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Study of the CCN formation as a function of aerosol components

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Understanding the role of aerosols in Earth's climate through direct and indirect effects has attracted a lot of attention over the last years. Due to the chemical complexity of aerosols along with the variety of the primary emissions sources and the conversions from gas to particle in atmosphere, accurate predictions for the aerosols impact on a regional and global scale still remains a challenging problem. In this study, we examine the relative contribution of directly emitted particles in the atmosphere (primary particles) and particles formed from gas-to-particle conversion (secondary particles) to the global aerosols and to the cloud condensation nuclei (CCN) formation. The Chemistry Transport Model v4.0 (TM4-ECPL) coupled with an extended version of the aerosol micro-physics model M7, which describes microphysical processes (nucleation, coagulation, condensation of gas-phase species) for sulfate, black carbon, organic carbon sea salt, dust and various secondary organic aerosols, is here used. A systematic analysis on the CCN production as a function of the aerosol chemical composition is performed. The sensitivity of the results to physical parameters that affect the CCN formation and cannot be accurately determined, such as hygroscopicity, is investigated based on a detailed sensitivity analysis. This work has been supported by the European FP7 collaborative project BACCHUS (Impact of Biogenic versus Anthropogenic emissions on Clouds and Climate: towards a Holistic UnderStanding).