# Root-associated branched GDGTs in terrestrial archives: potential bias on temperature estimates

A. HUGUET[1]*, M. GOCKE[2], S. DERENNE[1], C. FOSSE[3] AND G. L. B. WIESENBERG[4]

[1]METIS, CNRS/UPMC UMR 7619, Paris, France (*correspondence: arnaud.huguet@upmc.fr)
[2]Department of Agroecosystem Research, BayCEER, University of Bayreuth, Bayreuth, Germany
[3]Chimie ParisTech (ENSCP), Laboratoire de Spectrométrie de Masse, Paris, France
[4]University of Zurich, Department of Geography, Zurich, Switzerland

Branched GDGTs (brGDGTs) are increasingly used as paleotemperature proxies. Nevertheless, only a few studies of these bacterial membrane lipids were performed in terrestrial archives. In this work, brGDGTs were analysed in non-calcified and calcified living and dead roots, surrounding soil/sediment as well as reference material distant from roots. Samples were collected from two forest sites near Sopron (NW Hungary) and from a loess-paleosol sequence located at Nussloch (SW Germany), where calcified roots are highly abundant (up to 200 $m^{-2}$). In both sites, brGDGTs were more abundant in root samples and/or rhizosphere compared to reference material, suggesting that brGDGT source microorganisms are closely associated with the root surface. In addition, low concentrations of intact polar brGDGTs, presumably deriving from recently active microorganisms, were detected in Late Pleistocene sediments at Nussloch, showing that brGDGTs may also be produced in deep subsoils > 2 m. In the forest subsoil at Sopron and in those intervals of the Nussloch profile where the ancient roots were most abundant, GDGT-based temperatures from calcified roots and rhizosphere were lower than those from reference material, likely due to the post-sedimentary incorporation of brGDGTs related to deep-rooting source plants. In contrast, brGDGT-derived temperatures do not seem to be influenced by the presence of roots in topsoil, likely due to the much higher density of roots in topsoil than in subsoil and to the equilibration of root and non-root signal. Therefore, brGDGT-derived temperatures have to be interpreted with caution in terrestrial archives, especially when (calcified) roots are locally abundant (>> 50 $m^{-2}$).