Influence of aerosols on cloud characteristics over Europe: Study with the meteorology-chemistry-radiation eulerian model.

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Several studies demonstrated that aerosol particles play a crucial role in the climatic system, scattering the incoming radiation (direct effect) and altering cloud properties (indirect effect). Excellent efforts has been done by scientific community to represent the indirect effect in the atmospheric model, but the radiative forcing associated to indirect effect is still very uncertain.

In this study we tried to address the question: how well do the models reproduce the amplitude of aerosol indirect effects? In order to answer to the question, we used WRF/Chem model. A new parameterization for secondary organic aerosol (SOA) yield based on the volatile basis set implemented in WRF/Chem recently, has been coupled with the microphysics of clouds. The effects of this new mechanism is evaluated through the comparison of high resolution simulations on a cloud resolving domain (2 Km of resolution) against the groud-based and aircraft measurements of aerosol chemical composition and particles, and cloud microphysics, issued in the frame of European Integrated project on the Aerosol Cloud Climate and Air Quality Interaction (EUCAARI). The comparison of model results among observations suggest that discrepancies in simulation of chemical fields should be due to errors in simulated meteorological field and uncertainties in horizontal and vertical interpolation of anthropogenic emissions, in their total amount and hourly variations.

The amplitude of indirect has been calculated as IE=∂lnre∂lnN, where re is the cloud droplet effective radius and N aerosol particle number of each mode of log-normal distribution. Observations attribute the indirect effect to total aerosol particle number with a value of -0.22, very to theoretical value of -0.23. Instead, WRF/Chem reproduces the observed amplitude of IE, but attributes it to the particles of accumulation, while the observations indicate a strong IE due to total particle number.

The reasons of this results are under investigation.

Formation of monazite-(MREE) from paleozoic shales: Role of host rock chemical composition and organic material

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Rare earth element (REE) distributions of stream water, normalized to upper continental crust (UCC), showed, from the source to the catchment outlet, fractionation patterns from heavy REE enriched to more flat and middle REE (MREE) enrichement, together with a progressive disappearance of a negative Ce anomaly. As a consequence, Pourret *et al.* [1] suggest that the continental shelf could be considered as a potential REE trap and thus that shelf sedimentary rocks, similar to metalliferous deep sea sediments, represent a REE potential resource and guide for their exploration. The reassessment of the REE potential of France, led us to discuss the behavior of REEs, from the continental shelf to the basin plain, using authigenic monazite occurences within ordovician shales and black shales from Britanny (France). Monazite grains (up to 2 mm in diameter) are mostly characterized by their grey color, host-rock mineral inclusions, REE_{UCC} distribution patterns enriched in MREE, low Th and U contents, lack of inherited cores, that strongly suggest authigenic crystallization during diagenesis to low grade metamorphism conditions. Chemical composition highlights zoned crystals with MREE enriched cores (up to: 10 wt% Sm_2O_3; 1.3 wt% Eu_2O_3 and 5 wt% Gd_2O_3) and light REE (LREE) enriched rims. Thus grain cores are characterized by negative and low values of $\log[(La/Sm)_{UCC}]$ and high values of Eu whereas rims have slightly negative to positive values of $\log[(La/Sm)_{UCC}]$ with low Eu concentrations. Grey monazite REE_{UCC} patterns also reflect the abundance of these elements in shales and black shales. Indeed, at near neutral to alkaline pH, monazite evidenced MREE enriched patterns directly linked to organic matter (OM) content, whereas at alkaline pH, REE speciation is mainly driven by carbonate complexation, resulting in the formation of the LREE enriched monazite. This latter hypothesis will be further tested and reinforced by analysing OM fractions of shales and black shales. Eventually, such monazites were later concentrated within placers @ 2 kg/t.

[1] Pourret *et al*. (2012) *Mineralogical Magazine* 76 , 2247.

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