5. Ecological changes in soil methanotroph community structure and methane fluxes: an adaptative response to afforestation

Loïc Nazaries

It is well known that non-forested lands such as pastures produce methane gas (CH_4) whereas forests represent a strong CH_4 sink into soil. CH_4, which plays an important role in global warming, is oxidised by micro-organisms called methanotrophs. This study focused on the sustainability of methanotrophs after a land-use change such as afforestation of pasture. Soils were sampled from three sites in New Zealand: a native forest (Puruki) and two forests of manuka-kanuka trees (Turangi) converted from pasture over 35 and 55 years ago. Identification of the active populations used PLFA analysis combined with stable isotope probing (SIP). Structure of the methanotroph communities was analysed by T-RFLP. Determination of the variability in community structure was carried out with the additive main effect and multiplicative interaction (AMMI) model. Total PLFA abundance data showed that type I and type II methanotrophs were present in all soils whereas PLFA-SIP data suggested that type II methanotrophs was the most active population. T-RFLP data revealed that type II methanotrophs dominated the methanotroph community. However, there was no significant difference in methanotroph community structure between the sites. In conclusion, our data suggest that afforestation of pasture has a rapid effect on the methanotroph community structure with the establishment of a stable population of type II methanotrophs. This effect occurred in forests as young as 35 years.