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The radiation budget in regional climate simulations for Africa

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The long- and short-wave components of the radiation budget are among the most important quantities in climate modelling. In this study, we evaluated the radiation budget at the earth's surface and at the top of atmosphere over Africa as simulated by nine different regional climate models involved in the EU-project ENSEMBLES. This was done by comparisons with radiation budgets as computed by the GEWEX/SRB satellite-based product and as realized in the ECMWF reanalysis ERA-Interim. Our comparisons show that there are partly strong regional over- as well as underestimations of long- and short-wave components. In average there is a tendency to underestimate solar radiation and the energy loss by thermal emission. We found a clear statistical dependence of radiation budget imprecision on cloud cover, surface albedo and surface temperature uncertainties. In contrast to an investigation of model simulations for Europe (Kothe et al., accepted) cloud fraction errors over land are not the dominant factor whereas surface albedo errors in the short-wave and surface temperature errors in the long-wave spectrum have an increased influence. Over the ocean cloud fraction errors are the determining parameter.