D5.2 Ideas for the parametrization of WP5 aerosol dynamics in GCM

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This deliverable is speculative in nature. This was done in purpose: the plan was to arrive towards the end of the three years thesis work with a strategy to implement for the construction of a microphysical parameterization of aerosols.

While the actual research work has taken us somewhat farther form the microphysics of clouds than was initially programmed, we do have developed ideas on how to address this problem. We outline them here and it is intended to be the object of future work.

First of all we have acquired considerable experience in the use of the System for Atmospheric Modelling (SAM, [1]) in the Raditive-convective equilibrium configuration. SAM comes with different cloud microphysical packages ([2]), taken from literature, that are already coded and can be selected.

The different packages must be evaluated acording to a metric that is pertinent to the GCM parameterization. In this view, a new diagnostic has been developed on SAM in our group. This new diagnostics is able to evaluate quantitatively - at each timestep - the amounts of precipitable particulate, liquid and solid, along with the formation of liquid water. The different specifications of autoconversion can be seen as a proxy for the effect of aerosols. This new diagnostics has not been published yet, and it is still teh object of development.

A strategy for the verification of GCM microphysical parameterization can hence use the diffent packages of SAM, evaluate the autoconversion, and compare the results, in term of total precipitation and precipitation efficiency, with existing column version of GCMs.

In very practical terms, one can devise an experiment strategy similar to [3], where three sets of integrations were conducted; one with the original parameter settings described by [1], and a second one with the so called "NOSEDAALIQ5" setup of [4]. In this latter configuration the ice autoconversion is increased of a factor 100, and the liquid water one of a factor of 5, which was shown to produces more realistic atmospheric cloud radiative heating profiles than the original con- figuration. The third set of simulations used the double-moment scheme of [5].

The results of the three different type of integrations will then be compared to the column version of the LMDz model [6], that uses the Emanuel convective parameterization ([7], see also [8]). The comparison will be carried out in different large scale forcing configuration. First of all in radiative-convective equilibrium, with different specification of the surface; later, more realistic framework can also be tried.

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