

# Supplementary material for: the fate and transit time of carbon in a tropical forest

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## Radiocarbon as a tool for model testing

Measurements of radiocarbon in ecosystem carbon pools can be used to test the adequacy of model predictions. In particular, the pool age distributions predicted by the model and presented in Figure (4), can be compared with radiocarbon measurements as an independent variable for model confirmation. For this purpose, we developed an algorithm to obtain distributions of radiocarbon in ecosystem pools to obtain the expected variability in radiocarbon values as predicted by the model (Figure 4). Because of the radiocarbon ‘bomb spike’ effect of the 20th century, radiocarbon values change significantly from year to year, and their incorporation in biomass pools is time dependent.

For example, for the year 2010, we predict that for pools with fast cycling rates and narrow age distributions such as the foliage and fine litter pools, radiocarbon values are well constrained within a narrow range. For slow cycling pools such as soil carbon and coarse woody debris, the range in radiocarbon values is much wider (Figure S1). For these slow cycling pools, the number of samples required to characterize well the variability in radiocarbon would be much higher.

Empirical measurements of radiocarbon in ecosystem pools can be used to build frequency distributions that can then be inverted to obtain approximations of age distributions. Through this method, it is possible to independently test our model predictions.

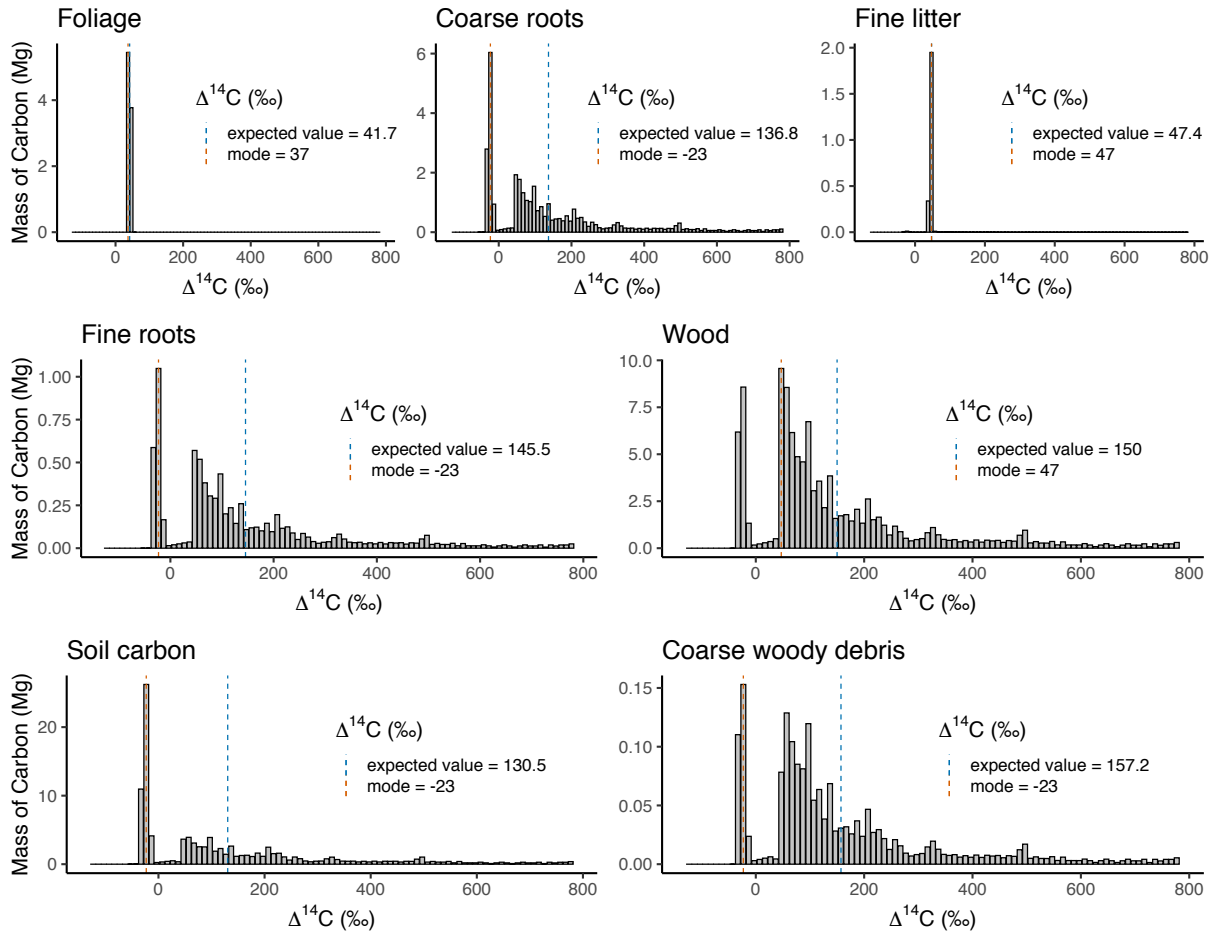


Figure S1: Expected distributions of radiocarbon for each of the pools obtained by taking pool age distributions and predicting the corresponding radiocarbon values from atmospheric  $^{14}\text{CO}_2$ . These radiocarbon distributions are time-dependent, and therefore we present here only the predictions corresponding to calendar year 2010.