

## ***Interactive comment on “How unusual was autumn 2006 in Europe?” by G. J. van Oldenborgh***

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Dr. Sterl raises a valid point. Given the short record of observations to fit the model to, it is very hard to estimate changes in the coefficients from the observations. However, in climate models the differences have been studied. In [van Ulden and van Oldenborgh \(2005\)](#) this has been shown for the grid point corresponding to the Netherlands, albeit only for winter and late summer. In these seasons the coefficients do not change very much except when non-linear effects such as soil moisture depletion play a large role. This effect is not very strong in autumn.

I have computed the coefficients for autumn and all of Europe in the ESSENCE model ensemble. In [Fig. 1](#) the same coefficients as in the paper are shown for 1950–2006 and for 2050–2100, plus the differences between these periods (on a five times finer scale). As the temperature gradients in the climatology weaken, the response to geostrophic wind weakens somewhat. The effect is strongest in eastern Europe, but for the westerly component also shows up in the area under study. The memory term increases slightly

in central Europe, probably due to more soil moisture depletion. Scaling linearly with the world averaged temperature change, these changes should be a factor 5 smaller in 2006 compared to 1950.

For the analysis presented here over 1950-2006 the modeled changes in the coefficients of the VSM are small compared to the other terms. This leaves the question whether this is the aspect where the models deviate from reality, as they are unable to simulate the autumn temperatures observed in 2006. This would have to be due to the coefficient of the southerly component of the geostrophic wind. As the coefficients closely follow the meridional temperature gradient, the question is whether the meridional temperature gradient has changed. Fig. 13 of the [CPD article](#) shows that on average the meridional gradient has not changed much in the region of the strongest warming in 2006, so that it is unlikely that nonlinear effects have changed  $A_S$  has changed so much as to invalidate the linear VSM.

I will incorporate this in the revised version of the article.

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Interactive comment on Clim. Past Discuss., 3, 811, 2007.

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Discussion Paper