Iron-protected organic carbon increased during drought in alpine wetland soils

YIYUN WANG[1], XIAOJUAN FENG[1*], HAO WANG[2] AND JINSHENG HE[2,3]

[1] Institute of Botany, Chinese Academy of Sciences, Beijing 100093, China (*correspondence: xfeng@ibcas.ac.cn, wangyy@ibcas.ac.cn)

[2] Northwest Institute of Plateau Biology, Chinese Academy of Sciences, Xining 810008, China (haowang913@126.com , jshe@pku.edu.cn)

[3] Peking University, Beijing 100871, China

In this study, we conducted a mesocosm drought experiment in Qinghai-Tibet Plateau to simulate a three-year water-table decline by 20 cm in an alpine wetland in comparison to the control (water-logging). We found that in soil from 10–20 cm, both water extractable OC and dissolved lignin decreased in the drought treatment compared with the control (from 2.24 ± 0.44 mg g^{-1} to 0.75 ± 0.02 mg g^{-1} and from 111 ± 9 μg g^{-1} OC to 50 ± 10 μg g^{-1} OC, respectively), confirming that organic matter decomposition was enhanced after exposure to oxygen. We then used a dithionite-citrate-bicarbonate (DCB) method to release the iron oxide "protected" organic matter [1] and found that a significantly higher proportion of OC (up to 11.8%) was bound to iron oxide in the 30–40 cm layer of the drought treatment than that in the control (8.3% ± 1.1%), indicating that more OC was protected by newly precipitated iron oxide during drought. Furthermore, increased amount of vanillyl and syringyl phenols were found associated with iron at 10–20 cm in the drought soils. Although drought increased the soil respiration rate [2], it also increased the portion of iron-protected OC. We therefore propose that wetland drought has a differential effect on the stable soil carbon pool in the longer term.

[1] Lalonde et al. (2012) *Nature* **483,** 198-200. [2] Hao W et al. (2014) *Chinese Journal of Plant Ecology* **38,** 619-625.