Short lived peaks of stem methane emissions in temperate black alder forest - irrelevant for ecosystem methane budgets?

Daniel Köhn, Anke Günther, and Gerald Jurasinski
University of Rostock, Landscape Ecology, Rostock, Germany (daniel.koehn@uni-rostock.de)

Tree stems can be a source of the greenhouse gas methane (CH$_4$) and locally as regionally important to the overall GHG budget. Stem emissions even hold the potential of narrowing down knowledge gap in the global methane budget. However, assessments of the global importance of stem CH$_4$ emissions are complicated by a lack of research and high variability between individual ecosystems. Here, we determined the contribution of emissions from stems of mature black alder (Alnus glutinosa (L.) Gaertn.) to overall CH$_4$ exchange in two temperate peatlands. We measured emissions from stems and soils using closed chambers in a drained and an undrained alder forest over 2 years. Furthermore, we studied the importance of alder leaves as substrate for methanogenesis in an incubation experiment. Stem CH$_4$ emissions at the undrained alder forest were very variable in time and only persisted for a few weeks during the year. Generally the drained alder forest did not soil nor stem CH$_4$ emissions. Different upscaling approaches were assessed and all approaches showed that stem CH$_4$ emissions contributed less than 0.3 % to the total ecosystem CH$_4$ budget. However, stem CH$_4$ seem to depend strongly on the hydrological regime and therefore vary strongly between ecosystems. Hence, every ecosystem must be considered attentively with respect to their stem CH$_4$ emissions.