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Interactive comment on "Critical assessment of the current state of scientific knowledge, terminology, and research needs concerning the role of organic aerosols in the atmosphere, climate, and global change" *by* S. Fuzzi et al.

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I would like to thank the referees for their comments and suggestions concerning the terminology section of our manuscript, especially Anonymous Referee #1 for addressing the discrimination of primary and secondary aerosol particles and chemical components.

In order to clarify and optimize the proposed definitions, I would like to suggest the

following adaptation and reformulation of sub-sections 2.3-2.5 (originally 2.3-2.6).

2.3. Primary, secondary, and aged aerosol particles

Primary particles of atmospheric aerosols are formed within a source and directly emitted to the atmosphere, whereas secondary particles are formed in the atmosphere by condensation (nucleation and growth) of gaseous precursors.

These definitions and the discrimination of primary and secondary aerosol particles are fully compatible with and flexibly applicable for different approaches of scientific investigation and mathematical modelling of atmospheric aerosols at all scales (molecular processes to global atmosphere):

a) Detailed process studies (laboratory and field experiments; chemical and microphysical box models): source = leaf/tree, engine/factory tailpipe, etc.; particles formed in a forest canopy or cooling exhaust plume considered as secondary (formed outside the source);

b) Simplified large scale studies (regional or global atmosphere and climate models): source = forest/ecosystem, urban area, etc.; particles formed in a vegetation canopy or street canyon considered as primary (formed inside the source).

The formation of particles in emission or exhaust plumes outside a point source or source region (industrial and vehicle tailpipe; forest canopy, etc.) will generally depend on ambient temperature, radiation, and atmospheric composition (water vapour, other co-condensable vapours/gases, photo-oxidants, etc.). Thus identical emissions/exhaust from identical sources (aircraft, ships, vehicles, ecosystems, plants, animals, soil, micro-organisms, etc.) can and will produce different amounts of particles under different conditions (day/night; summer/winter, tropical/polar). In accordance with the definitions outlined above, this can be explicitly resolved in detailed process models or included in the emission parameterisations of simplified large-scale models. Aged particles have undergone physical or chemical transformation in the atmosphere (co-

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agulation; structural rearrangement; phase transition; growth/shrinkage by condensation/evaporation of semi-volatile components; adsorption/absorption of volatile components; chemical transformation). Obviously, both primary and secondary particles can undergo atmospheric aging.

2.4. Primary and secondary aerosol components

Primary chemical components of atmospheric aerosols are substances formed within a source and directly emitted into the atmosphere, whereas secondary chemical components are substances formed by chemical reactions in the atmosphere. Secondary components can be formed in the gas phase and condense onto pre-existing particles or lead to the formation of new particles, but they can also be formed by chemical transformation of primary components in the condensed phase. Moreover, chemical aging (transformation) of atmospheric aerosols can lead to the formation of multiple generations of secondary chemical components. Note that aged primary aerosol particles can contain secondary chemical components (e.g., transformation of primary non-volatile components or uptake of secondary semi-volatile components) and secondary aerosol particles can contain primary chemical components (e.g., contribution of primary semi-volatile components to the nucleation and growth of secondary particles).

2.5. Organic, inorganic, and carbonaceous aerosols (particles)

In organic, inorganic, and carbonaceous atmospheric aerosols (particles), the chemical composition and physicochemical properties of the condensed phase are dominated by organic, inorganic, or carbonaceous components (organic compounds and black/elemental carbon), respectively.

Typically, aged atmospheric aerosol particles contain both organic and inorganic components which influence their physicochemical properties and atmospheric effects. Nevertheless, some of the most abundant particle types are dominated either by organic/carbonaceous components (e.g., soot, secondary organic aerosol particles) or by inorganic components (e.g., sea salt, mineral dust).

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Traditionally the total carbon (TC) content . . .

In any case, I consider it very important to distinguish very clearly and consistently between primary & secondary particles on the one hand, and primary & secondary chemical components on the other. This distinction is a prerequisite for efficient investigation and consistent description of atmospheric aerosol formation (emission, nucleation, growth) and transformation (physical and chemical aging).

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