Supporting Information for "Counter-gradient momentum transport through subtropical shallow convection in ICON-LEM simulations"

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Additional Supporting Information (Files uploaded separately)

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Introduction A detailed information about six supporting figures and accompanying animation is provided below.

Text S1. To confirm if the tendency of zonal momentum flux is indeed smaller than all other terms we calculated temporal tendency over 15 min for 100 km, 50 km and 25 km domains. Fig.S1 shows that the tendency term is significantly smaller than H.Trans term

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in 100 km domain while it is comparable to budget terms in 50 km and 25 km domain. It is expected that the instantaneous tendencies will be even smaller than those calculated here with 15 min output.

Text S2 and S3. To check the sensivity of our results to placement of smaller domain within a bigger domain of 100 km we performed additional tests. We conducted analysis on 4 different 25 km domains placed near and far away from lateral boundaries (Fig.S2). We also did this analysis on 50 km domains (Fig.S3).

Text S4 and S5. We analyzed the association between the zonal momentum flux and cloud organization at two different altitudes (886 m Fig.S4 and 383 m Fig.S5).

Text S6. We reproduce Fig.1 from the main manuscript here but displace the legend to the bottom so that profiles above 2 km are seen. Though our focus in this manuscript is on the layers below 2 km in all figures.

Movie S7. This animation shows association between zonal momentum flux ($\overline{u'w'}$) and cloud organisation at 1.5 km altitude using 15 min frequency output on 12 and 13 December 2013. The color scheme and Contours are similar to Fig.8 in the main manuscript.

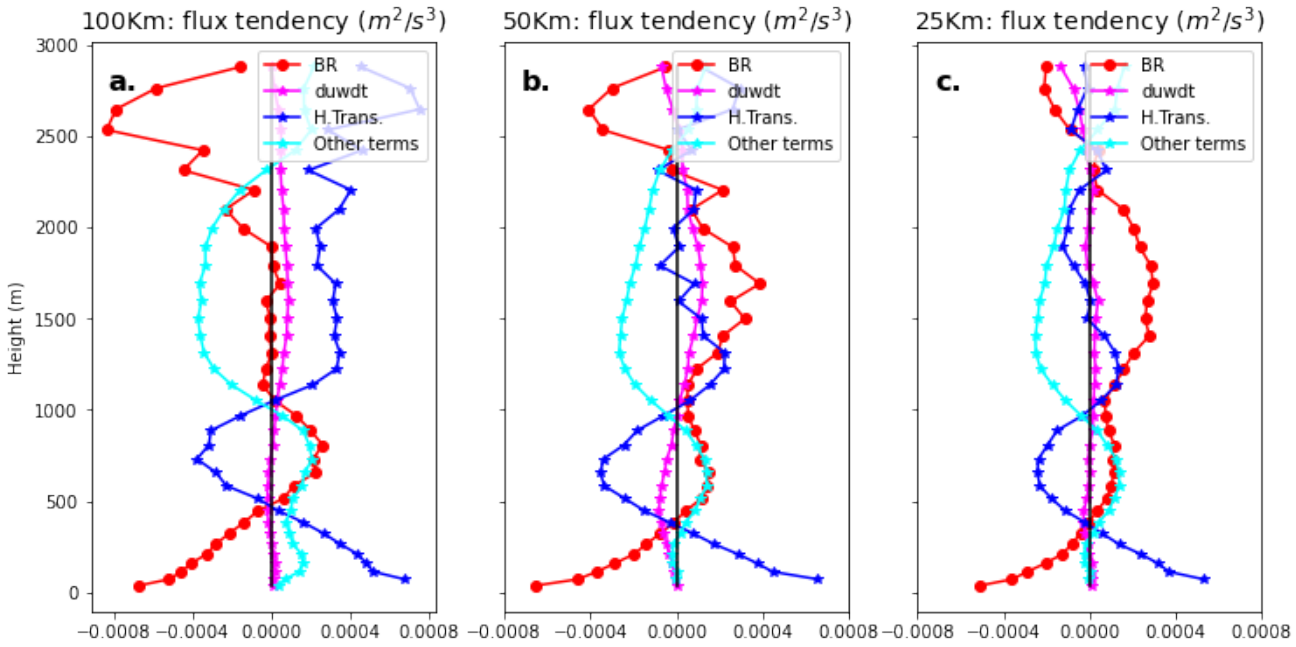

Figure S1. The domain dependence of zonal momentum flux budget terms (m^2s^{-3}) in Eq.1 and Eq.4 of the main manuscript: BR (red), H Trans (Blue), Temporal tendency (Magenta) and Other terms (Cyan) in 100 km (a), 50 Km (b) and 25 Km domain sampling.

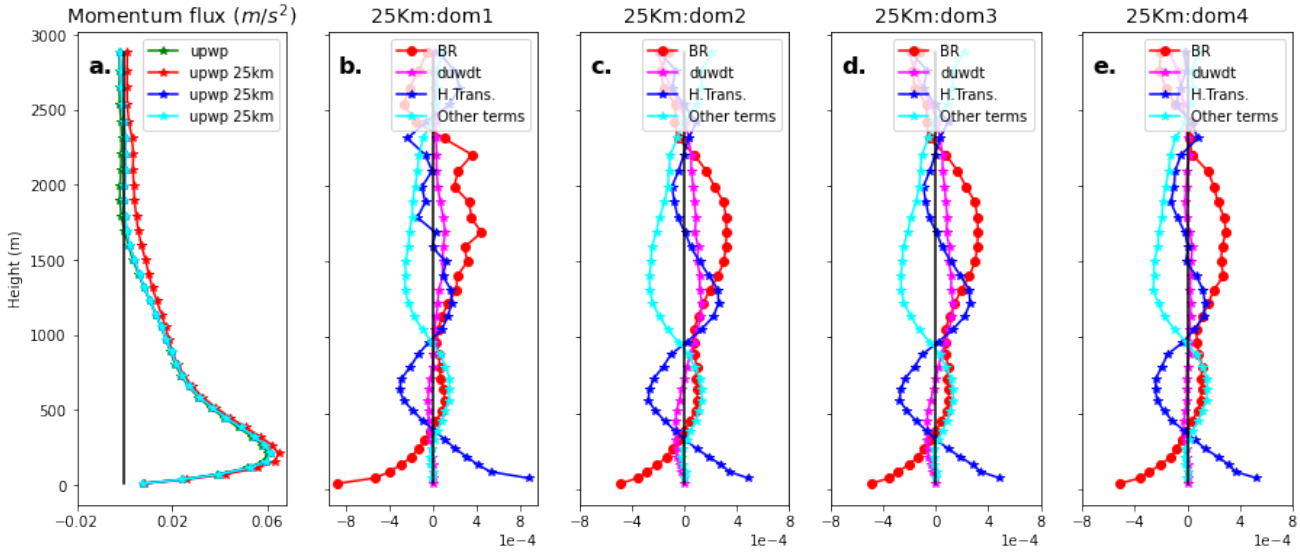

Figure S2. The dependence of zonal momentum flux budget terms (m^2s^{-3}) on the placement of domain within larger (100 km) domain. Results for 4 domains (b-e) and corresponding zonal momentum flux (a) (m^2s^{-2}) for 25 km domains

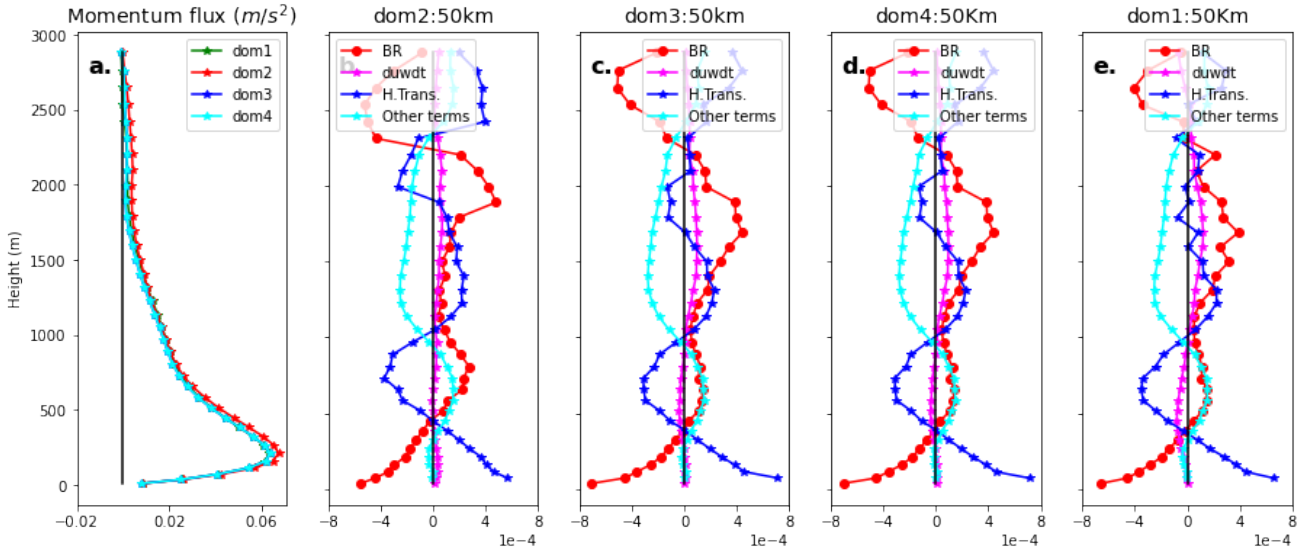

Figure S3. The dependence of zonal momentum flux budget terms (m^2s^{-3}) on the placement of domain within larger (100 km) domain. Results for 4 domains (b-e) and corresponding zonal momentum flux (a) (m^2s^{-2}) for 50 km domains

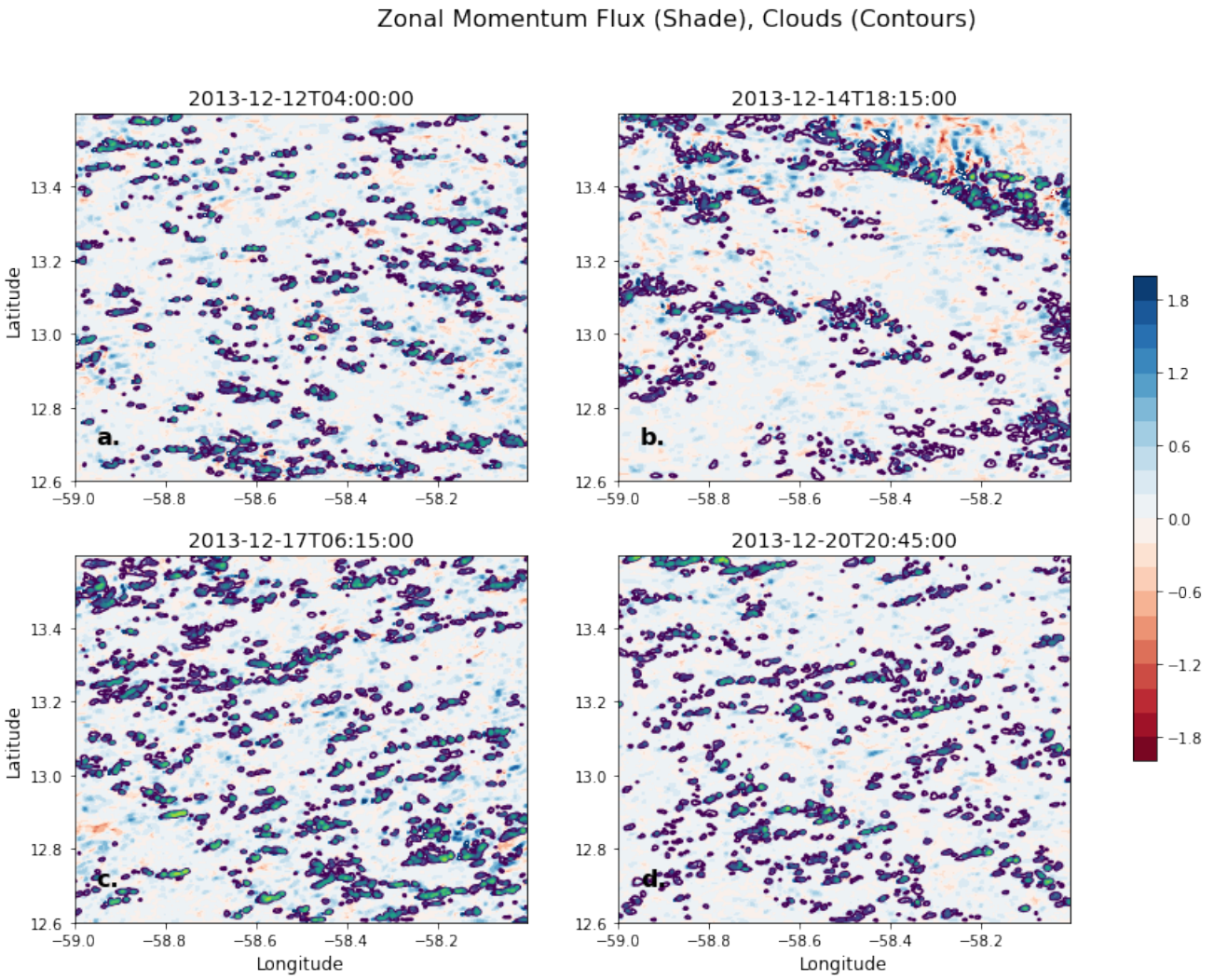

Figure S4. The maps of distribution of zonal momentum flux ($\overline{u'w'}$ m^2 s^{-2}, shaded) and cloud liquid water (Contours with interval 0.5 g Kg^{-1}) at four time stamps (similar to Fig.8 in the main manuscript) at 886 m altitude.

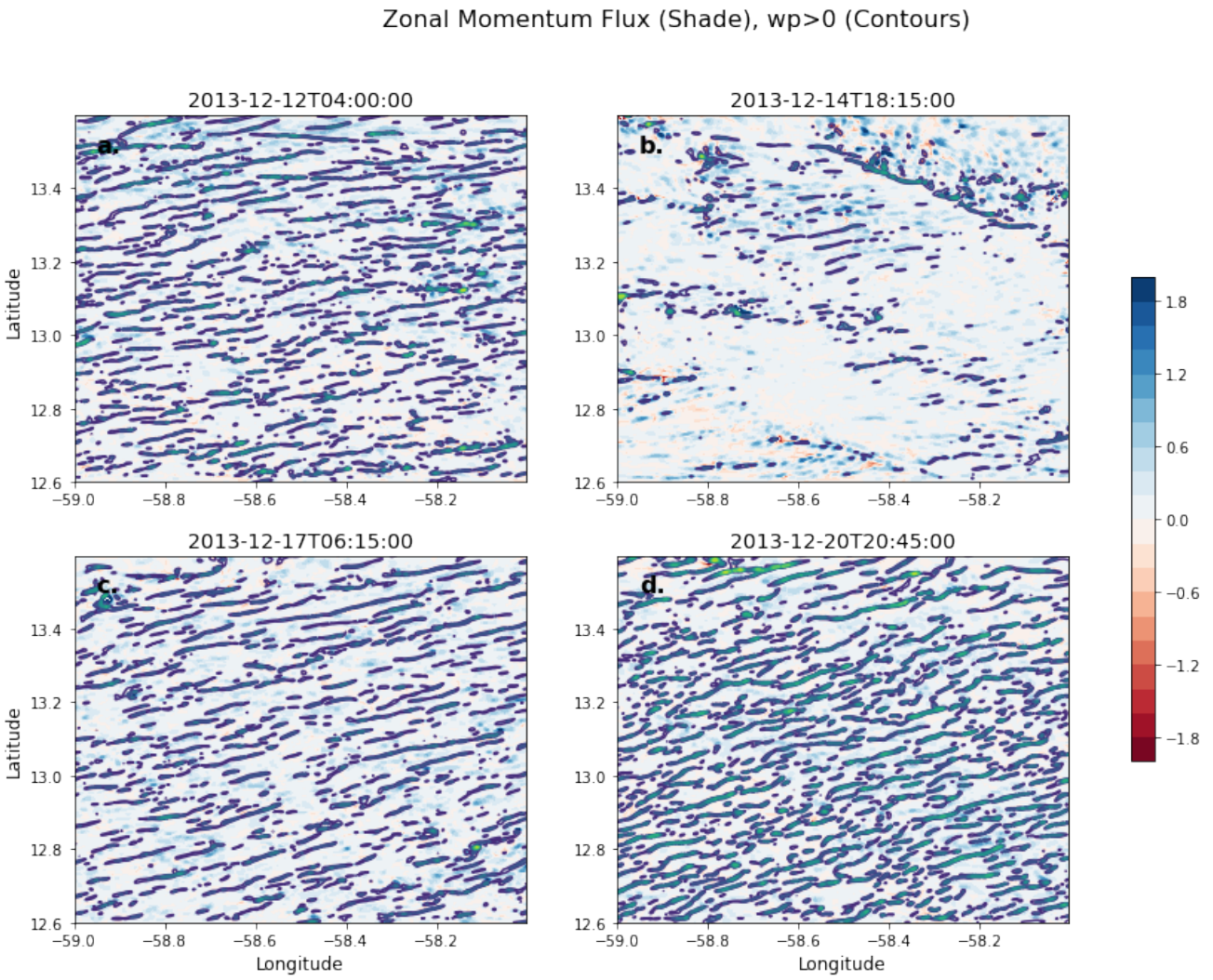

Figure S5. The maps of distribution of zonal momentum flux ($\overline{u'w'}$ m^2 s^{-2}, shaded) and positive vertical velocity contours at four time stamps (similar to Fig.8 in the main manuscript) at 383m altitude.

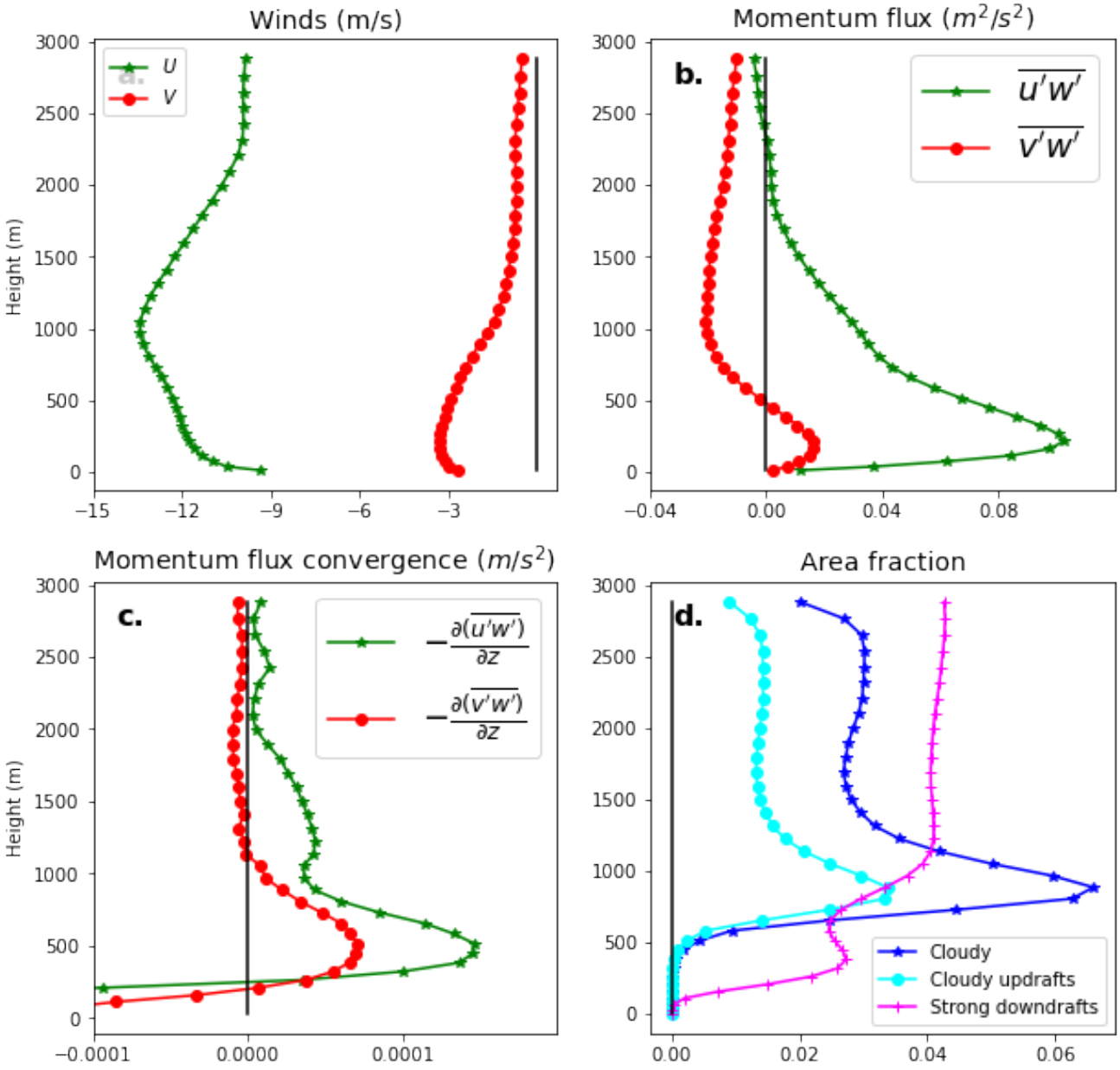

Figure S6. Fig.1 of the main manuscript reproduces to make the vertical profile above 2 km visible