Production of metal chelating ligands by soil horizon specific ectomycorrhizal fungus

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Mycorrhizal symbiosis with fungi is an important way for roots of most plants to gain nutrients from the soil. This is achieved by fungal exudation of specific ligands (i. e. low molecular mass orgnanic acids (LMMOAs) and siderophores) with high metal complexing ability that promote mineral dissolution, and thereby increase the bioavailability of essential mineral nutrients. The northern boreal zone is dominated by stratified podzol soils where plant nutrients are present in different forms along the profile. LMMOAs and siderophores have been found in forest soil solution at varying concentrations and composition depending on the soil horizon. The ectomycorrhizal fungal community composition also varies by depth. Our hypothesis is that these soil horizon restricted variations of ligands and fungal taxa reflect adaption of the fungi to the prevailing nutrient availabilities of the different soil horizons.

To test our hyothesis, we studied the production of LMMOAs and siderophores in liquid cultures of six isolates representing four different taxa of the genus *Piloderma* (abundant in boreal forests) isolated from root tips in a well developed podzolic soil profile in northern Sweden. The experiment was performed under iron limited conditions to promote the production of ligands. We found that one of the isolates, which was present in the complete profile, from the organic horizon troughout the mineral horizons, produced several different LMMOAs in high concentrations. In contrast, an isolate restricted to the iron oxide rich soil horizon (illuvil, B-horizon) was only able to produce a few different types of LMMOAs in significantly lower concentrations. However, this isolate produced siderophores at the highest concentrations, enabling growth at low bioavilibility of iron. The isolates that showed low production of siderophores were restricted from the organic and eluvial (E) soil horizons where the availabilty of iron is high.

These findings indicate that ectomycorrhizal fungi are adapted to the accecibilty of nutrients in their specific sourrundings by the production (and possibly regulation) of exedudates of optimal composition and concentration.

Distinct neon isotope compositions found in polycrystalline diamonds and framesites from the Jwaneng kimberlite pipe, Botswana

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We have undertaken helium, neon and argon analyses of eleven polycrystalline diamonds from the Jwaneng kimberlite pipe, Botswana, with known diamond paragenesis. In contrast to the findings of crustal noble gases in framesites from the same kimberlite pipe by Honda *et al*. 2004 [1], the Jwaneng polycrystalline diamonds appear to have similar noble gas, particularly neon, isotope compositions as observed in MORBs, regardless of their parageneses. This implies that the Jwaneng polycrystalline diamonds may have formed in recent time, possibly as young as the kimberlite emplacement age of 235Ma. In contrast, Jwaneng framesites could be as old as the diamond inclusion age of 2.9 Ga. Furthermore, neon isotope compositions in the mantle where Jwaneng diamonds formed appear to have temporally changed from crustal Ne (as observed in the framesites) to the MORB-like Ne (as observed in the polycrystalline diamonds).

The apparent difference of neon isotope compositions and formation ages between the Jwaneng polycrystalline diamonds and framesites may imply that primordial noble gases in the upper part of the mantle have significantly been outgassed at early stage of the earth's formation, and that crustal noble gases could have been introduced into the diamond stability field of the sub-continental mantle by subduction-related processes. Subsequently primordial noble gases were continuously supplied from the lower to upper part of the mantle in order to form MORB-like Ne compositions in the upper mantle.

[1] Honda *et al*. (2004) *Chemical Geology* **203**, 347-358.