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Carbon sequestration between the actual and the potential timberline – Cembran pine forests in Obergurgl, Ötztal

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Climatic change and abandonment of (sub)alpine pasture land enable trees to migrate into areas that are presently covered by dwarf-shrub communities. The advent of trees has the following consequences: (1) changed quality of aboveground litter, (2) changes in the diurnal and seasonal amplitude of soil temperature, (3) changes in the soil microbial community, (4) changes in the rooting density and depth. In Obergurgl, Ötztal, Austria, a dwarf-shrub community in 1800-2100 m a.s.l. is gradually encroached with Cembran pine. In a field survey we observed that soils under pine contain considerably less C than soils under dwarf shrub. We present data from a field assessment showing the extent of the effect. Further on, we propose several hypotheses explaining the ecosystem dynamics together with efficient methods to test the hypotheses. The implications of the change in vegetation and soil carbon are interpreted in the context of the ecosystem services carbon sequestration, slope stability and water holding capacity.