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Evaluating the global energy budget with a regional climate model over Europe

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With a greater focus recently placed on regional climate modeling for a better understanding of regional climate processes, knowledge of the earth's radiation balance is crucial in these models as it plays a key role as driver of the climate system. Thus, this study evaluates both the longwave and shortwave components of the radiation budget at the surface and top of the atmosphere (TOA) for the present day period over Europe using simulations from the regional climate model RegCM4. The simulations will be assessed by comparing them to radiative fluxes from satellite derived and ground based observations. These data include those from reanalysis products such as ERA40 and the NASA/Global Energy and Water Cycle Experiment (GEWEX) Surface Radiation Budget (SRB) Project, which provides global TOA, atmospheric and surface shortwave and longwave radiative fluxes for various uses including detecting climate trends with high precision. Additional radiative fluxes for comparison to the simulated ones, particularly at the TOA, will include the Clouds and Earth's Radiant Energy System (CERES) directly measured fluxes that are still ongoing on three separate satellite missions. Highly accurate ground based measurements, such as the Baseline Surface Radiation Network (BSRN), will also be used for assessing the surface modeled fluxes. The evaluation of the regional model will be further discussed with sensitivity experiments to determine the dependence and impact of climate parameters such as cloud fraction, planetary and surface albedo and surface temperature on the radiation budget taking into account their errors. This analysis will contribute to the usefulness of the regional model for not only evaluating the radiation budget but its determination to simulate the climate as well and its importance within the research community.