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Moisture transport to Antarctica by extra-tropical cyclones

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Moisture transport to Antarctica is a significant factor in determining the mass balance of the continental ice sheet, and consequently global sea levels. Synoptic-scale cyclones are well known to transport moisture towards Antarctica, but the large-scale conditions under which cyclones can transport significant amounts of moisture and what factors control the transport remain unclear. We simulate a case study of a cyclone that transported a large amount of moisture to Antarctica using OpenIFS, which is a state-of-the-art global numerical weather prediction model. OpenIFS is a version of the Integrated Forecast System (IFS) used at ECMWF for operational weather forecasting and has been available to academic and research institutions since early 2013. The following numerical experiments are conducted: a control experiment at T255 (80 km) horizontal resolution (the same as Era-Interim), a higher resolution experiment, and sensitivity experiments which investigate the effect of the sea surface temperatures on the cyclone development and the amount of moisture transport. We analyse the synoptic evolution of the cyclone and will present the dynamical reasons for the large meridional moisture transport. Zonal and meridional moisture fluxes, as well as the moisture budget of specific geographical areas, will also be presented to quantify the poleward moisture transport, identify physical processes responsible for the transport, and finally to determine the effect of the sea surface temperatures on the amount of moisture transport.