Nearly two decades of stable isotope probing: So where are we now with using the technique to study soil organic matter cycling?

The concept of following the assimilation of stable isotope labelled substrates into newly synthesised soil microbial biomass biochemicals (= biomarkers) was first demonstrated nearly 20 years ago in studies of unculturable soil methanotrophs [Radajewski et al., 2000 Nature; Bull et al., 2000 Nature]. These landmark papers laid the foundations for an approach that has come to be generally known as stable isotope probing (SIP). Historically, SIP has developed along two distinct paths, namely those applications focussing on genomic material (DNA and RNA) and those targeting small molecules, such as phospholipid fatty acids (PLFAs). In recent years applications have developed to include other classes of biochemicals that can be linked to various aspects of soils biomass activity and organic matter cycling. This presentation will explore how the small molecule SIP technique has progressed from the original and widely used 13C-PLFA taxonomic approach to a significantly more powerful tool for exploring soil organic matter dynamics in relation to: (i) revealing the assimilation of different substrates, (ii) the turnover rates of different organic matter pools, (iii) the connectivity between C and N cycles, and (iv) trophic interactions.