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Estimation of Soil Respiration and Belowground Biomass on the Qinghai-Tibet Plateau by Applying Regression Models

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Soil respiration strongly interacts with climate change representing a significant process in global carbon dynamics. The release of carbon dioxide to the atmosphere accelerates global warming as well as global warming influences soil processes related to greenhouse gas emissions. The Qinghai-Tibet Plateau is a key region for studying climate-induced soil processes due to its particularly high sensibility to global warming resulting from high altitudes over a large area with widely spread permafrost areas.

Soil respiration on the Qinghai-Tibet Plateau is fundamentally influenced by the amount of belowground biomass which is likewise significant to quantify in order to better understand soil carbon dynamics. However, for both belowground biomass as well as for soil respiration on the Qinghai-Tibet Plateau, data on belowground biomass and soil respiration are extremely scarce. The large and complex terrain of the Qinghai-Tibet Plateau points to the need of predictive tools to derive estimates of root biomass and soil respiration for time and cost reasons. Various models have been developed to approximate them, often still requiring high-resoluted, area-wide input data sets. Therefore, alternative approaches are necessary with less requirements concerning input variables. We applied different regression models developed from empirical studies with obtainable data sets for the input variables in order to find the most optimum available one to approximate belowground biomass and soil respiration at large scale on the Qinghai-Tibet Plateau. Our comparison with field data shows that our results are consistent to the results of other studies′ direct measurements. The application of regression models allows us to provide a more accurate basis to the pixel-based, area-wide estimation of root biomass and soil respiration on the Qinghai-Tibet Plateau with obtainable data sets. Calculating soil respiration and belowground biomass by means of regression models so supports the assessment of potential greenhouse gas emissions on the Qinghai-Tibet Plateau, further fullfilling our requirement to overcome limited data at a large scale.