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Evaluation of Soil Moisture in the Coupled CCAM-CABLE Model over South Africa Using In-Situ and ESA CCI Satellite Observations

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This study evaluates the performance of the coupled CCAM-CABLE model estimates of soil moisture against in-situ measurements from the Skukuza flux tower and ESA CCI satellite observations both at a point and regional scale. In situ measurements are used to evaluate the accuracy of the soil moisture products at a point (location of the flux tower) through the use of conventional statistical measures such as correlation coefficient, normalised mean bias, root mean square error (RMSE) and coefficient of efficiency. The coupled CCAM-CABLE simulations performed best compared with observations for the surface soil moisture and root zone soil moisture for both the dry (March to October) and wet (November to April) seasons. There is evidence of overestimation of observed soil moisture by the various products. Differences in model performance at the surface and the root zone were observed. Following the evaluation at the site level, we further evaluated the performance of CCAM-CABLE, ESA CCI and GLEAM model projections over a grid covering parts of South Africa using correlation coefficient and root mean square difference (RMSD). There is disagreement (i.e. strong negative correlation) between CCAM-CABLE and ESA-CCI mainly during the wet season especially for the ESA-passive product. However, there is moderate to strong correlation between ESA CCI and CCAM-CABLE during the dry period. Similarly, there is evidence of agreement between the GLEAM models and CCAM-CABLE especially during the dry period for most of the grid. The models generally agree on the estimates of root zone soil moisture with correlation coefficients ranging between 0.7 and 1, and RMSD between 0 and 20% for savanna areas, and correlation coefficient between 0.2 to 0.5, and RMSD of 20 to 40% for the grassland. We conclude that the soil moisture estimated using the coupled CCAM-CABLE is comparable with satellite and in situ observations at different soil depths and scales.

HPC content

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