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Sensitivity analysis of terrestrial carbon budget with changing land use land cover and climate by combining dynamic vegetation model and satellite observed data at high resolution over Austria-Eisenwurzen

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The understanding of the terrestrial carbon budget depends on the development of the terrestrial carbon sink, which is influenced by the forest dynamics under climate change and environmental conditions. In this study, we choose a new approach combining the CARAIB-dynamic vegetation model (DVM) and satellite observed data at a high resolution of 3 km over the Austria-Eisenwurzen region for the year 1985-2020. Using machine learning techniques and remote sensing Landsat satellite data, we extracted the land use and land cover (LULC) over the study region. It is giving the precise estimation of spatial and temporal change of forest dynamic over the year 1985-2020. In addition, the geographical distribution of Eisenwurzen 80 % part is the Northern Alps, 11 % of the area belongs to the Northern Alpine Foothills and 9 % belong to the Central Alps. The objective of this study is to understand the model sensitivities and uncertainties in dynamic conditions which are necessary for a reliable and robust estimation of the terrestrial carbon budget. Here, we will conduct our simulation with CARAIB-DVM in different environments – with and without LULC change, no climate change (de-trending), climate change scenario, constant atmospheric CO_2. Additionally, we are simulating our model over the course of >100 years for analysis of model sensitivity to climatic parameters. From, this study, we explore how the changes in these parameters affect the estimation of the terrestrial carbon sinks. Given that the parameters we are exploring in this analysis are highly uncertain, especially at the regional level and at high resolution, it is important to see how these adjustments affect the estimation of the carbon budget. Hence, with this study, we understand which input parameters are responsible for the uncertainty in the estimation of carbon sequestration. Further, we will calibrate the dynamic vegetation model to minimize uncertainty in the future projection (until 2070). In conclusion, this study allows us to understand the importance of changing land-use, climate, and environment scenarios and to constrain the model with an improved input dataset that reduces the uncertainty in the model evaluation of the regional carbon budget of terrestrial ecosystems.