Impact of global emissions of primary marine organic aerosols

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Methodology

The chemical composition of marine aerosols as a function of their size is an important parameter for the evaluation of their impact on the global climate system. In this work we model the impact of the primary insoluble organic matter emitted from the sea on the chemical properties of the aerosols at global scale using the Chemistry-Transport Model TM5 coupled to a microphysical aerosol dynamics model that allows the resolution of particle masses and numbers in size. The mass of the emitted sea spray particles is calculated on line and partitioned between insoluble organic and sea salt components in the accumulation mode, using a function that relates the emitted organic fraction to the surface ocean chlorophyll-a concentrations [1].

Results

The annual emissions of marine primary insoluble organics in the sub-micron range is 5.58 Tg/y. Their inclusion results in an increase of primary particulate organic matter over the oceans up to 0.5 μg m^{-3} during the high biological season. Modelled insoluble organic matter is compared with few observations collected at oceanic locations. The model understimates the concentrations in periods of high biological activity, however the uncertainties related to the modelled estimate and the measurements are large.

[1] O'Dowd *et al.*(2008), *GRL*, **35**, L01801

Role of deep crustal contamination in the genesis of Perinthatta anorthosite massif, South India

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The southern granulite terrain (SGT), south India, is an ensamble of Precambrian granulite terrains separated by Neoproterozoic shear systems. The Perinthatta anorthosite massif (PAM) is a ~ 60 sq. km elliptical body, emplaced within the Archaean granulite domain of the SGT along the Bavali-Moyar shear zone system. Spatially, the PAM is associated with Archaean charnockites, pyroxene granulites and presumably Archaean metasediments-the Wynad schist belt. Previous studies suggest that the PAM could be broadly coeval with several small discrete bodies of gabbro, granophyre and syenite localised along the Bavali fault, but their precise age and genetic linkage remain ambiguous. Within the PAM, the lithology comprises a gradation from anorthosite to gabbroic (noritic) anorthosite and anorthositic gabbro, with variable proportion of plagioclase (An_{50-65}), interstitial high- and low- Ca-pyroxenes, Fe-Ti oxides, apatite, olivine, biotite and hornblende. The rocks exhibit relict primary high-T exsolution and reequilibration textures suggesting initial crystallisation at deep crustal levels (~30 km, 9-10 kbar), emplacement at shallow crustal levels (~15 km, 5-6 kbar) followed by granulite facies metamorphism (ca. 700-800°C and 7-10 kbar). An Sm-Nd isochron for nine whole rocks (wr)-two pyroxene-two plagioclase separates yields an age of 635±40 Ma (2σ), (MSWD=2.1), $^{143}Nd/^{144}Nd_i$ = 0.51146± 0.00003 (εNd = -7.0±1). Additionally, 3 point (wr-pyroxene-plagioclase) regressions for two other samples yield distinct ages and Nd_i: 705±75 Ma, εNd = -5.5 ±1.9 and 558±62 Ma, εNd = -3.55±1.6.

We interpret the 635 Ma wr-mineral isochron age as the time of emplacement of the massif, while the 558 Ma age corresponds to its metamorphism. The 635 Ma age is in agreement with the 750-560 Ma ages for several pre-collision calc-alkaline and alkaline mafic-felsic intrusions in the SGT and some anorthosite complexes elsewhere in the E. Gondwana (e.g. 660±60 Ma Saririaky anorthosite, Madagascar). The consistency of low εNd of all the samples and the corresponding T_{DM} ages between 1.6 to 1.8 Ga suggest significant contamination of mantle melts by ancient crust at a lower crustal regime.

[1] Rajesh, (2006) *J. Asian Earth. Sci.*: **26**, 541-553.