Is Peat Accumulation Really Accelerating in Northeast China?

Author: Loehle, Craig

Source: Mountain Research and Development, 30(3) : 316

Published By: International Mountain Society

URL: https://doi.org/10.1659/MRD-JOURNAL-D-10-00058.1

Is Peat Accumulation Really Accelerating in Northeast China?

Comment on Bao et al (2010): Recent carbon accumulation in Changbai Mountain peatlands, northeast China (MRD vol 30 no 1)

Bao et al (2010, this journal) studied peat in the Changbai Mountains, China, using lead isotopes to date layers of the peat. They estimated peat accumulation with depth based on thickness and density and converted this to accumulation versus time. They found peat accumulation rates for all 8 cores to have increased from 100 to 200 g m^2 y^{-1} in 1800 or so to between 500 and 1300 g m^2 y^{-1} in 2000 (their Figure 4). Unfortunately, their analysis assumed that there is no loss of peat mass to the atmosphere.

As surface vegetation in peat dies, it can become buried if the peat is growing in depth. As it is buried, it undergoes some decomposition before becoming refractory and well preserved at depth. Peat can exist above the water table, where it undergoes oxic decomposition (Nedwell and Watson 1995). In addition, peat can oxidize 5–7 cm or more below the water table in apparently anoxic zones, possibly due to oxygen available in the rhizosphere of plant roots (Watson et al 1997). Finally, it is almost always the case that the water table in a peat bog fluctuates seasonally to at least some degree. When it is low, parts of the "anoxic" zone will be exposed and subject to decay. We can confirm this diagnosis by noting that the zone of "rapid accumulation" in Bao et al began at 25–40 cm depth, easily within the decomposition zone. The tops of these cores were not necessarily even anaerobic, as no data on water table depth were provided.

If peat progressively decays as it becomes buried, the reduced amounts of residual peat with depth will give exactly the impression of reduced carbon accumulation in the deeper layers, as found by Bao et al (2010). Proper estimation of peat accumulation rates in the top zone requires gas exchange measurements integrated over the year (eg Wickland et al 2001). This estimate can be compared to deeper levels below the oxidation zone to evaluate changes in accumulation rates, although the top layers may not necessarily be subdivided further. Thus the analysis by Bao et al is not suitable for input to global carbon budgets per se, and further analyses are necessary to evaluate the status of the peatlands in the Changbai Mountains.

REFERENCES

Bao K, Xiaofei Y, Jia L, Wang G. 2010. Recent carbon accumulation in Changai Mountain peatlands, northeast China. *Mountain Research and Development* 30(1):33–41. doi: 10.1659/MRD-JOURNAL-D-09-00054.1.

Nedwell DB, Watson A. 1995. CH_4 production, oxidation and emission in a U.K. ombrotrophic peat bog: Influence of SO_4^{2-} from acid rain. *Soil Biology and Biochemistry* 27(7):893–903.

Watson A, Stephen KD, Nedwell DB, Arah JRM. 1997. Oxidation of methane in peat: Kinetics of CH_4 and O_2 removal and the role of plant roots. *Soil Biology and Biochemistry* 29(8):1257–1267.

Wickland KP, Striegl RG, Mast MA, Clow DW. 2001. Carbon gas exchange at a southern Rocky Mountain wetland, 1996–1998. *Global Biogeochemical Cycles* 15(2):321–335.

AUTHOR

Craig Loehle
craigloehl@aol.com
National Council for Air and Stream Improvement, Inc, 552 S Washington Street, Suite 224, Naperville, Illinois 60540, USA