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Combining modelled and remote sensing soil moisture anomalies for an operational global drought monitoring

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Soil moisture anomalies (i.e. deviations from the climatology) are often seen as a reliable tool to monitor and quantify the occurrence of drought events and their potential impacts, especially in agricultural and naturally vegetated lands. Soil moisture datasets (or their proxy) can be derived from a variety of sources, including land-surface models and thermal and microwave satellite remote sensing images. However, each data source has different advantages and drawbacks that prevent to unequivocally prefer one dataset over the others, especially in global applications that encompass a wide range of soil moisture regimes. The analysis of the spatial reliability of the different datasets at global scale is further complicated by the lack of reliable long-term soil moisture records for a ground validation over most regions. To overcome this limitation, in recent years the Triple Collocation (TC) technique has been deployed in order to quantify the likely errors associated to three mutually-independent datasets without assuming that one of them represents the "truth". In this study, three global datasets of soil moisture anomalies are investigated: the first one derived from the runs of the Lisflood hydrological model, the second one obtained from the combined active/passive microwave dataset produced in the framework of the European Space Agency (ESA) Climate Change Initiative (CCI), and the last one derived from the Moderate-Resolution Imaging Spectroradiometer (MODIS) Land Surface Temperature (LST) observations. A preliminary analysis of the three datasets aimed at detecting the areas where the TC technique can be successfully applied, hence the spatial distribution of the random error variance for each model is evaluated. This study allows providing useful advises for a robust combination of the three datasets into a single product for a more reliable global drought monitoring.