabatic and dynamical terms inducing the inter-member variability have been analysed.

The study is carried out for the Arctic applying an ensemble of 20 members, differing in their initial conditions only, simulated with the RCM HIRHAM5 during summer (July- September) 2012. This time period is of particular importance because of the melting sea ice and its influence on atmospheric circulation and the resulting effect on the inter-member variability. The model is driven by the Era-Interim data set and runs with a spatial resolution of 25 km.

The amplitude of the inter-member variability of the HIRHAM5 ensemble simulations fluctuates both temporally and spatially. The spatial distribution reveals two centres of high inter-member variability, over the Laptev Sea and over the Beaufort Sea/North America. The inter-member variability is generated/reduced by horizontal/vertical baroclinicity terms, which fluctuates in time like the inter-member variability.

The maximum inter-member variability is associated with the great Arctic cyclone event during the beginning of August 2012.