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Comparison of calibration and validation for soil moisture modelling using dry and wet periods

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Soil moisture knowledge is crucial for hydrological modelling, meteorology and agriculture. Eleven years of soil moisture data (2005-2015) had been collected from five sites at Stanley microcatchment (1.75 km2), which is part of the Scaling and Assimilation of Soil Moisture and Streamflow (SASMAS) project (Rüdiger et al., 2007). The catchment has a grassland cover and is located in a semi-arid to temperate region. Data were collected for the top 30 cm soil at a 20 minutes time resolution by Campbell Scientific CS616 water content reflectometers. The one-dimensional vertical flow model, HYDRUS-1D, has been demonstrated to be adequate at this field site by Chen et al. (2014) for the years of 2005 to 2007. This study firstly explored how the soil moisture calibration made by Chen et al. (2014) for the 2005-2007 period (predominantly drought affected) performed for the full eleven years of data (2005-2015) (non-drought in the latter half of this period). Secondly, we independently calibrated the soil moisture for two separate periods, one wet and the other dry, and analysed the influence of the climate in the calibration period on the parameters and how it can affected the model's performance. Thirdly, we used the parameters found in the wet and dry calibration periods for two validation periods with contrasting climate to the calibration (e.g. wet calibration and dry validation), to analyse the impact of the different parameter sets on the soil moisture modelling. For the model calibration and validation we used a Monte-Carlo based non-search algorithm (GLUE) to assess statistically the calibration and validation performance.