Effect of N on microbially mediated weathering of primary minerals

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The aim of this study was to determine whether N addition affects: (a) composition of microbial communities in forest soil responsible for mobilization of nutrients from primary minerals, (b) kinetics of organic acid production, (c) rate of nutrient release from primary minerals and uptake by plants, and (d) C allocation patterns in the rhizosphere. We used microcosms with pine seedlings growing in mor layer soil from granite outcrops in a mixed pine-spruce-birch forest. Fungal mats often observed at the mor layer-rock interface harbor microbial communities that mobilize mineral nutrients from granite rocks and/or capture and transport the mobilized nutrients to tree roots via mycelial networks of ectomycorrhizal fungi. The growth substrate was amended with quartz, apatite, biotite or no minerals and two concentrations of a slow release N fertilizer in factorial combinations. Microcosms were sampled destructively after 0, 6, 12 & 60 weeks. Bacterial and fungal communities were analysed by DGGE & 454 pyrosequencing and soil solutions sampled to study kinetics of organic acid production (LC-MS) and for elemental analysis (ICP-AES) to determine weathering rates. C allocation patterns were studied using ^{13}C-RNA based stable isotope probing (SIP) of rhizosphere microbial communities. After 12 weeks there were only small changes in rhizosphere bacterial communities in response to N application and/or mineral amendments but fungal community structure exhibited larger changes. N had a negative effect on mobilization of nutrients from these minerals into the soil solution, and also reduced plant nutrient uptake. Seedlings in apatite-amended substrates had higher biomass compared to those grown in biotite-treated substrates and also higher P concentrations.

Contemporaneous crustal records in the eastern and western Dharwar craton: Evidence from U- Pb and Lu - Hf isotope sytematics

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Combined U - Pb and Lu - Hf isotope systematics of detrital (metasedimentary) and magmatic (orthogneissic) zircon grains from the eastern and western Dharwar craton provide new insight on the tectonomagmatic evolution of this ancient crust in the Indian shield. This data set establish the antiquity and nature of the source magma (juvenile or recycled) sampled by the analyzed zircon grains and provide a better understanding of the Archean curstal evolution in the Indian shield. For this study we have selected five samples (three from the western and two from the eastern block) thatyielded reasonable number of zircon grains.

U - Pb ages for detrital zircon grains suggest presence of ≥3.4 Ga crustal components in both the western block and the eastern block of the Dharwar craton. Zircon from magmatic rocks of the western block yielded ages ranging between 3.1 - 3.2 Ga, while those from the eastern block show a bi-model distribution with records of older components (3.0 - 3.2 Ga) and presence of younger events (overgrowth at 2.7 and 2.5 Ga). Magmatic and detrital zircon grains of western Dharwar block exhibit εHf(t) of +1 to +5 and Hf model ages of 3.25 - 3.45 Ga suggesting formation of juvenile crust during this epoch. A predominant phase of crustal reworking during 2.85 - 3.1 Ga could be inferred from the subchondritic εHf values (-5 to -0.9) for detrital zircon grains.

The age data for majority of the detrital and few magmatic zircon grains from the eastern Dharwar craton suggest formation of juvenile crust (εHf of +1 to +4) during 3.2 to 3.6 Ga. A crustal reworking phase during 2.5 to 3.0 Ga could be inferred from the εHf ranging from +4 to -16 in majority of the magmatic and some detrital grains. The combined U–Pb-Hf isotope data is consistent with the idea that crust formation processes took place contemporaneously in both western and eastern blocks of the Dharwar craton.

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