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Controlling factors of surface soil moisture temporal stability at watershed scale

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Soil moisture plays a significant role in the land surface-atmosphere interactions. Temporal stability was frequently used for estimating areal mean soil moisture using limited number of point measurements. This study investigated the factors that determine soil moisture temporal stability using simulated high spatial resolution soil moisture data at watershed scale. Results show locations under dominate vegetation cover and with low topographic wetness index (TI) values are likely to provide reasonable areal mean soil moisture estimates. We demonstrated that including the information of vegetation cover and TI can effectively reduce the number of the sampling locations that required for determining the representative point. The length of sampling period is also shown to be important in correctly determining the representative point. When 10 sampling points were used, a sampling period of approximately 300 days can provide robust areal mean soil moisture estimates of the entire study period of 9 years. The presented study may be useful for improving our skills in applying the temporal stability method for areal mean soil moisture estimating, and hence remote sensing product validation.