

## Priming effect and isotope $^{13}\text{C}$ dynamics at natural abundance during the biodegradation of lignin in a soil environment

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For the progress of isotope-based studies of decaying debris in soil profiles, factors that affect isotope  $^{13}\text{C}$  dynamics of plant-derived biopolymers during decomposition need to be analysed. Many applied biogeochemical investigations are paying attention to isotope-ratio mass spectrometry, although for obtaining advanced accuracy when using these techniques, particularly for soil organic matter (SOM) studies at natural abundance levels, the appraisal of possible isotopic fractionation occurring during different stages of plant decomposition is essential. New insights into possible fractionation processes occurring during decomposition of a highly resistant plant component such as lignin (which remains during the last stages of vegetal decomposition) would have some important implications for assessing long-term SOM quality. Despite the direct implications for multitude of research lines, C isotopic dynamics during biological transformations of major structural biopolymers remains mostly unexplored and knowledge of the factors affecting the  $^{13}\text{C}$  SOM fingerprint are scarce. Thus, this research evaluates the isotopic  $^{13}\text{C}$  discrimination during the biodegradation of lignin to obtain more reliable estimates of the contribution of this highly resistant plant component to SOM buildup, as well as the influence of soil environment that may further exacerbate microbial discriminatory actions. Changes in  $^{13}\text{C}$  composition during aerobic decomposition of the following substrates: a) hydrolytic lignin, b) soil, and c) soil+lignin mixture, were monitored over a 10 months incubation period. The results indicate that SOM decomposed faster than pure lignin. Also, soil+lignin mixture showed a synergic degradative behaviour with a greater mineralization rate than adding together soil and lignin individual rates, suggesting that priming effects can be produced during in-soil biodegradation of lignin. Isotopic fingerprint of the  $\text{CO}_2$  released from lignin during biodegradation showed a lower  $^{13}\text{C}$  concentration than the initial substrate and consequently, with ongoing decomposition, the solid residue became progressively  $^{13}\text{C}$ -enriched.

## Lithosphere-asthenosphere interactions (Middle-Atlas (Morocco): Geochemical highlights

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The Neogene-Quaternary Middle Atlas province is the largest and youngest volcanic field of Morocco, bringing up a large variety of mantle xenoliths. The eighteen xenoliths are mainly lherzolites, but also include harzburgite, wherlite and pyroxenite. A major, trace elements & Sr-Nd-Pb-Hf isotopes study was conducted on CPX and host-rocks (WR) coupled petrographic constraints. Lherzolites show flat REE patterns with variable enrichment in LREE ie. various degrees of metasomatism. Harzburgites present a significant MREE enrichment. Sr isotopes of both WR and CPX show low ratios and define a limited range of variation ( $0.7023 < ^{87}\text{Sr}/^{86}\text{Sr} < 0.7035$ ). Reported on the Nd-Sr diagram, they define a field extending between the DMM and HIMU compositions. Pb isotopic ratios are high and range, for  $^{208}\text{Pb}/^{204}\text{Pb}$ , between 38.87 and 40.54, for  $^{207}\text{Pb}/^{204}\text{Pb}$  from 15.59 to 15.64, and for  $^{206}\text{Pb}/^{204}\text{Pb}$  from 19.08 to 20.29. Two Sm/Nd internal isochrons have been calculated for two different volcanic sites and yield Pan-African and Alpine indicative ages. Together, these constraints allow us to propose that Middle-Atlas mantle experienced several lithosphere asthenosphere interaction processes. Such an HIMU signature is common in the European subcontinental mantle sampled by Cenozoic volcanism. At last, this study demonstrates that even in geodynamical complex zones experiencing various thinning episodes, preserved old lithospheric mantle can be present in continental lithosphere.