



## Influence of erosion rates on particle size and carbon export from upland landscapes

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Erosion in soil-mantled landscapes affects soil thickness, which modulates the production of soil. Soil thickness and erosion rate, combined with soil mixing processes, control the time particles spend in the soil. This time strongly influences both the physical and chemical characteristics of soil particles. There is increasing recognition that long term transport and sequestration of carbon in soils and sediments is strongly related to both the size and mineralogy of the particles therein. Here we examine how clay formation in soils is strongly influenced by erosion rates and the impact of clay formation on carbon sequestration. We show that the flux of mineral-associated carbon from upland landscapes has two competing influences: increased erosion rate increase the total flux of material from the system, but decreased erosion results in more clays, which can stabilize more carbon as it is transported from the system. Our simulations suggest that the former influence is likely to dominate. We also show that mixing can strongly affect particle residence time in soils: although the mean residence times of particles within unmixed and fully mixed soils are the same, the distributions of residence times are different: material leaving unmixed soils will have higher clay contents and will thus be more exporting mineral-associated carbon more effectively than material leaving well mixed soil.