

This manuscript describes a modeling study which implements a new land-atmosphere coupling scheme (based off Machulskaya & Mironov 2018) in the E3SM single-column model. The purpose of this new coupling scheme is to improve the representation and role of land surface heterogeneity in the coupling process by taking sub-grid land cover patch characteristics into account. This is important because it is known through observations that heterogeneous land surfaces can induce significant responses in the boundary layer, and most climate models currently do not consider these heterogeneous effects in their coupling parameterizations. The authors show that including the effect of heterogeneity in the coupling scheme leads to a significant atmospheric response (namely in low cloud cover and liquid water path) in the E3SM model over the ARM Southern Great Plains site in Oklahoma. This study is a good first step towards a better representation of land-atmosphere coupling heterogeneity in models in the future.