

Interactive comment on “The influence of internal variability on Earth’s energy balance framework and implications for estimating climate sensitivity” by Andrew E. Dessler et al.

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Equation (1) in my comment SC4 has the same shape as Eq. (8) with respect to the traditional climate feedback parameter λ displayed in my comment SC3

$$R = F + \lambda T_S + a_2 a_1 (\lambda_2 - \lambda_1) (T_{S,2} - T_{S,1}) + a_3 a_1 (\lambda_3 - \lambda_1) (T_{S,3} - T_{S,1}) + a_3 a_2 (\lambda_3 - \lambda_2) (T_{S,3} - T_{S,2}) \quad (1)$$

where it is implied that $R = a_1 R_1 + a_2 R_2 + a_3 R_3$, $F = a_1 F_1 + a_2 F_2 + a_3 F_3$, $\lambda = a_1 \lambda_1 + a_2 \lambda_2 + a_3 \lambda_3$ and $T_S = a_1 T_{S,1} + a_2 T_{S,2} + a_3 T_{S,3}$. Here a_1 , a_2 and a_3 are the area fractions of the three regions 90°N to 19.4°N, 19.4°N to 19.4°S and 19.4°S to 90°S.

However, T_S is a global average. In the case with the climate feedback parameter Θ introduced in the discussion paper, the 500 hPa mean tropical temperature T_A is used instead of T_S . Because T_A is averaged over the tropical regions 30°N to 19.4°N, 19.4°N to 19.4°S and 19.4°S to 30°S there are different area fractions for T_A than for R , F and Θ . This was overlooked in SC4. The correct equation with $T_A = b_1T_{A,1} + b_2T_{A,2} + b_3T_{A,3}$ should be:

$$R = F + \Theta T_A + (a_2b_1\Theta_2 - a_1b_2\Theta_1)(T_{A,2} - T_{A,1}) + \\ + (a_3b_1\Theta_3 - a_1b_3\Theta_1)(T_{A,3} - T_{A,1}) + (a_3b_2\Theta_3 - a_2b_3\Theta_2)(T_{A,3} - T_{A,2}) \quad (2)$$

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