Supplement of Atmos. Chem. Phys., 21, 16689–16707, 2021
https://doi.org/10.5194/acp-21-16689-2021-supplement

Atmospheric Chemistry and Physics
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EGU

Supplement of

A meteorological overview of the ORACLES (ObseRvations of Aerosols above CLouds and their intEractionS) campaign over the southeastern Atlantic during 2016–2018: Part 1 – Climatology

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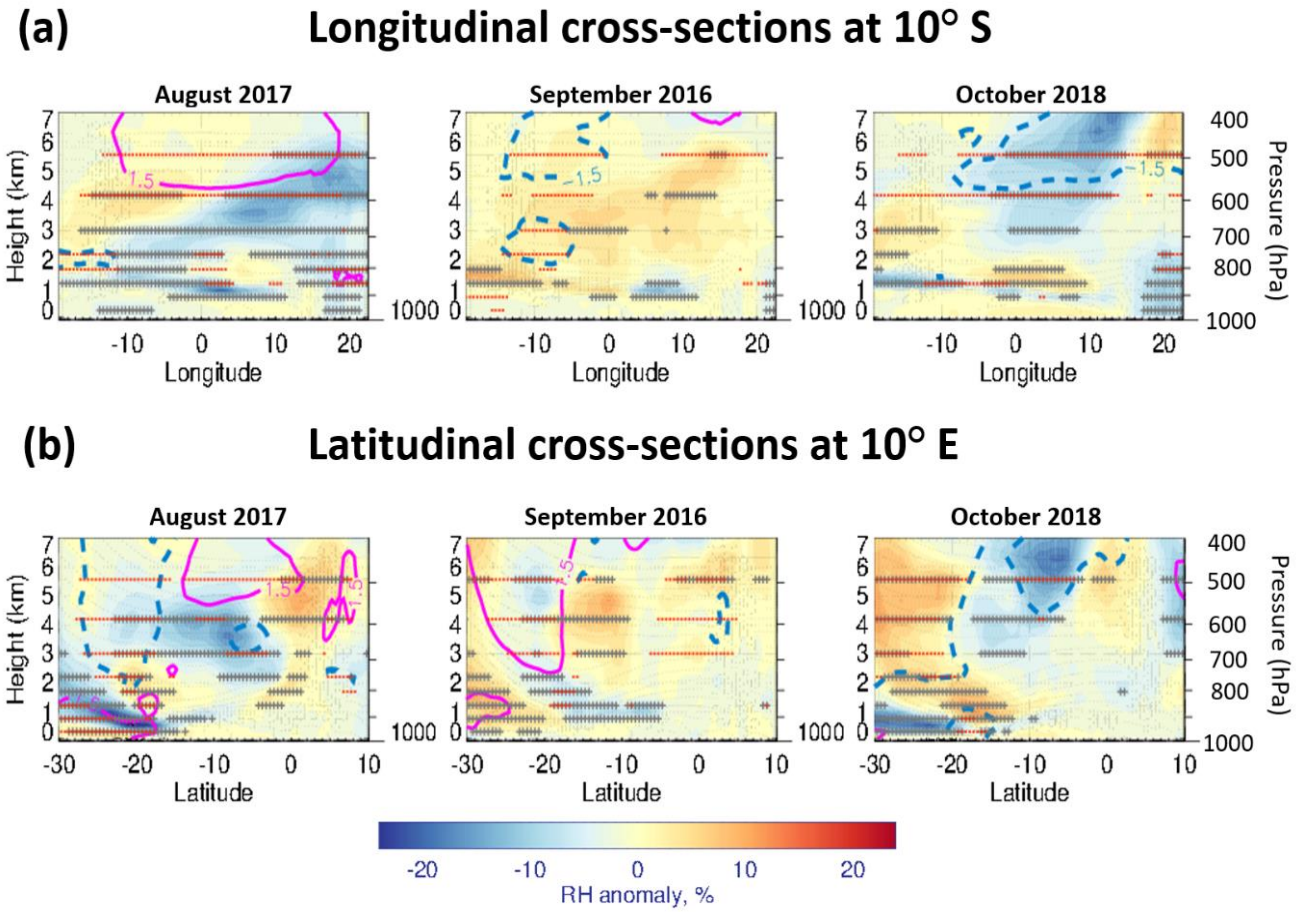

Figure 1S. (a) Longitudinal cross-sections at 10° S and (b) latitudinal cross-sections at 10° E of RH anomaly overlaid by horizontal wind speed anomaly (contours: blue dashed; weaker wind speed (-1.5 m s^{-1}), and magenta solid; stronger wind speed, 1.5 m s^{-1}) from the climatological mean (2000–2018) for the 3 years of the deployment months (August 2017, September 2016, October 2018). The red dot (gray cross) indicates wind speed anomaly (RH anomaly) data is significant at the 85% confidence level.

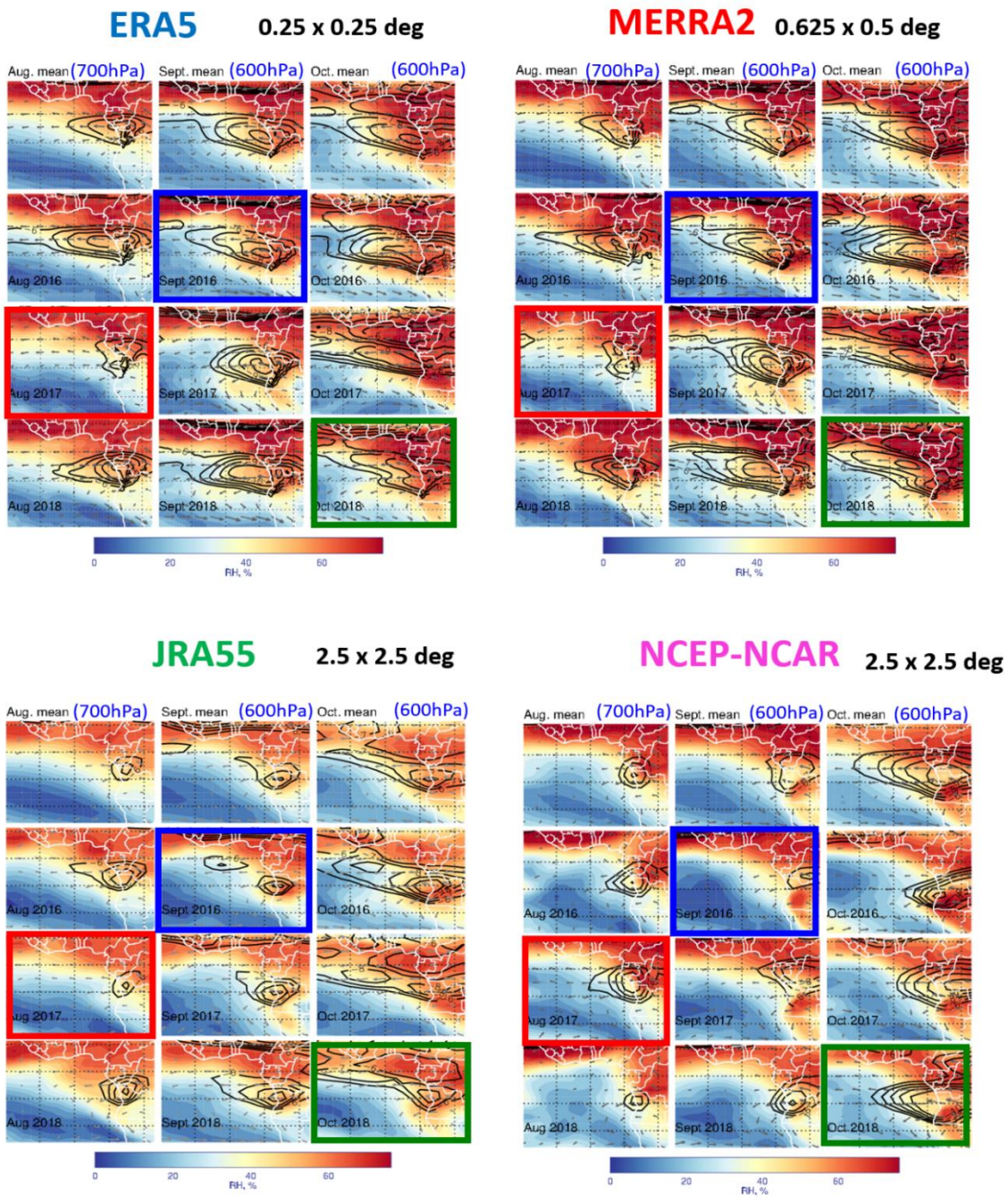

Figure 2S. Maps of zonal wind (black contour, from -10 m s^{-1} to -6 m s^{-1} with 1 m s^{-1} interval), RH (shading, %), and horizontal wind vector at 700 hPa for August and at 600 hPa for September and October for (1st row) the climatological mean (2000–2018) and (2nd – 4th rows) the August, September, and October in 2016-2018. The color boxes (red, blue, and green) indicate the month of ORACLES deployment. The plots are made using ERA5, MERRA2, JRA55, and NCEP/NCAR (from top left to bottom right) reanalyses data, respectively.

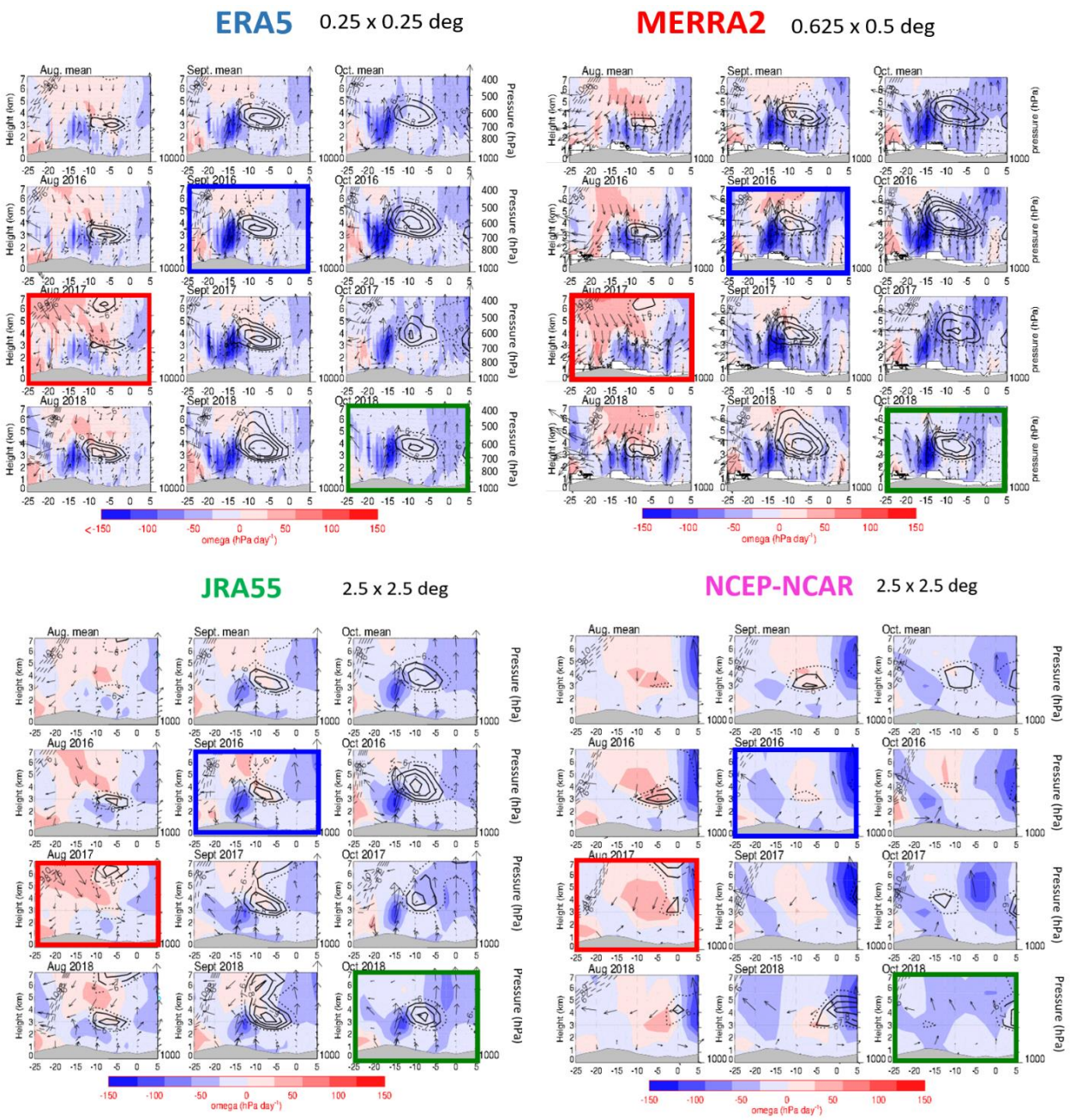

Figure 3S. Latitudinal cross-sections of vertical velocity (omega (ω), shading, hPa day^{-1}) averaged over the jet entrance region (12–18° E) overlaid by wind vectors (meridional wind vs vertical wind; the vertical wind (ω, hPa day^{-1}) is multiplied by -1 to represent the ascent as a positive value). Zonal wind (black contour, m s^{-1}) is overlaid for the (1st row) climatological mean and (2nd – 4th rows) August-October in 2016-2018. The gray-filled area represents the inland topography. The plots are made using ERA5, MERRA2, JRA55, and NCEP/NCAR (from top left to bottom right), respectively. The color boxes (red, blue, and green) indicate the month of ORACLES deployment.

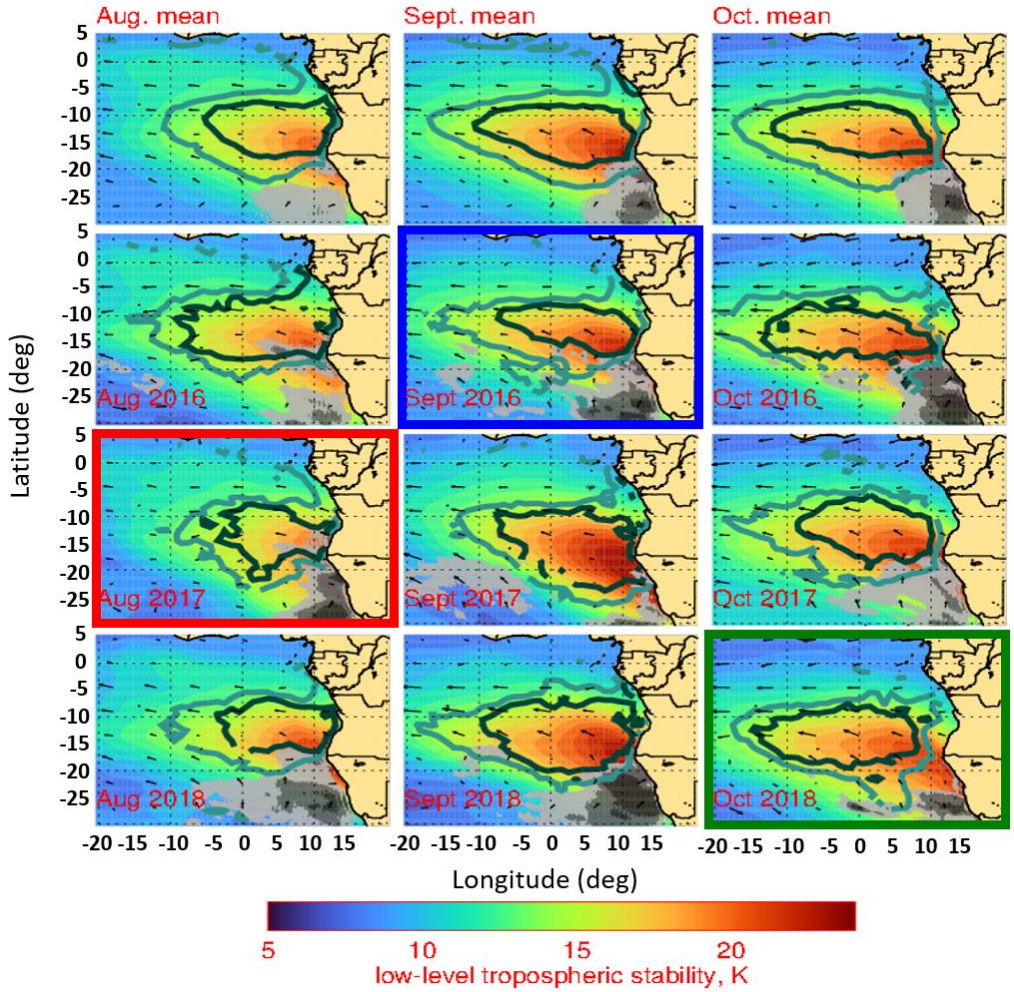

Figure 4S. Maps of LTS (shading, K) and low-level cloud fraction (contour, low-CF; cloud-top below 2.5 km, %) (0.8 and 0.9) overlaid by subsidence (omega at 800hPa, 50, 65, 80 hPa day^{-1} from the light gray) and horizontal wind vector (black, m s^{-1}) at 800 hPa for August, September, and October. Top row: climatology computed over 2003-2018. Second through the fourth row: monthly mean values for August through October 2016, 2017, and 2018, respectively. The colored boxes around the plots represent the years of ORACLES deployments.

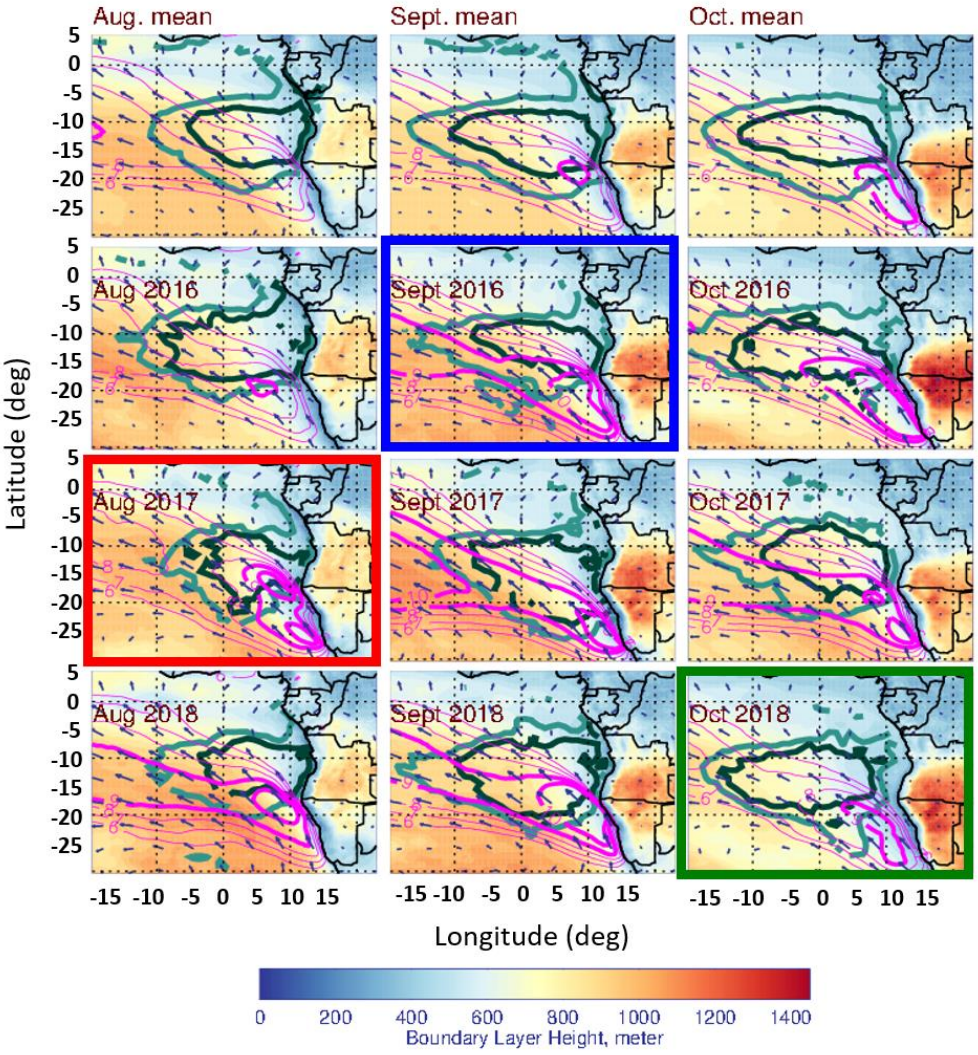

Figure 5S. Maps of mixed-layer BLH (shading, m) and 925 hPa horizontal wind (vector, m s^{-1}) overlaid by low-CF (green contour, %) and 925 hPa horizontal wind speed (magenta contour, m s^{-1}) for the climatological mean and the 3 years of ORACLES deployment (August, September, and October, 2016–2018). The colored boxes around the plots represent the years of ORACLES deployments.

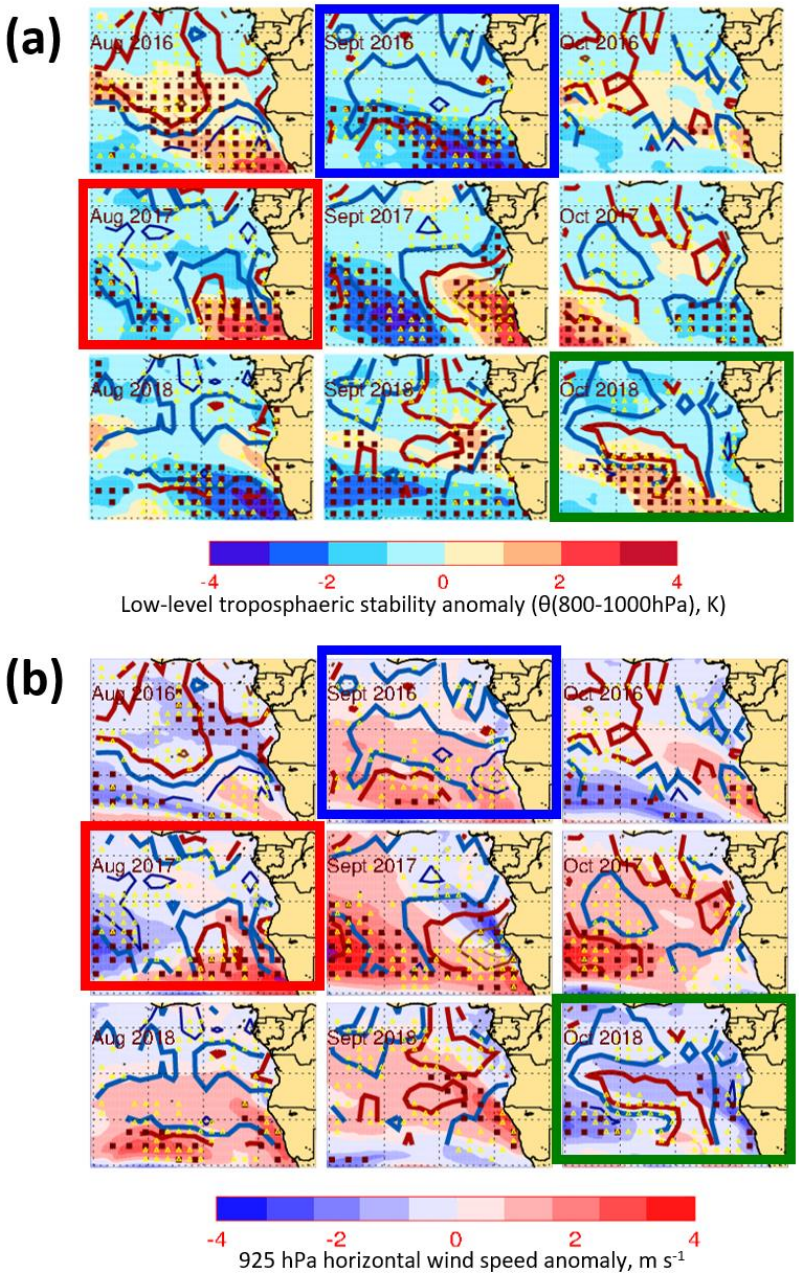

Figure 6S. (a) Maps of LTS anomaly (shading, K) overlaid by low-CF anomaly (contours: blue (-0.02, -0.07, -0.12), and dark red (+0.02, +0.07, +0.12), %). (b) Maps of 925 hPa horizontal wind speed anomaly (shading, m s^{-1}) overlaid by low-CF anomaly (same contours as (a)). The purple square (yellow triangle) indicates shaded field (low-CF anomaly) data is significant at the 85% confidence level. The colored boxes around the plots represent the years of ORACLES deployments.

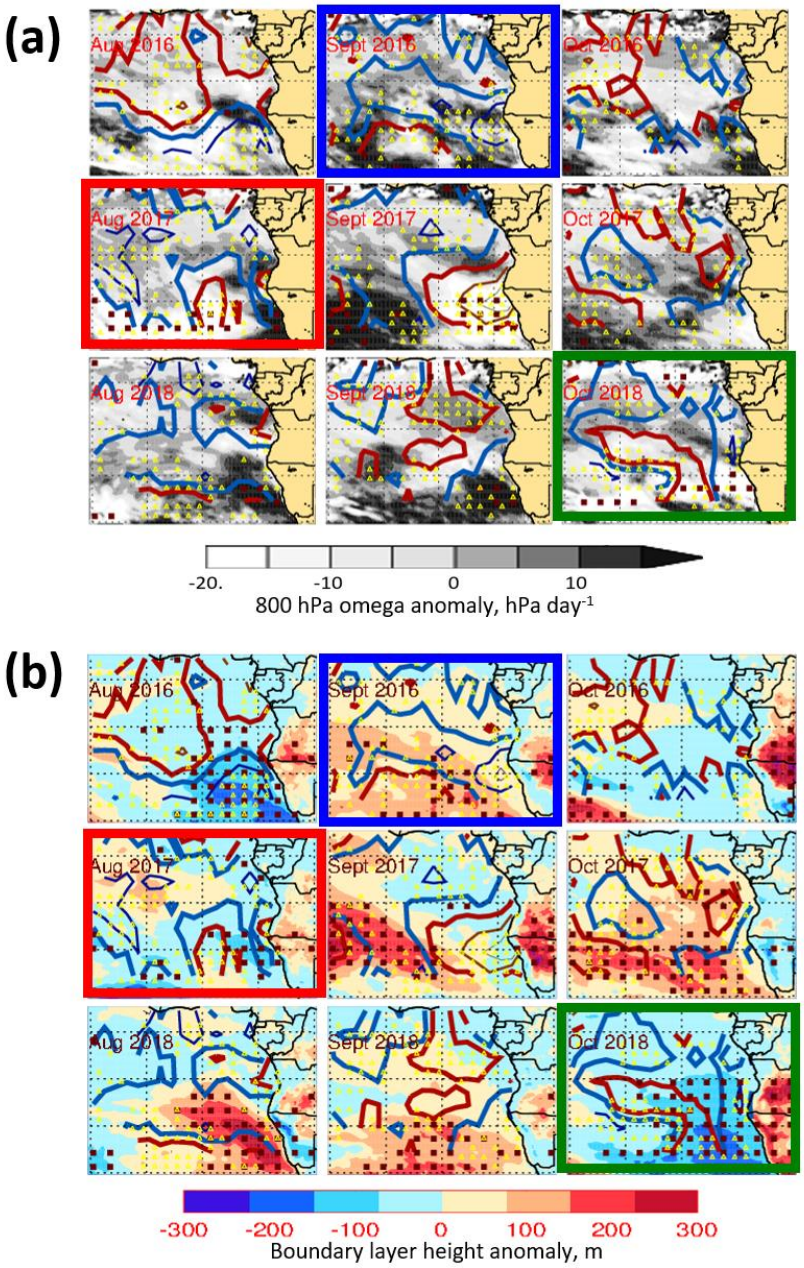

Figure 7S. (a) Maps of 800 hPa vertical velocity anomaly (omega) (gray shading, hPa day^{-1}; subsidence is a positive value) overlaid by low-CF anomaly (contours: blue (-0.02, -0.07, -0.12), and dark red (+0.02, +0.07, +0.12), %). (b) Maps of BLH anomaly (color shading, m) overlaid by low-CF anomaly (same contours as (a)). The purple square (yellow triangle) indicates shaded field (low-CF anomaly) data is significant at the 85% confidence level. The colored boxes around the plots represent the years of ORACLES deployments.

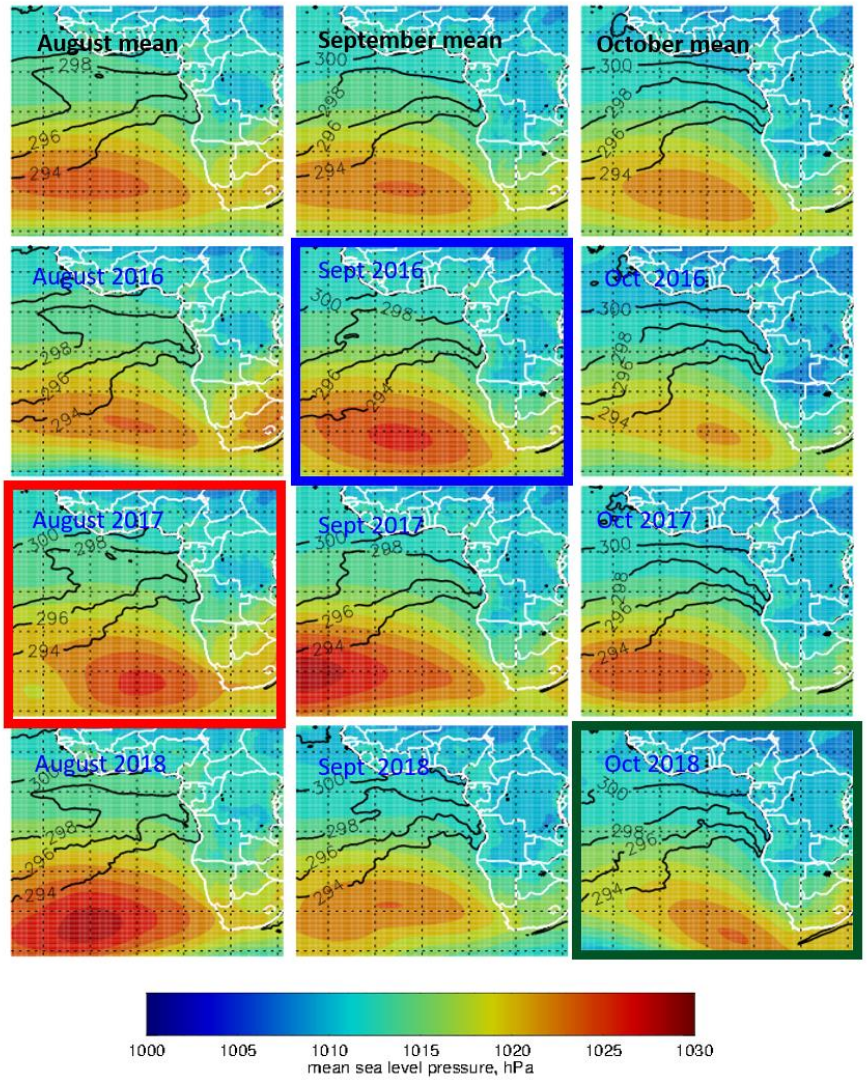

Figure 8S. Maps of SLP (shading, hPa) overlaid with SST (contour, black, K) for the climatological mean (2000-2018) and the August, September, and October for 2016-2018. The colored boxes around the plots represent the years of ORACLES deployments.

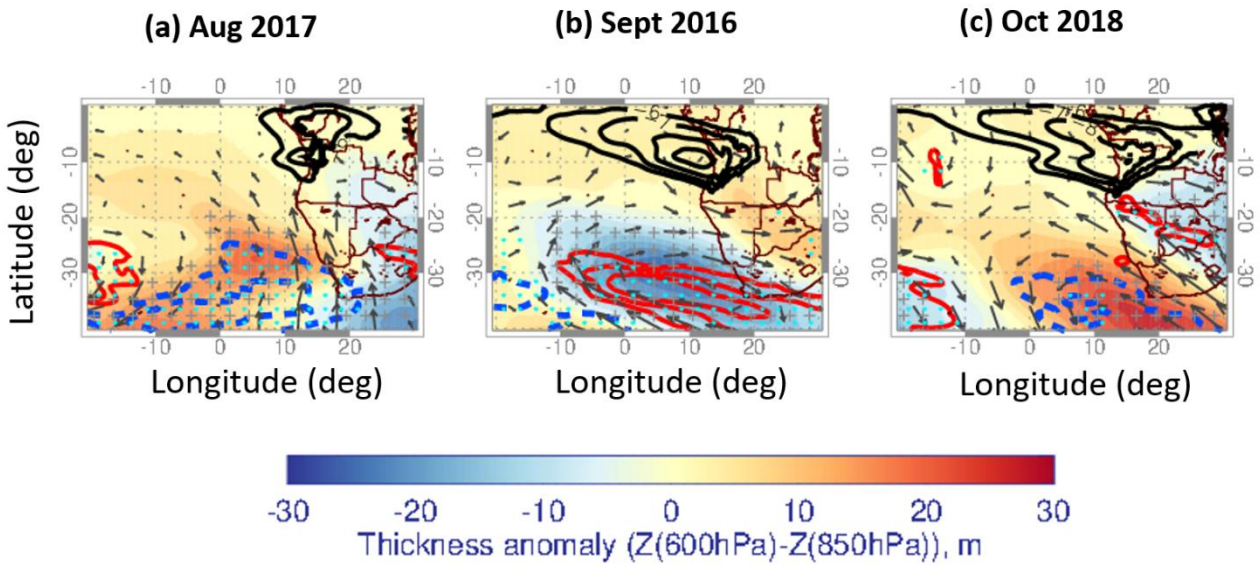

Figure 9S. Maps of thickness anomaly (Z600hPa – Z850hPa, shading, m), 250 hPa PV anomaly (dashed contour, PVU; the blue dashed (red solid) line represents the negative (positive) PV anomaly), and 250 hPa horizontal wind anomaly (arrow, m s^{-1}) overlaid by 700 hPa zonal wind (black contour, m s^{-1}) during (a) August 2017, and the same but overlaid by 600 hPa zonal wind during (b) September 2016, and (c) October 2018. The cyan dot (gray cross) indicates PV anomaly (thickness anomaly) data is significant at the 85% confidence level. The negative (positive) PV anomaly corresponds to the high (low) thickness anomaly and the warm air (cool air). The cyclonic (anticyclonic) circulation represents the winds turning clockwise (anticlockwise) in SH associated with the phase of the upper-level wave.

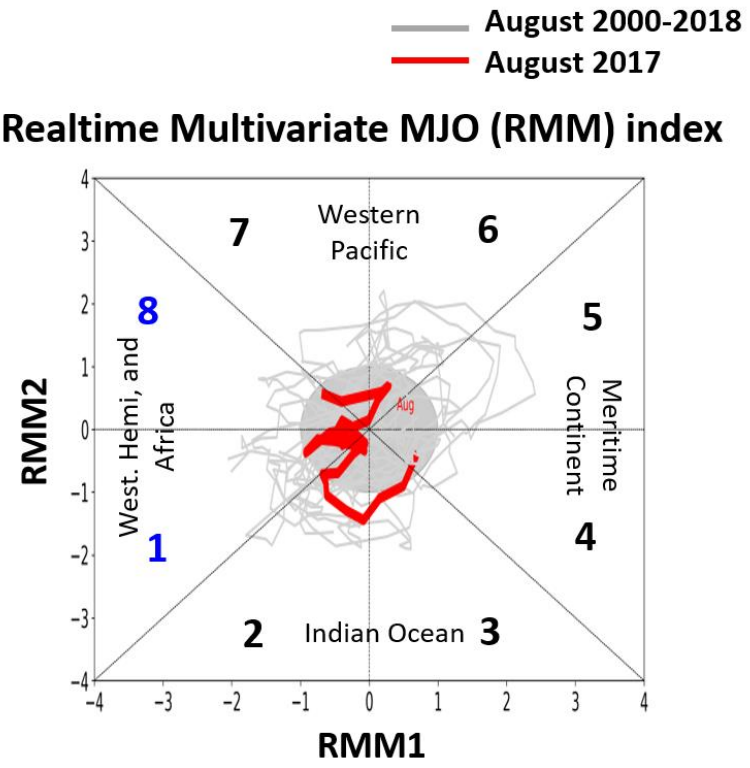

Figure 10S. Realtime Multivariate MJO (RMM) index during August 2000-2018 (gray), and August 2017 (red). When the index is within the center circle ($RMM1^2 + RMM^2 < 1$, gray), the MJO convection is considered to be weak in the given location. Outside of this gray circle, the MJO convection over the given location is considered to be strong and moves in an anti-clockwise direction from west to east. The MJO convection over the western hemisphere and Africa corresponds to phase 1 and phase 8, highlighted with blue. The RMM index data is obtained from http://www.bom.gov.au/climate/mjo/.