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Simulating forest productivity along a neotropical elevational transect: temperature variation and carbon use efficiency

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A better understanding of the mechanisms controlling the magnitude and sign of carbon components in tropical forest ecosystems is important for reliable estimation of this important regional component of the global carbon cycle. We used the JULES vegetation model to simulate all components of the carbon balance at six sites along an Andes-Amazon transect across Peru and Brazil and compared the results to published field measurements. In the upper montane zone the model predicted a vegetation dieback, indicating a need for better parameterisation of cloud forest vegetation. In the lower montane and lowland zones simulated ecosystem productivity and respiration were predicted with reasonable accuracy, although not always within the error bounds of the observations. Model-predicted carbon use efficiency in this transect surprisingly did not increase with elevation, but remained close to the 'temperate' value 0.5. This may be explained by elevational changes in the balance between growth and maintenance respiration within the forest canopy, as controlled by both temperature- and pressure-mediated processes.