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Borneo Vortices: A case study and its relation to climatology

P. Braesicke (1), S. H. Ooi (2), and A. A. Samah (2)

(1) NCAS-University of Cambridge, Chemistry Department, Cambridge, United Kingdom (pb261@cam.ac.uk), (2) NARC, Institute of Postgraduate Studies, University of Malaya, 50603 Kuala Lumpur, Malaysia (azizans@um.edu.my)

Borneo vortices (BVs) develop over the South China Sea and are main drivers for the formation of deep convection and heavy rainfall in East Malaysia. We present a case study of a cold-surge-induced BV during January 2010 in which the export of potential energy lead to a strengthening of the subtropical jet. Potential vorticity (PV) and water vapour analyses confirm a significant impact of the BV on upper tropospheric composition. Dry, high PV air is found far below 100 hPa in the vicinty of the vortex. Using a PV threshold analysis of ERA-Interim data we construct a climatological composite of similar events and characterise the thermal, dynamical and composition structure of a 'typical' BV. We note the preferential formation of BVs during ENSO cold conditions and show that two effects contribute to the formation of the dry upper layer above a BV: Air is vertically transported upwards in the BV whilst precipitating and the large scale flow in which the BV is embedded advect dry, ozone rich air from the equatorial TTL over the BV. Thus the occurence frequency of BVs is important for the regional variability of upper tropospheric/lower stratospheric composition.