Organic carbon storage in steep mountain streams of Chile

Nicholas A. Sutfin[1], Bridget K. Livers[1], Ellen Wohl[1], Fernando Ugalde[2], and Luca Mao[2]
[1]Department of Geosciences, Colorado State University
[1]Departamento de Ecosistemas y Medio Ambiente, Pontificia Universidad Católica de Chile

Abstract. We compare organic carbon storage along stream networks in coastal ranges of Chile with abundant storage in the Colorado Front Range. Our work on mountainous streams of the Colorado Front Range indicates that, despite steep, narrow valley geometry, these river corridors can store substantial amounts of organic carbon in sediment and as downed wood on the valley bottom. This work also indicates that wider, lower gradient portions of the river network are disproportionately important in storing carbon in the form of downed, dead wood and organic-rich sediments in beaver meadows. We compare organic carbon storage in small, steep channels within the coastal ranges of Chile to evaluate how well the patterns we have observed in Colorado represent other mountainous environments. Along a tectonically active continental margin, Chilean streams are prone to valley-side landslides and to debris flows and rainfall-generated floods within the river corridor. Despite lithologic variability among sites, few fine sediments or soils are present along these rivers and finer grained organic matter is limited. Downed wood is abundant, however, and constitutes the greatest reservoir of organic carbon. We sampled valley-bottom organic matter in sediment and surveyed downed wood to estimate the magnitude of organic carbon storage per unit area. As expected, values of carbon storage along river corridors within native beech (Nothofagus) and exotic pine plantation forest are lower than values along river corridors of the Colorado Front Range. We attribute these lower values to the higher magnitude and more frequent geomorphic disturbances along river corridors in Chile, rather than to differences in gross primary productivity of the watershed. More frequent geomorphic disturbances in Chile effectively flush particulate organic carbon downstream beyond the mountains.