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Variation in the partitioning of carbon above and belowground in the Brazilian coastal Atlantic forest elevation gradient

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We characterize the spatial trends in carbon storage in both above and below ground biomass along an elevation gradient in Atlantic Forest sites located on the steep slopes of the Serra do Mar on the north coast of the State of São Paulo, southeast Brazil. We used radiocarbon isotope to investigate the role of soil clay content in the dynamics of soil carbon. We assessed tree biomass, coarse woody debris stocks, litter layer and carbon storage in the soil based 1ha plots distributed across the gradient of elevation. Carbon concentration in each compartment were determined and used to convert biomass into carbon stocks. The carbon stock varied along the elevation range from approximately 100 to 150 Mg ha⁻¹ in aboveground and 90–300 Mg ha⁻¹ in belowground. Radiocarbon measured in bulk soil organic matter decrease rapidly from positive values (indicating the predominance of carbon fixed since the 1960s) near the surface to large negative values (indicating that radiocarbon has resided in the soil long enough for significant radioactive decay to occur). The soil in sea level differs markedly from the other soils and D¹⁴C values in this soil are positive, indicating relatively recent origin of the organic matter sampled in this soil. Finally, the total carbon stock varied from approximately 180 to 460 Mg ha⁻¹. Most of the carbon stock was found belowground and not aboveground as normally found in lowland tropical forests. The total stock of carbon increased significantly with elevation. As the soil and air temperature also decreased significantly with elevation, we found a significantly inverse relationship between carbon stock and temperature. Using this inverse relationship, we made a first approach estimate that an increase of 1°C in soil temperature would decrease the carbon stock in approximately 17 C Mg ha⁻¹.