Review of

Oshima, N., and M. Koike (2012), Development of a parameterization of black carbon aging for use in general circulation models, *Geoscientific Model Development Discussions*, *5*(2), 1263–1293, doi:10.5194/gmdd-5-1263-2012.

General Comments

This manuscript presents a new parameterization for time scale τ_{BC} for the aging of black carbon (BC), i.e., the conversion from the hydrophobic to the hydrophilic state. The new parameterization is meant to be used in general circulation models (GCMs) that treat size distribution of hydrophobic and hydrophilic BC separately using lognormal modes. I do not recommend this manuscript for publication in *Atmospheric Chemistry and Physics*.

I am not convinced of the usefulness of this parameterization for τ_{BC}. τ_{BC} had been used in GCMs that considered only aerosol mass concentrations (i.e., size distributions not treated) as a simple time scale parameter to determine the rate at which BC becomes hydrophilic and thus can be removed from the atmosphere by wet scavenging. Today, as noted by reviewers #1 and #2, a growing number of GCMs explicitly treat aerosol microphysics. The new parameterization for calculating τ_{BC} in this manuscript requires that the GCM treats aerosol microphysics (condensation) using lognormal size distributions. In such GCMs, the aerosol microphysics schemes automatically provide enough information (BC size distribution and coating of other chemical components) that the cloud condensation nuclei (CCN) properties can be derived such that the amount of BC that can undergo wet scavenging can be determined directly without using τ_{BC}. Thus, I don't see how τ_{BC} is needed anymore.

If I am misunderstanding how this parameterization for τ_{BC} can be used in GCMs, then the parameterization needs to be improved. The parameter *A* in Equation (6) should be re-formulated in terms of mono-dispersed aerosol size distribution instead of lognormal size distribution. Instead of

$$\tau_{BC} = \frac{A(D_m, \sigma)}{V_{BC}}$$

the parameterization should be

$$\tau_{BC} = \frac{A(D_p)}{V_{BC}}$$

where D_p is the particle diameter. This way, the parameterization can be more generally applied to GCMs that use sectional or lognormal modes for modeling aerosol size distributions. Also this way, A can be interpolated with only D_p as an input instead of D_m and σ. In this parameterization, the overall τ_{BC} can be then be determined by integrating $\tau_{BC}(D_p)$ with the modeled BC size distribution.