Supplementary material - Analysis of variability in divergence and turn-over induced by three idealized convective systems with a 3D cloud resolving model

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S1 Experiment overview

Table S1 gives an overview with definitions of all experiments performed in this study.

Table S1. List of experiments with their respective settings. Each experiment was done with each of the cases.

Name	Experiment collection	Definition
Control_reference	All experiment collections	$z_{top} = 6000.0$ m (case 1) $z_{top} = 2500.0$ m (case 2 & 3) 200x200x100 m grid $L_v = L_{v,ref}$ $adv(z) = w\frac{\partial \boldsymbol{v}_{hor}}{\partial z}$, $adv(z) = w\frac{\partial q_v}{\partial z}$
ENS_01	Ensemble member	$z_{top} = 6095.9565472$ m $z_{top} = 2539.98189467$ m
ENS_02	Ensemble member	5758.42068902 m // 2399.34195376 m
ENS_03	Ensemble member	5887.00610239 m // 2452.91920933 m
ENS_04	Ensemble member	6052.55517416 m // 2521.89798923 m
ENS_05	Ensemble member	5695.83407152 m // 2373.26419647 m
ENS_06	Ensemble member	5744.91637676 m // 2393.71515698 m
ENS_07	Ensemble member	5737.47939255 m // 2390.61641356 m
ENS_08	Ensemble member	5968.36439833 m // 2486.8184993 m
ENS_09	Ensemble member	6095.57941954 m // 2539.82475814 m
ref_res_500m	Resolution (coarse grid)	500x500x250 m grid
ref_res_1km	Resolution (coarse grid)	1000x1000x500 m grid
cubic_res_200m	Resolution (fine cubic grid)	200x200x200 m grid
cubic_res_100m	Resolution (fine cubic grid)	100x100x100 m grid
controlling_lve_0.6	Latent heat	$L_v = 0.6L_{v,ref}$
controlling_lve_0.8	Latent heat	$L_v = 0.8L_{v,ref}$
controlling_lve_0.9	Latent heat	$L_v = 0.9L_{v,ref}$
controlling_lve_1.1	Latent heat	$L_v = 1.1L_{v,ref}$
controlling_lve_1.2	Latent heat	$L_v = 1.2L_{v,ref}$
controlling_vadv_0.0	Vertical advection of hor. momentum	$adv(z) = 0\frac{\partial \boldsymbol{v}_{hor}}{\partial z}$
controlling_vadv_0.5	Vertical advection of hor. momentum	$adv(z) = 0.5w\frac{\partial \boldsymbol{v}_{hor}}{\partial z}$
controlling_vadv_0.8	Vertical advection of hor. momentum	$adv(z) = 0.8w\frac{\partial \boldsymbol{v}_{hor}}{\partial z}$
controlling_vadv_1.5	Vertical advection of hor. momentum	$adv(z) = 1.5w\frac{\partial \boldsymbol{v}_{hor}}{\partial z}$
controlling_qvadv_0.8	Vertical advection of water vapor	$adv(z) = 0.8w\frac{\partial q_v}{\partial z}$
controlling_qvadv_1.2	Vertical advection of water vapor	$adv(z) = 1.2w\frac{\partial q_v}{\partial z}$

S2 Decorrelation of ensemble members

In Figure S2 the decorrelation between ensemble pairs is shown per case (analogously to and based on Hohenegger and Schär (2007)). The calculation of a zonal velocity deviation field is given in Equation S2. Subsequently, members have been paired to calculate the correlation coefficient between their zonal velocity deviation fields. Because for some simulations initial conditions or final conditions (after 0 and 120 minutes) were not stored properly in the netCDF files, some member pairs of the 10 member ensemble have been omitted. Additionally, if an odd number of members could be used due to such an error, one member has been used in two pairs.

$$U_{deviation.x} = U_{reference} - U_{member.x} \tag{S2}$$

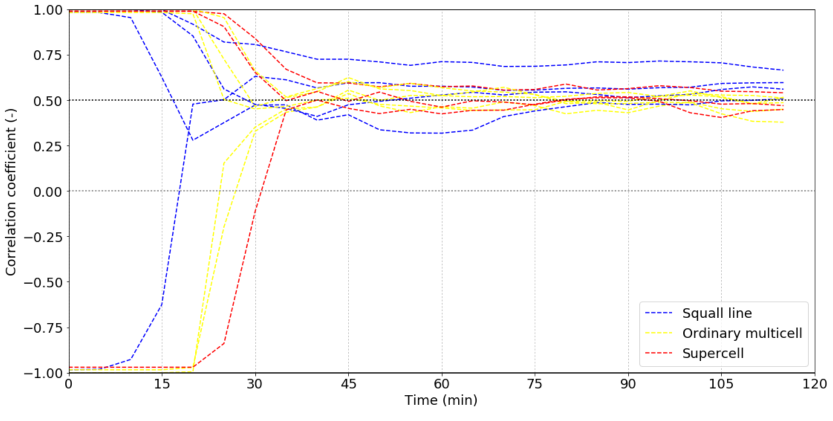

Figure S2. Correlations between zonal velocity deviation fields as function of time. Initially, the errors behave nearly linearly (0-10 minutes), starting from nearly ± 1. Then there is a transition stage (10-35 minutes). After the transition stage, all pairs of zonal velocity deviation fields but two (both from the squall line case) seem to behave randomly. After 70 minutes only one has not yet approached the random realization asymptote.

References

Hohenegger, C. and Schär, C.: Predictability and Error Growth Dynamics in Cloud-Resolving Models, Journal of the atmospheric sciences, 64, 4467–4478, 2007.