

The manuscript titled as “Morphology and Mixing of BC Particles Collected in Central California During the CARES Field Study” is about “characterization of the (BC) particle mixing state and morphology using Scanning Transmission X-ray Microscopy (STXM) at the carbon K-edge”. In their work, characteristics of BC aerosol particles collected at two sampling sites were a main focus, which is worth to be published in ACP.

There are some specific comments which can help improve this manuscript.

- (1) The description of sampling sites and conditions needs to be consistent and clearer in the manuscript. That is, in the experimental section, the two sampling sites were described as “the first site was in the Sacramento urban area (T0 site) expected to have enhanced fresh emissions (?), and the second site was located 40 km east of T0 in the Sierra Nevada foothills (T1 site) expected to have enhanced aged aerosol (?).” In the abstract and in the conclusion, it is said as “at both urban and rural sites” and “at source (T0) and receptor (T1) sites in the California central valley”, respectively. Of course, these three different descriptions on the sampling sites may be related to each other, but without some concrete connections. It is better to make these descriptions consistent. In the experimental section, it is said that “Samples utilized here were collected over two days (June 27 and June 28) during a period of high temperatures and increased aerosol loadings over T0.” And in the abstract and conclusion sections, it is said that “During a period of high photochemical activity and pollution buildup”. I think these two description are not consistent. In addition, to relate the findings for BC particles collected at the two sampling sites, information on backward trajectories, sampling times and durations at T0 and T1 sites, and wind speed and direction needs to be given to better provide some clear idea about samples collected at T0 and T1 sites.
- (2) In the abstract and Results section, thick “organic” coating is mentioned, and in the conclusion, it is said that “During this period, the overall particle size at the receptor site was significantly larger due to the condensation of organic and inorganic species”. Indeed, I am curious about the modification of “inorganic” species during the possible aging process. If some argument about inorganic species aging is given in the Results section, it will be interesting.
- (3) The abstract and conclusion parts need to be rewritten to convey the findings and meaning of this work more consistently and clearly.
- (4) List of Awkward and/or ambiguous sentences and/or sections
 - p. 3, lines 22-23
 - p. 4, lines 4-6 (and needs to say why)
 - p.4, lines 9-21: only the expert of this technique could understand this part.
 - p.6, lines 3-6: Difficult to understand.
 - p.6, line 20: droplet mode → ???
 - p.6, lines 31-31 and p.7, lines 4-5: This description is mostly inconsistent with some descriptions given elsewhere in the manuscript.

- p.7, line 16: “in source regions” and “the source of these particles” → ???
- p.8, lines 25-29: Hard to understand.

(5) Typos:

- P.3, line 8 : relative humidity → moisture
- P.3, line 13 : definition of rho is missing.
- P. 4, line 24 : molecular markers → chemical (or functional group) markers
- P.4, line 32
- P. 5, line 29: maps OCBC and OCBCIN, particles → maps, OCBC and OCBCIN particles
- P.5, line 30: INOC → IN
- Many places in the manuscript: $D_{BC}:D_{Total}$ → D_{BC}/D_{Total}
- P.10, Figure 1 caption : A-C → A-D
- P.11, Figure legend: Soot inclusion → BC inclusion
- P.14, Figure caption : $D_{BC}:D_{Total}$ → D_{BC}/D_{Total}