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ABSTRACT TITLE: Cryptic Methane Emissions from Upland Forest Ecosystems

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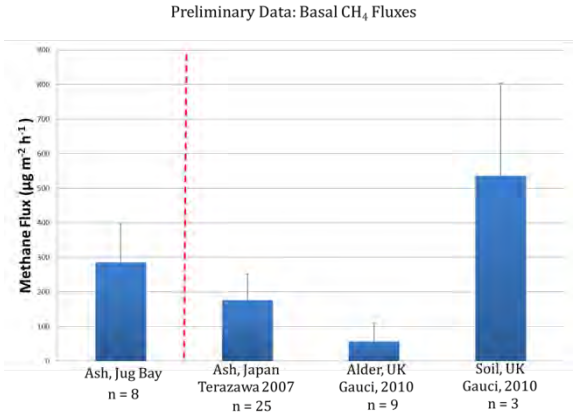
Background

There is evidence that upland ecosystems emit 36% as much methane to the atmosphere as global wetlands, yet we know almost nothing about this source. Earth system models will need to be refined in order to quantify CH_4 emissions from upland forests, and this requires a more nuanced understanding of the biogeochemical processes that govern upland CH_4 emissions. Our objectives were to test the paradigm that upland trees transpire methane, and test the biogeochemical assumptions of an existing global model of upland methane emissions.

Methods

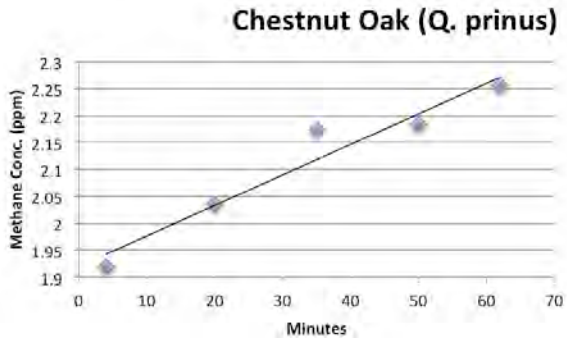
Transects were established in two temperate forests, each anchored on the dry end by upland forest and on the wet end by a forested wetland (Figure 1). At one site (SERC) the wet-end forest is saturated seasonally during the winter and dry during the summer, while at the second site (Jug Bay) the forest wet year around. We developed closed chambers to detect CH_4 emissions from the full range of tree diameters present at our site. Previous studies of methane emissions from trees have been biased toward small-diameter trees that account for a relatively small fraction of mature forests. The result is two versions of tree chambers, one for small-diameter stems and one for larger stems (Figure above). We are in the process of fitting chambers to the trees on each transect and present limited preliminary data below.



Results and Discussion

Methane emissions from *Fraxinus* spp. at Jug Bay in Sep 2012 were higher than similar species reported by Gauci et al. (2010), and 60% of soil emission rates from the same Gauci et al. (2010) study on an area basis (Figure right).

We attempted a flux measurement from one upland tree to test our methods. The *Quercus prinus* is located in a site where the water table is >30 cm deep during the wettest time of year (Jan-Mar) and soils clearly indicate the site is upland. Despite the fact that it was winter, we measured significant CH_4 flux from the stem of this tree, indicating that our design will be sensitive enough to detect the low emission rates that are expected in upland forests.



Gauci, V. et al. 2010. Woody stem methane emission in mature wetland alder trees. *Atmospheric Environment* 44:2157-2160