Supplementary Material for

Mesoscale modeling of smoke transport over the Southeast Asian Maritime Continent: Coupling of smoke direct radiative effect below and above the low-level clouds

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This PDF file includes:

Fig. S1 – S7

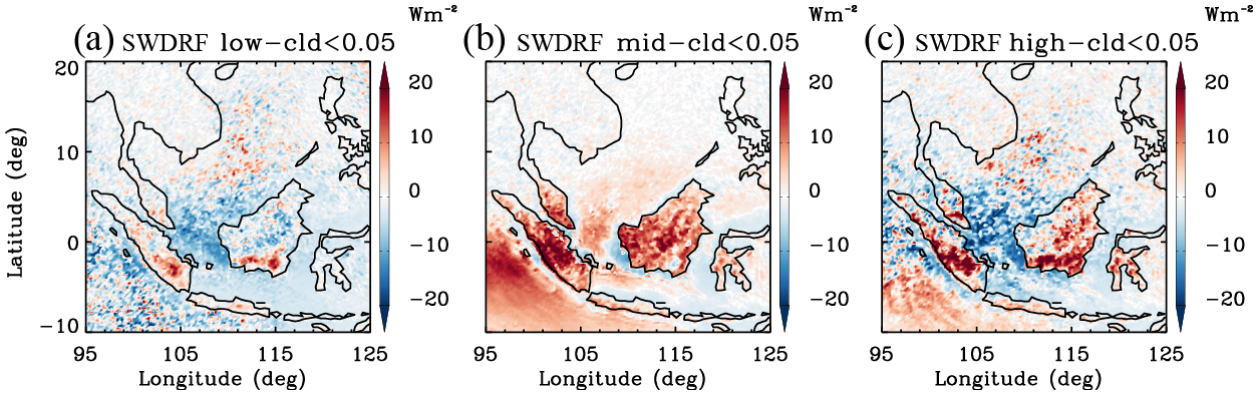

Fig. S1. Distribution of monthly averaged variables in October 2006. (a) Aerosol Short Wave Direct Radiative Forcing (SWDRF) at TOA for low-level cloud fraction less than 0.05, (b)-(c) are similar to (a) but respectively for mid-level, and high-level cloud fractions less than 0.05. The OC/BC ratio is 10 in the simulation.

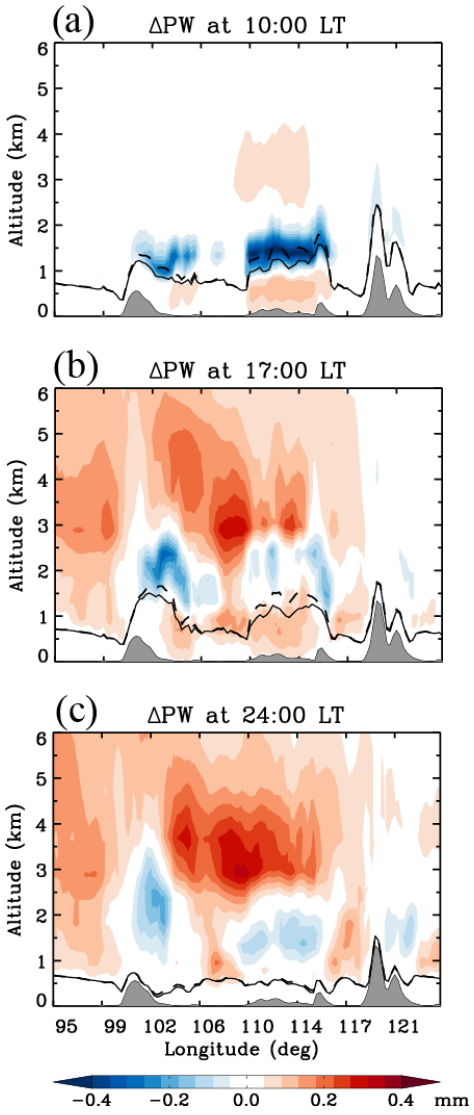

Fig. S2. Vertical cross section of monthly averaged change of precipitable water ΔPW in October 2006 at (a)10:00 LT, (b) 17:00 LT and (c) 24:00 LT. ΔPW is averaged along the vertical cross section centered at the latitude of 1°S (extends 2 grid points into and out). The terrain also showed as gray shaded in each panel. The difference of ΔPW is defined as $\Delta PW = PW_{Ra} - PW_{non\text{-}Ra}$. The OC/BC ratio is 10 in the simulation. Also overlaid in the panels are the PBLH simulated with the radiative effect of smoke aerosols (black line) and PBLH without the radiative effect of fires (dotted line).

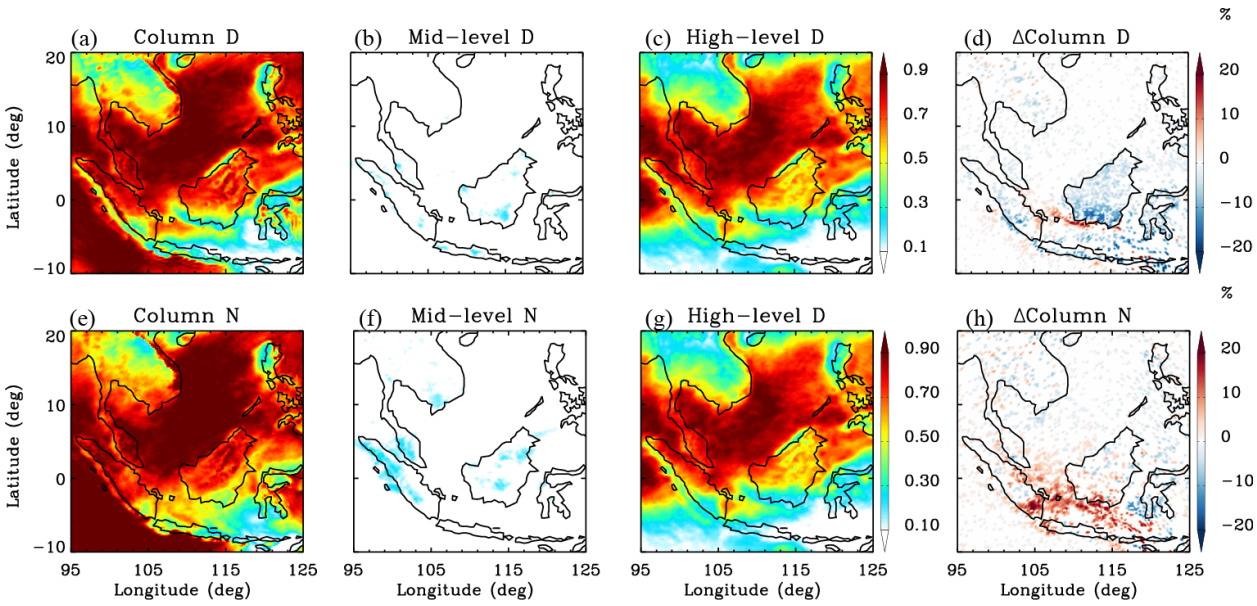

Fig. S3. Distribution of monthly averaged variables in October 2006. Top-row is simulated for daytime (a) cloud fraction, (b) mid-level cloud fraction, and (c) high-level cloud, all without consideration of smoke radiative feedback, (d) difference of column cloud. Second row is the same as top row but for nighttime. All the difference showed here with 95% confidence by paired samples t test. Clouds between 2000 m and 6000m are middle-level clouds, and above 6000m are high-level clouds. The OC/BC ratio is 10 in the simulation.

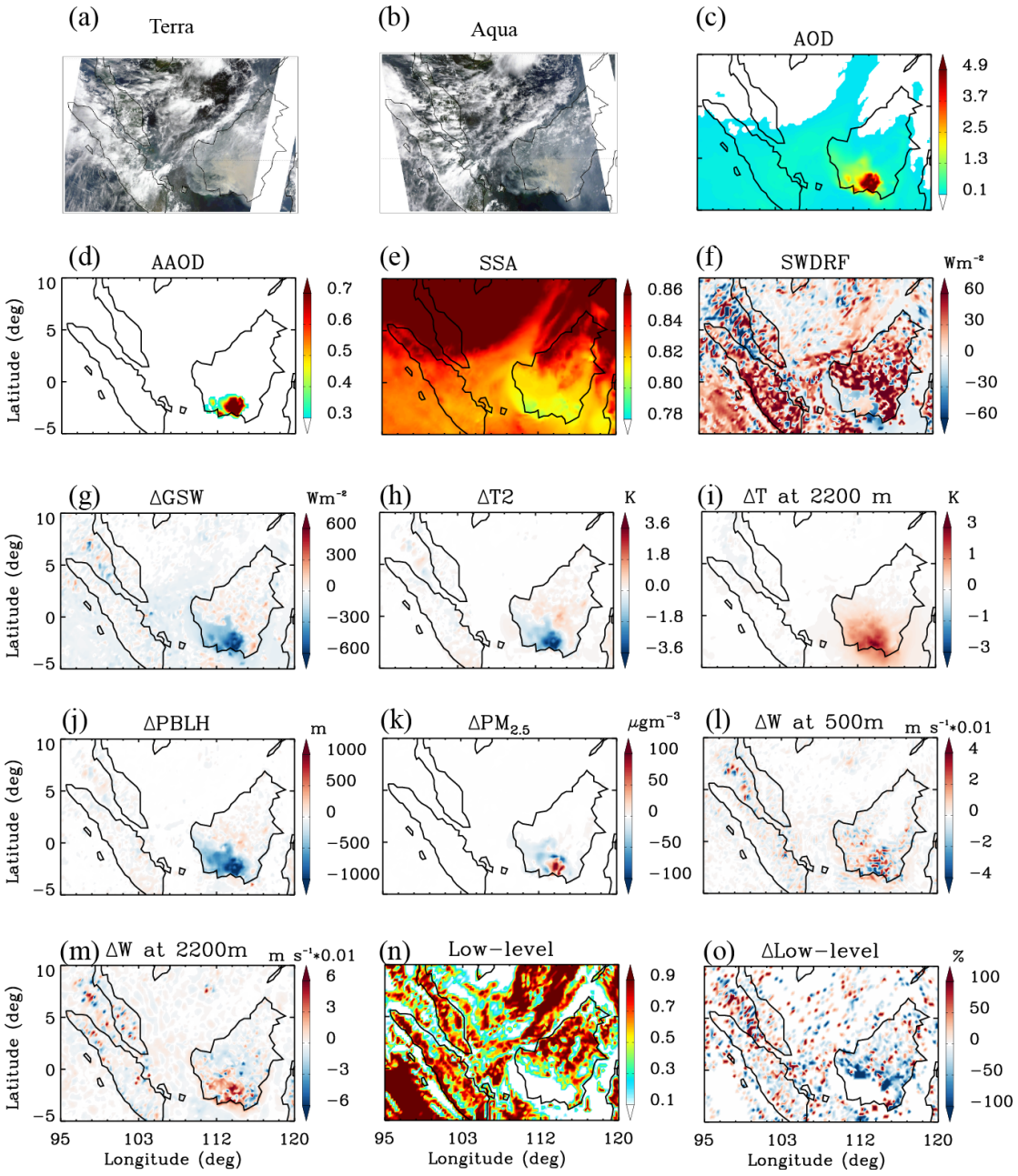

Fig. S4. Distribution of averaged variables for the afternoon time during a smoke event (12:00 – 16:00 LT in Oct 31 in 2006). MODIS three-band color overlay images (red, band 1; green, band 4; and blue, band 3) from (a) Terra and (b) Aqua satellites, (c) AOD, (d) AAOD, (e) SSA, (f) Aerosol SWDRF at TOA, (g) ΔGSW, (h) ΔT2, (i) ΔT at 2200m above surface, (j) ΔPBLH, (k) $\Delta PM_{2.5}$, (l) ΔW (vertical velocity) at 500m above surface, (m) ΔW at 2200m above surface, (n) low-level cloud fraction, (o) The difference (in

62 percentage) of low-level cloud fraction. The difference of each variable (ΔV) is defined as ΔV =
63 $V_{Ra} - V_{non\text{-}Ra}$. The OC/BC ratio is 10 in the simulation.

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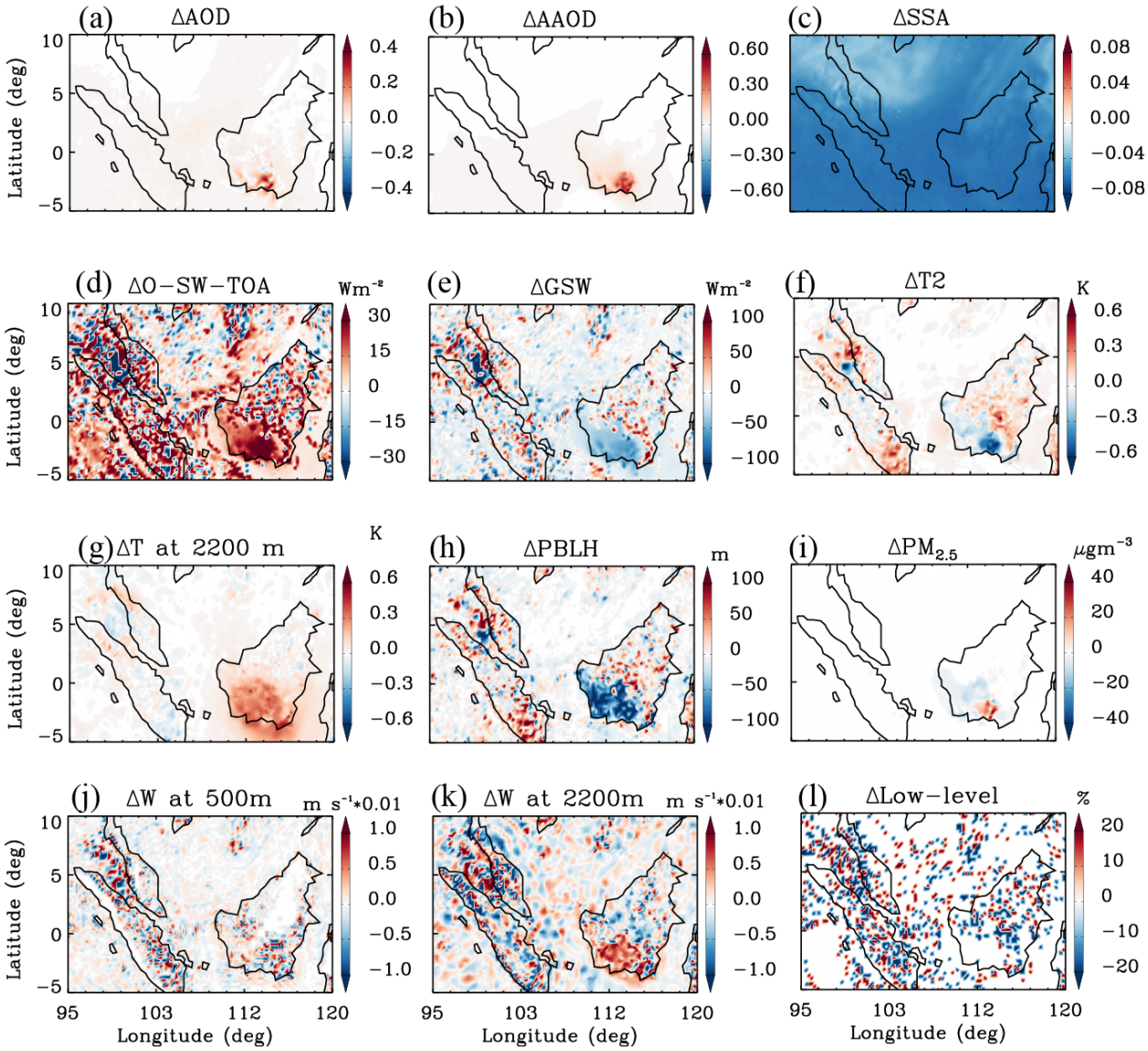

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66 Fig. S5. Similar as Fig. S4, but the difference of each variable (ΔV) is defined as ΔV = $V_{oc/bc=10}$ −
67 $V_{oc/bc=17}$.

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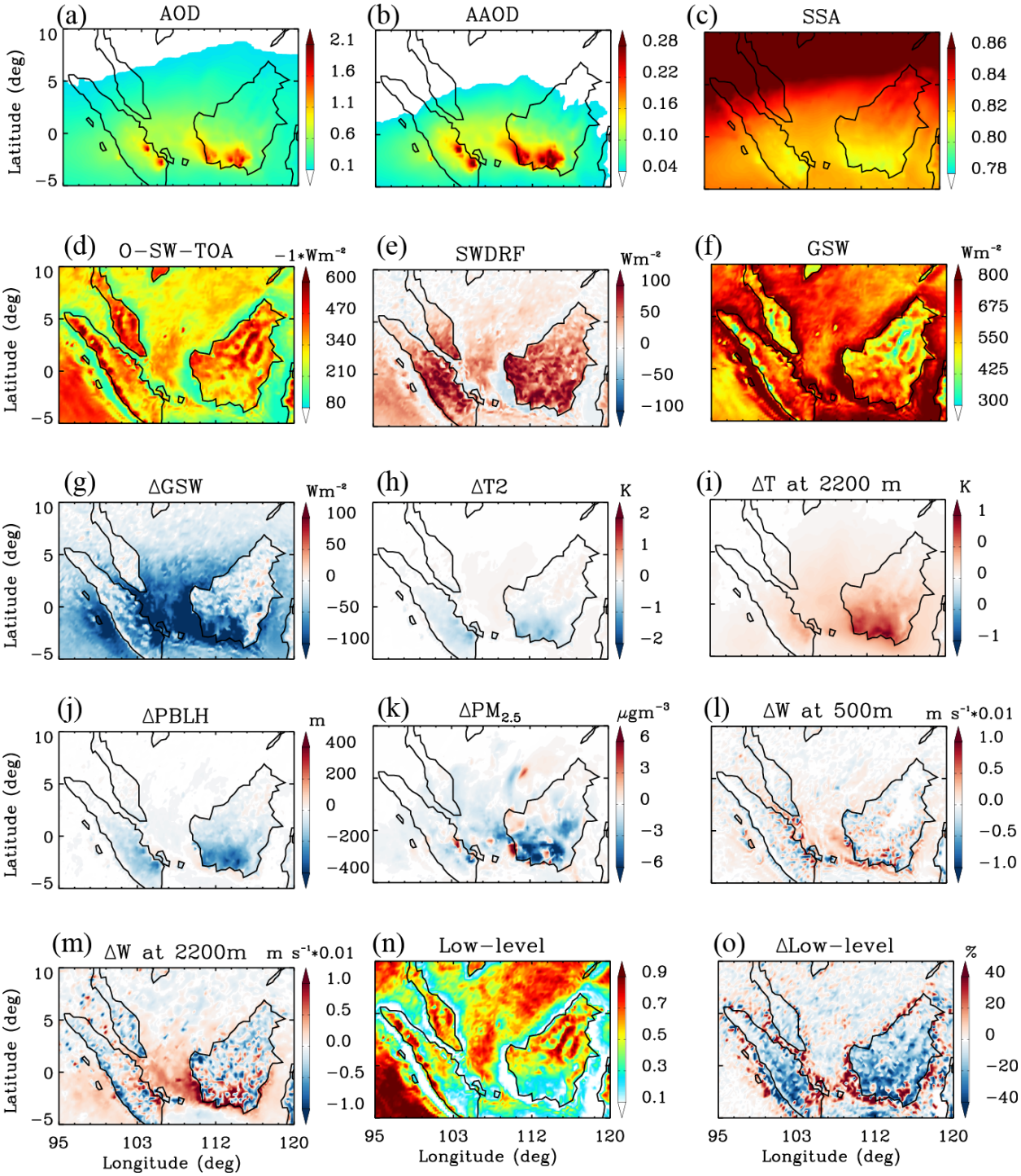

Fig. S6. Similar as Fig. S4, but for the afternoon time (12:00 – 16:00 LT) of several days during big events of Oct 1, 2, 4, 6, 8-16, 18,19, 27, 31 in 2006. The OC/BC ratio is 10 in the simulation.

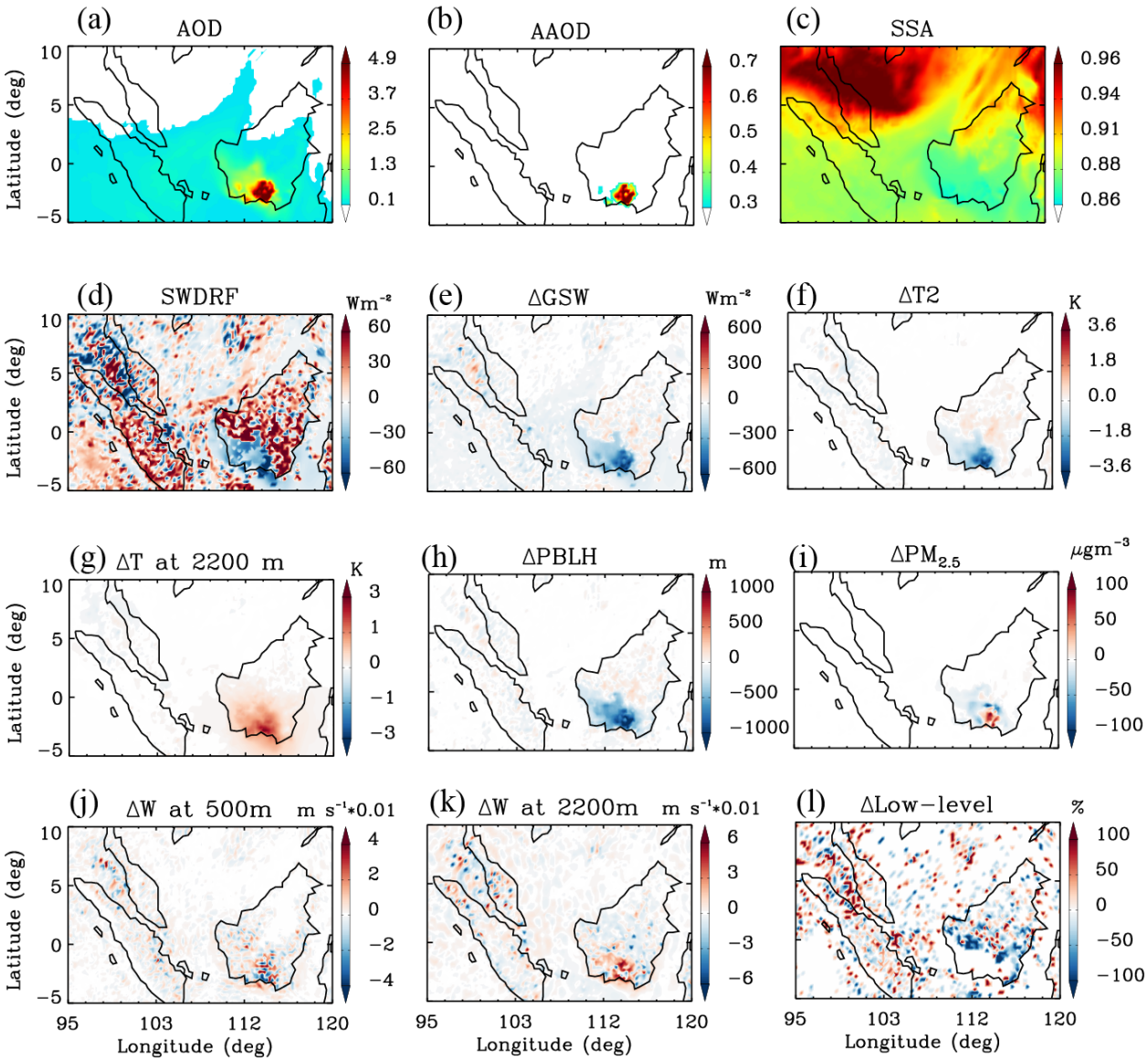

Fig. S7. Similar as Fig. S4, but for monthly averaged variables in October 2006, and difference of each variable (ΔV) is defined as $\Delta V = V_{Ra} - V_{non\text{-}Ra}$. The OC/BC ratio is 17 in the simulation.