

## Author's response to reviewer #1

### *General comment:*

*The manuscript by Ueda et al, "Morphological features and mixing states of soot-containing particles in the marine boundary layer over the Indian and Southern Oceans" reports aerosol measurements especially soot-containing particles collected from a research cruise. They used various measurement techniques including PSAP, CN counter, OPC, Ion chromatography, and transmission electron microscopy. The data set is valuable for global aerosol researches especially for those who study aerosol in remote area. I found this study is valuable and is clearly written with enough data. The microscopic analysis is also important and useful to understand the mixing states and hygroscopicity of aerosol particles. I have some technical comments to clarify the manuscript.*

### Response:

We thank anonymous Referee #1 for the many constructive comments related to the overall clarity of the article. We revised the manuscript according to the reviewer's comments. Modified words and sentences are highlighted as red in the text of the revised manuscript.

### *Technical comment 1:*

*Page4 Line21-26: It is not clear how the volumes and projected diameter were determined from the projected area  $S$ . Please explain the method more detail including how Pt/Pd shadowing was used in this study.*

### Response:

Incorrect sentences were accidentally retained here. The Pt/Pd shadowing method was not used for this study. Therefore, these sentences were revised as "The diameter of the equivalent circle was estimated from  $S$ " (P4L27).

### *Technical comment 2:*

*Page7 Line4 "Shapes of particles in these samples were round, dome-like, or rotundate rectangular (examples indicated by blue arrows in Fig. 9).": Blue arrows should indicate sulfate based on the caption in Fig. 9. It is not clear which arrows we should see (and*

*which particles).*

Response:

The sentence was revised to “Based on the image contrast and shadow of Pt/Pd of the particle, most of the particles were classified as round (r), dome-like (d), or rotundate rectangular (rr) on the film (examples indicated by blue arrows in Fig. 9a).” (P7L6). For blue arrows in Fig. 9, round, dome-like, and rotundate rectangular particles were designated respectively as r, d, and rr. Close-up pictures of some particles were added to Fig. 9. In addition, the location of an arrow pointing a specific particle was rearranged to indicate the particle clearly. An explanation of blue arrows was added to the caption in Fig. 9.

*Technical comment 3:*

*Page7 Line13-14 “in the samples H–J collected over the Southern Ocean, as indicated by green arrows”: I can not see the satellite structures in the particles indicated by green arrows in Fig 9.*

Response:

Close-up pictures of particles having satellite structures were added to Fig. 9 of the revised manuscript.

*Technical comment 4:*

*Page7 Line18 “such particles would be acidic droplet particles neutralized by the addition of ammonium after collection”: This discussion is not clear. Do you mean the particle changes its shape after collection because of neutralization over the substrate? Some additional explanation or discussion is needed here.*

Response:

We revised the sentence to the following in the revised manuscript: “In this study, some rectangular particles showed a satellite structure, which suggests impact by sulfuric acid droplets. Rectangular particles are usually regarded as fully neutralized ammonium sulfate. Therefore, the existence of such particles invites curiosity. One possibility for the origin is the transformation of acidic particles after collection by neutralization with ambient ammonia over the substrate.” (P7L21–24).

*Technical comment 5:*

*Page 7 Line 32: “externally mixing of soot” will be “external mixture of soot”*

Response:

We revised the text as you suggested (P8L10).

*Technical comment 6:*

*Page 23 Fig. 9 sample H: The red arrow indicates no particle. Please revise the figure.*

Response:

The arrow position was revised.