Key note presentation

Combining multiple isotopes and metagenomic to delineate the role of canopy nitrification at ICP Forest sites

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Forest canopies influence our climate through carbon, water and energy exchanges with the atmosphere. However, less investigated is whether and how tree canopies change the chemical composition of precipitation, with important implications on forest nutrient cycling. In a previous study, we provided for the first time unequivocal isotopic evidence that biological nitrification in tree canopies was responsible for significant changes in the amount of nitrate from rainfall to throughfall across two UK forests (*Guerrieri et al.* 2015). This finding strongly suggested that bacteria and/or Archaea species of the phyllosphere were responsible for transforming atmospheric N before it even reaches the soil. Despite epiphytes representing an important component of tree canopies (*Kemball et al.* 2014), attention has been mostly directed to their role as pathogens, while we still do not know whether and how they affect nutrient cycling. Here we give an overview of the recently EU funded project – NITRIPHYLL – within the MSCA programme. The project aims to i) quantify biological canopy nitrification in tree canopies using $\delta^{15}N$, $\delta^{18}O$ and $\delta^{17}O$ in forest water and ii) characterize microbial communities harboured in tree canopies for two of the most dominant species in EU (*Fagus sylvatica* L. and *Pinus sylvestris* L.) using metagenomic tecniques. We consider 11 sites included in the ICP forest network, chosen along a climate and nitrogen deposition gradient (*Waldner et al.* 2014). We will present preliminary results regarding the microbial diversity in forest canopies and water samples (rainfall and throughfall) at some of the investigated ICP sites. In particular we will characterize the composition of epiphyfitic phyllosphere microbial communities and explore differences between the two investigated species for the relative abundance of bacterial and Archaea classes and - within them – identifying those species related to N cycling.

Guerrieri et al. (2015). Isotopic evidence for the occurrence of biological nitrification and nitrogen deposition processing in forest canopies. Global Change and Biology, 21 (12): 4613-4626.

Kembal et al. 2008. Relationships between phyllosphere bacterial communities and plant functional traits in a neotropical forest. PNAS, 11 (38): 13715-13720

Waldner P et al. (2014). Detection of temporal trends in atmospheric deposition of inorganic nitrogen and sulphate to forests in Europe. Atmospheric Environment, 95: 363-374