Evolution of volcanic aerosol over the North Atlantic Ocean

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In the North Atlantic region volcanic exhalation from Iceland can be expected to significantly contribute to the natural SO_4 budget as sulfur gases typically comprise a large fraction of volcanic gas emissions, even at the quiescent stage. In addition, strong winds can generate dust storms over Arctic deserts, and dust plumes may be transported over great distances impacting on air quality in the British Isles and continental Europe [1]. Here we report real-time observations using a quadrupole aerosol mass spectrometer (Q-AMS) at the Mace Head Atmospheric GAW Research Station, on the west coast of Ireland. Together with other real time measurement techniques operated at this station Q-AMS registered volcanic sulfate and dust plumes from Iceland in air advected over the North Atlantic Ocean. Following this event, elevated levels of sulphate and light absorbing particles were encountered at Mace Head. Concurrently nitrate levels remained low and largely unchanged indicating no major contributions from anthropogenic pollution. Advection of sulphate aerosol formed from direct sulphur emissions from volcanoes caused significant changes in the aerosol chemical composition and size distribution. A concurrent dust outbreak from Iceland increased the level of absorbing material. These results suggest that volcanogenic emissions and Aeolian dust from Arctic deserts in Iceland can be potentially significant regional sources of aerosols over the North Atlantic and therefore should be adequately considered in regional and global climate models.

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Microbial population structure at low-temperature siliceous Fe-deposits at the Jan Mayen hydrothermal fields

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Large amounts of siliceous Fe-hydroxides are deposited by low-temperature hydrothermal venting distal to the high-temperature vents at the southwestern part of the Mohns Ridge close to Jan Mayen. The deposits occur as rust coloured mounds and small chimney-like structures along faults and fissures in the rift valley for distances of several hundreds of metres. The deposits have a stratified structure of millimetres to centimetres thick yellow to dark brown laminated layers that are separated by millimetres to centimetres sized cavities. The individual layers and lamina have a highly porous microtexture of various filamentous particles. The dominating particles in brown layers are 1 µm thick tubular and flat, twisted and branching filaments resembling stalks of iron-oxidising bacteria like *Gallionella sp* and the newly described *Mariprofundus ferrooxidans* that are encrusted by various amounts of Fe-hydroxide.

The analytical power of environmental DNA sequences for modelling microbial ecosystems depends on accurate assessments of population structure. Clone library and 454 pyrosequencing was therefore used to estimate the number of operational taxonomic units (OUT) in these iron rich structures. Phylogenetic analyses evidenced a large diversity of uncultured bacteria where proteobacteria (55%) and planctomycetes (16%) were the numerically abundant groups. There is limited knowledge about iron oxidation as an ancient metabolic pathway and few isoaltes have so far been cultivated. To further investigate the role of this iron mounds into the ecosystems and their interaction with microorganisms, cultivation experiments focusing on enrichment of iron oxidisers using FeS as substrate were applied. Dominant members in the enrichments showed closest phylogenetic affiliation (97% identity) to the newly described *Mariprofundus ferrooxidans* which is a novel lineage of ζ-proteobacteria involved in formation of marine biogenic iron precipitates. The most abundant OTU within the ζ-proteobacteria however shows phylogenetic affiliation to a novel organism present in our enrichments.