Geophysical Research Abstracts
Vol. 21, EGU2019-16995, 2019
EGU General Assembly 2019

Variable rooting strategies stabilize biome productivity

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Tree water access via roots is crucial for forest functioning and therefore a vast variety of rooting strategies have evolved in the global forest systems. Especially, the distribution of roots within the soil column is important for buffering temporal shortages of precipitation. However, dynamic global vegetation models (DGVMs) often condense this variety into biome scale averages, potentially overestimating the dependence of forest functioning on short term precipitation. Here we present first results of implementing variable root systems into a DGVM (LPJmL 4.0) applied to Central- and South-America. We show how variable root systems constrained by soil & sediment thickness enable a better reproduction of state variables like forest cover or biomass pattern as well as intra-annual variability of e.g. evapotranspiration. We find that trade-offs between water accessibility and below ground carbon investment explain local diversity and co-existence of rooting strategies. We present mean rooting depth maps and below ground carbon investment maps based on our modelling results. Conclusively, we propose a stabilizing effect of realized rooting depth on ecosystem productivity.