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# TOA radiative budget in models and measurements and possible implications for climate sensitivity

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A comparison between two sets of satellite observations and output from 20 CGMs shows a discrepancy between models and observations, where the modelled global mean TOA albedo is systematically higher than that observed. Deviations are especially pronounced in certain regions, e.g. marine subtropical areas dominated by stratocumulus clouds. Furthermore, it is found that models deviate more from the more recent CERES measurements than from the older ERBE measurements as a consequence of being tuned to agree with ERBE TOA fluxes. To investigate how the choice of tuning to ERBE rather than to CERES affects model behavior, specifically if it may change the sensitivity of a model to GHG forcing, an experiment is carried out with the NCAR CAM3.1, in which the TOA radiative balance is tuned to agree with ERBE and CERES respectively through alterations in the model cloud parameterization. The equilibrium climate sensitivities of the two model configurations are found to differ by 0.24 K, a difference which is small compared to e.g. the spread in estimated climate sensitivity in state-of-the-art climate models. Still, that the values differ elucidates the fact that climate sensitivity calculations are indirectly based on parameters that are not well restricted by observations and make clear the need for more restricting measurements to avoid arbitrariness in climate sensitivity estimates and future climate predictions.