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Development of the air quality model BOLCHEM: addition of aerosol sources, dynamics and sinks

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The ability to forecast the aerosol properties at local and regional scales is challenging since the processes governing their production, accumulation and removal are complex and non-linear. In addition, the aerosol processes are highly influenced by meteorological variables, therefore an online coupling between meteorological and aerosol models is mandatory and represents the state-of-the-art in the air quality modelling. Such air quality models are a few and their performances in reproducing aerosol properties suggest that more work has to be done to improve the aerosol treatment in models. Aiming at contributing to this issue, the present work describes a new implementation of the aerosol physical and chemical processes into the regional air quality model BOLCHEM. BOLCHEM contains a meteorological model, an algorithm for airborne transport and diffusion of pollutants and two photochemical mechanisms. The meteorology is already coupled online with the gas-phase chemistry. The aerosol model is process-based oriented, seeking for realistic/natural coupling with meteorology. The main components of the aerosol model are: source emissions models for sea-salt, secondary organic and dust aerosol, aerosol dynamic model and models for sedimentation, dry and wet removal (sinks). The aerosol populations are considered to be log-normally distributed, in seven modes: four soluble and three insoluble. The aerosol particles are made by combinations of sulfate, black carbon, organic matter (primary and secondary), sea-salt and dust. Preliminary results about simulation of the aerosol load for case studies are presented.