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A further assessment of vegetation feedback on decadal Sahel rainfall variability

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In this paper the vegetation feedback on decadal Sahelian rainfall is analyzed using a set of ensembles of Atmospheric General Circulation Model/dynamic vegetation simulations. In the control experiment, where the full vegetation feedback is included, the ensemble is consistent with the observed decadal rainfall variability, with a forced component estimated from the ensemble mean to be about 60% of the observed variability. In a sensitivity experiment where climatological vegetation cover and albedo are prescribed from the control experiment, the ensemble of simulations is not consistent with the observations because of strongly reduced amplitude of decadal rainfall variability, and the forced component drops to 40% of the observed variability. The decadal rainfall variability is driven by sea surface temperature (SST) forcing, but enhanced by land-surface feedbacks. Both, local evaporation and moisture flux convergence changes are important for the total rainfall response. Also the internal decadal variability (not SST-forced) is much stronger in the control experiment compared with the one where vegetation cover and albedo are prescribed. It is further shown that this positive vegetation feedback is physically related to the albedo feedback, supporting the Charney hypothesis.