Geophysical Research Abstracts
Vol. 16, EGU2014-2395, 2014
EGU General Assembly 2014

Comparing carbon sequestration potential of pyrogenic carbon from natural and anthropogenic sources

Cristina Santin (1), Stefan Doerr (1), and Augustin Merino (2)

(1) Swansea University, Geography, Swansea, United Kingdom (s.doerr@swan.ac.uk), (2) Department of Soil Science and Agricultural Chemistry, University of Santiago de Compostela, Spain.

The enhanced resistance to environmental degradation of Pyrogenic Carbon (PyC), both produced in wildfires (charcoal), and man-made (biochar), gives it the potential to sequester carbon by preventing it to be released into the atmosphere. Sustainable addition of biochar to soils is seen as a viable global approach for carbon sequestration and climate change mitigation. Also the role of its 'natural counterpart', i.e. wildfire charcoal, as a long-term carbon sink in soils is widely recognized. However, in spite of their fundamental similarities, research on the potential of 'man-made' biochar and wildfire charcoal for carbon sequestration has been carried out essentially in isolation as analogous materials for accurate comparison are not easily available.

Here we assess the carbon sequestration potential of man-made biochar and wildfire charcoal generated from the same material under known production conditions: (i) charcoal from forest floor and down wood produced during an experimental boreal forest fire (FireSmart, June 2012, NWT- Canada) and (ii) biochar produced from the same feedstock by slow pyrolysis [three treatments: 2 h at 350, 500 and 650°C, respectively]. The carbon sequestration potential of these PyC materials is given by the recalcitrance index, R50, proposed by Harvey et al. (2012). R50 is based on the relative thermal stability of a given PyC material to that of graphite and is calculated using thermogravimetric analyses.

Our results show highest R50 for PyC materials produced from down wood than from forest floor, which points to the importance of feedstock chemical composition in determining the C sequestration potential of PyC both from natural (charcoal) and anthropogenic (biochar) sources. Moreover, production temperature is also a major factor affecting the carbon sequestration potential of the studied PyC materials, with higher R50 for PyC produced at higher temperatures. Further investigation on the similarities and differences between man-made biochar and wildfire charcoal is needed to elucidate the potential of knowledge transferability of PyC characteristics between the biochar and the wildfire research communities.

Reference: Harvey et al. (2012) An index-based approach to assessing recalcitrance and soil carbon sequestration potential of engineered Black Carbons (Biochars). Environmental Science & Technology 46:1415-1421.