Interactive comment on “Organic aerosol and global climate modelling: a review” by M. Kanakidou et al.

Anonymous Referee #5

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This is a timely review on the state of knowledge on the issue of atmospheric organic aerosol. The review is very comprehensive, up to date and very well written. I especially appreciate that the authors' highlight some of the standing issues in each topic. This will be very helpful for readers of this review, who undoubtedly will have diverse and broad backgrounds. I think that the review fits very well the readership of Atmospheric Chemistry and Physics and should be published following some modification.

My main comment is that the authors do not discuss relevant work that has been conducted in the last several years by groups working on laboratory experiments that characterize the processing of organic aerosol. A review of some of these studies was recently published (Y. Rudich, Chemical Reviews 2003), but additional studies have since been published. Specifically, the reactions of ozone and OH with organic surfaces and aerosols have been thoroughly studied, most notably on oleic acid aerosol
particles and multicomponent particles. These studies used well-defined laboratory models to identify the kinetics, reaction mechanisms and implications for the CCN activity of organic aerosols and should be mentioned in this review in the discussions about aging processes and hygroscopicity changes (see partial list of references below). In addition, recent paper by Katrib et al (2004) suggests new reaction pathways for the formation of large molecular weight products in the ozonolysis reactions of oleic acid. This new reaction pathway involves reactions of Criege intermediates in the condensed phase with aldehydes, ketons and alkenes and it does not involve acidity. This is also a topic that is relevant to the current in the HULIS discussion. Some references on the topics include:


There is also a paper by Abbatt’s group showing activation of oleic and linoleic acid particles to cloud droplets following ozonolysis. The paper, now accepted in JGR-atmosphere is relevant to the review and puts the lab work as an important tool for understanding aging of organic aerosols.


Other relevant studies focused on reactions of other radicals (such as OH, NO3, Cl and Br) with organic layers that lead to changes in the hydrophobicity of these surfaces (in the same context as the ozone reactions), as measured by contact angle and microbalance methods:


Mmereki, B.T., and D.J. Donaldson, Direct observation of the kinetics of an atmospher-


An important topic also uncovered in this review is the role of the organic matrix in sequestering pollutants at the interface. This topic may be less relevant to the climatic issues, but certainly relevant to issues such as health effects and transport of pollutants in the troposphere. Some laboratory studies of this issue have been conducted by Donaldson et al


There is also substantial lab work on the thermodynamic properties of organic aerosol. See for example


I suggest that the authors will consider to relate to this large body of laboratory studies by mentioning some of these studies and by providing some references for those readers who would like to learn more about the laboratory studies which are every relevant for the topic.

There are additional minor points to be mentioned:

1. Section 3.1.3: Claeys et al revised their initial mechanism about the OH oxidation leading to methylerythriol (atmospheric Environment 2004). This should be mentioned here (it is mentioned somewhere else in the review as well).

2. Section 9.2: it is unknown if the mixtures suggested by Fuzzi et al for presentation of WSOC really represent the chemical reactivity of organic aerosol. They may replicate some physical properties such as surface tension. Russell et al are also working on finding good mixtures that will represent the organics in aerosols. (see


3. Section 11. The word “optic” should probably be “optical”

4. Section 13.3. “pre-fired” should probably be “heated”