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Tropical cirrus and water vapor: an effective Earth infrared iris feedback?

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Abstract. We revisit a model of feedback processes proposed by Lindzen et al. (2001), in which an assumed 22% reduction in the area of tropical high clouds per degree increase in sea surface temperature produces negative feedbacks associated with upper tropospheric water vapor and cloud radiative effects. We argue that the water vapor feedback is overestimated in Lindzen et al. (2001) by at least 60%, and that the high cloud feedback is small. Although not mentioned by Lindzen et al. (2001), tropical low clouds make a significant contribution to their negative feedback, which is also overestimated. Using more realistic parameters in the model of Lindzen et al. (2001), we obtain a feedback factor in the range of -0.15 to -0.51, compared to their larger negative feedback factor of -0.45 to -1.03. It is noted that our feedback factor could still be overestimated due to the assumption of constant low cloud cover in the simple radiative-convective model.

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