Sensitivity of simulated warm conveyor belt associated with an extratropical cyclone to model resolution and treatment of cloud processes - a NAWDEX case study

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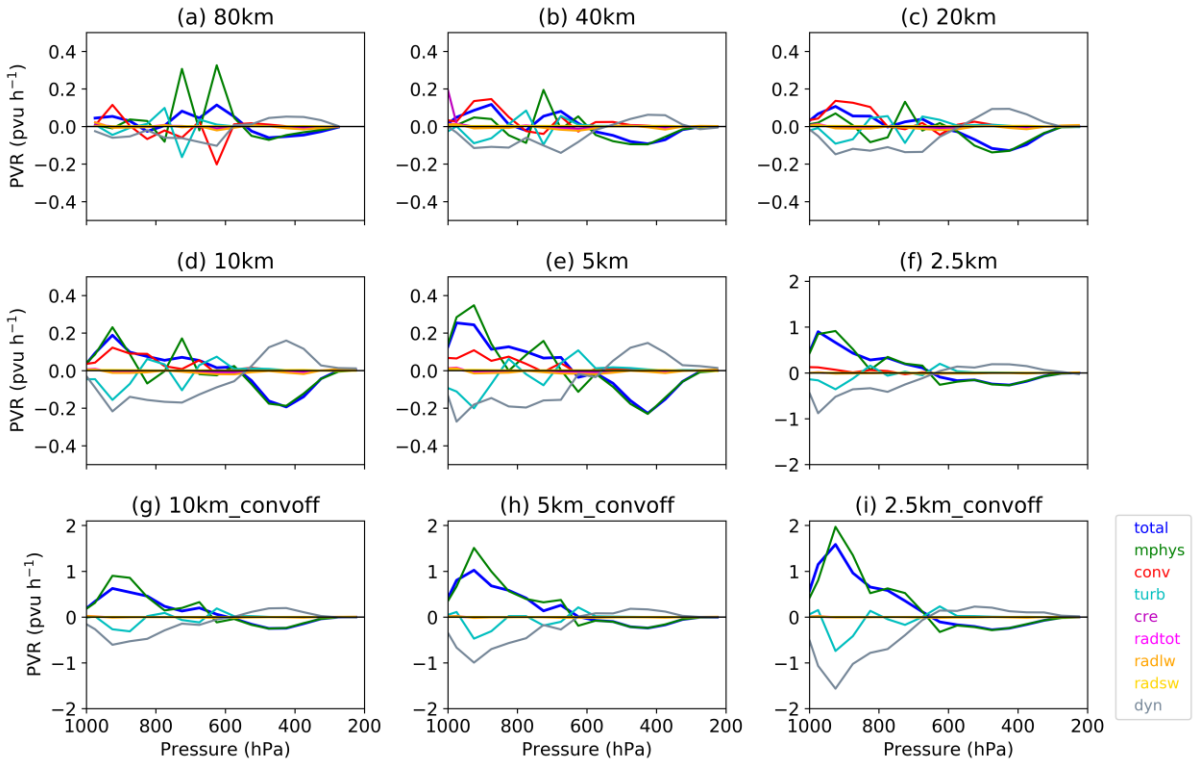

The figure shows, for a range of horizontal resolutions, ICON-NWP simulations of potential vorticity (PV) modification due to dynamics and different diabatic processes along a warm conveyor belt associated with a NAWDEX event - cyclone Vladiana in the North Atlantic (22-24 September 2016). The different processes that contribute to PV modification are cloud microphysics including saturation adjustment (mphys), convection (conv), turbulence (turb), cloud-radiative effect (cre), longwave radiation (radlw), shortwave radiation (radsw), their sum (radtot = radlw + radsw) and dynamics (dyn). 'convoff' indicates simulations with explicit convection. Please note that the scale of the y-axis changes after panel (e). The simulations shown here use 1-moment cloud microphysics; simulations with a 2-moment scheme are very similar.

Key findings:

- The PV modification in the warm-conveyor belt is mainly caused by diabatic heating from cloud microphysical processes.
- The contribution from cloud radiative effect is minor.
- In general, the diabatic heating and hence the diabatic PV modification increases with increasing resolution.