Quantification of carbon export after fire by water erosion

Cornelia Rumpel, Abibou Ba, Frédéric Darboux, Vincent Chaplot, Olivier Planchon

Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02797, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02797
EGU General Assembly 2008

Quantification of carbon export after fire by water erosion

C. Rumpel (1), A. Ba (1), F. Darboux (2), V. Chaplot (3), O. Planchon (3)

(1) CNRS, Laboratoire de Biogéochimie et Ecologie des Milieux Continentaux, Centre INRA Versailles-Grignon, Thiverval-Grignon, France (cornelia.rumpel@grignon;inra.fr)

(2) INRA Orléans - Science du Sol, Olivet, France

(3) SOLUTIONS, IRD, South Africa and Thailand

Wildfire may lead to long-term soil carbon gain or loss, depending on the ability of the system to conserve chemically stable black carbon (BC). Rainfall events can lead to erosion of this organic matter form deposited on the soil surface. The objective of this study was to quantify horizontal as well as vertical BC transport during a rainfall simulation experiment with sandy soil in northern Senegal. The conceptual approach consisted of artificial burning of harvested residues, which were subsequently exposed to two different rainfall regimes: with and without occurrence of splash. After the rainfall simulation experiment, we quantified the total amount of carbon added to the soil and chemically recalcitrant black carbon (BC) (1) exported from the plots, (2) infiltated into the soil and (3) remaining on the soil surface.

Transport processes affected around 40-60 % of the total carbon and BC added. Our results showed that 30 % of the total carbon added by the fire was exported from the site, whereas another 15 % were vertically transported into the soil. BC, which represented about 40 % of the total carbon added, was transported in higher proportions compared to total C (horizontally as well as vertically) when the splash erosion was allowed to occurr. The preferential export of BC was strongly dependent on the rainfall regime: when splash erosion was suppressed, BC export was greatly reduced, whereas BC infiltration increased compared to rainfall with splash occurring. We conclude that water erosion of BC during rainfall events after wildfire is an important

factor determining the fate of potentially stable carbon in the ecosystem.