ABSTRACT: Forests recovering from disturbance are strong carbon (C) sinks that play an important role in climate regulation through their influence on the global C cycle. Climate change is likely to alter forest recovery dynamics or even prevent recovery, and changes in disturbance-recovery dynamics will impact the global C cycle. To improve understanding of how forest recovery dynamics are shaped by climate and may be impacted by climate change, we are creating a comprehensive database on C cycling in secondary forests and using it, together with biogeochemical process modeling, to understand how and why C cycling in forests varies as a function of ecosystem age, how these patterns vary globally with respect to climate, and how expected changes in atmospheric CO₂ and climate will affect patterns of forest recovery. A review on the subject (Anderson-Teixeira et al. 2013; GCB) indicates that the dynamics of forest recovery are sensitive to climate and are being impacted by increasing atmospheric CO₂ and changing climate. Rates of forest recovery generally increase with CO₂, temperature, and water availability. Drought reduces growth and live biomass in forests of all ages, having a particularly strong effect on seedling recruitment and survival. Responses of individual trees and whole-forest ecosystems to CO₂ and climate manipulations often vary by age, implying that forests of different ages will respond differently to climate change. Furthermore, species within a community typically exhibit differential responses to CO₂ and climate, and altered community dynamics can have important consequences for ecosystem function. Age- and species-dependent responses provide a mechanism by which climate change may push some forests past critical thresholds such that they fail to recover to their previous state following disturbance. Ongoing data synthesis and modeling efforts are aimed at enhancing understanding of the interactive effects of forest age and climate change on carbon cycling.