UFZ-Seminar „Water and Environment“

HELMHOLTZ ZENTRUM FÜR UMWELTFORSCHUNG UFZ

15. January 2017, 3 p.m.

Seminar Room 1, Brückstr. 3a, Magdeburg

Thomas Alexander Davidson

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will give a talk on:

Synergy between nutrients and warming enhances methane ebullition from shallow lakes

Lakes and ponds are important natural sources of the potent greenhouse gas methane (CH_4), with small shallow waters being hotspots of emission (Tranvik et al. 2009, Holgerson and Raymond 2016). Episodic ebullition (bubbles) of CH_4 makes up a large proportion of total CH_4 flux (DelSontro et al. 2016, Wik et al. 2016b). However, difficulty measuring such episodic events (Wik et al. 2016a) reduces the predictability of the CH_4-flux response to nutrient enrichment and rising temperatures. Here, the world's longest-running, mesocosm-based, shallow lake climate change experiment was used to investigate how the combination of warming and eutrophication (i.e., nutrient enrichment) affects CH_4 ebullition. Eutrophication without heating increased the relative contribution of ebullition from 51% to 75%. More strikingly, the combination of nutrient enrichment and experimental warming treatments, of +2-3ºC and +4-5ºC, had a synergistic effect, increasing mean annual ebullition by at least 1900 mg CH_4-C m^{-2} yr^{-1}. In contrast, diffusive flux showed no response to eutrophication and a small increase at higher temperatures (average 63 mg CH_4-C m^{-2} yr^{-1}). As shallow lakes are globally the most common lake type, abundant in highly climate-sensitive regions (Verpoorter et al. 2014) and most vulnerable to eutrophication, these results suggest their current and future contributions to atmospheric CH_4 concentrations may be significantly underestimated.