General.

We would like to appreciate the referee for providing the valuable comments to improve the manuscript. We have revised our manuscript by fully taking the editor's comments into account. Responses to specific comments are described below. All the changes made and appeared in the revised text are shown in red. All detailed answers to comments are displayed in blue.

Comments of Referee #3 and our responses to them

This study reports the molecular composition and characteristics of marine organic aerosols in Sansha, South China Sea, and especially focuses on the OSs and NOCs. The data is very informative and valuable. The following comments need to be addressed before being published on ACP.

Response: We deeply appreciate your valuable suggestions and time spent reviewing our manuscript.

General comments:

1. This work highlights the contribution of marine emissions to aromatic/aliphatic organic sulfur and nitrogen aerosols. My major concern is the potential influence of biomass burning on the aromatic/aliphatic sulfur or nitrogen, or other organic compounds in marine aerosols over the South China Sea.

Many shipboard cruise observations have suggested the obvious impacts of biomass burning emissions on the marine organic aerosol formation over the South China Sea, including studies from Chinese researchers. The authors also report that higher

concentrations of OSs and NOCs and more fire pots were observed during December to March. Biomass burning has been proved to be one. Thus, more solid and detailed evidence should be provided to exclude the possible impacts of biomass burning emissions on the formation of sulfur/nitrogen organic aerosols.

The K+ concentrations in June-August are much higher than during other months. I may suggest analyzing the data during Aug. 20—May (without the data in Jun-Aug) and during Jun-Aug separately for the correlation analysis in Fig. 5 or the PCA analysis in Fig. 6. It should also be noted that previous studies have reported that the K+ in biomass burning aerosols would decrease rapidly during long-range transport in the atmosphere.

Response: We are very sorry for the confusion caused by our insufficient discussions. We carried out the correlation analysis between potassium ions and the organic compounds under investigation in phases in accordance with your instructions (Figure 1). The results showed a weak correlation between potassium ions and most organic components. In addition, we have demonstrated from another perspective the weak impact of biomass burning pollutants transported over long distances on the aerosol OSs and NOCs in the Sansha area.

The analysis of air mass back trajectories shows that although biomass combustion activity is more intense in inland areas during winter and spring, the main air masses arriving at study stie have not passed through the combustion intensive areas. Furthermore, if we assume that biomass burning in inland or coastal areas transferred OSs to Sansha, this will only lead to an increase in OS_a (anthropogenic origin) abundances, rather than a highly consistent increase in OS_i, OS_m (biological origin), and OS_a abundances. In particular, OSs showed significant correlations ($r > 0.6$, $P < 0.01$) with local O_3 levels.

The above results suggest that aerosol OSs in the Sansha area may be mainly formed locally

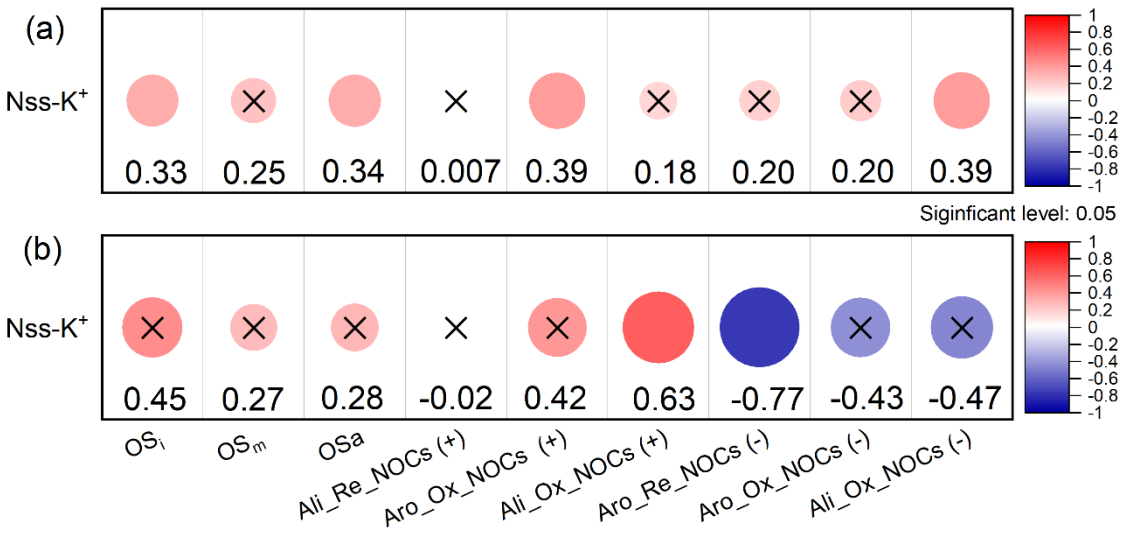

Figure 1. Correlation analysis between nss-K^+ and investigated organic compounds for data during (a) Aug. 20—May and (b) Jun-Aug.

We have added more descriptions in the revised manuscript.

Lines 344–348: …these OSs showed significant correlations ($r > 0.6$, $P < 0.01$) with local O_3 levels. The above results suggest that aerosol OSs in the Sansha area may be mainly formed locally and are tightly associated with precursor emission levels (e.g., abovementioned phytoplankton emissions)...

Lines 409–412: Even if we assume that biomass burning in inland or coastal areas transported OSs to the Sansha region, it would only lead to a significant increase in OS_a abundances but not induce a synchronous increase in OS_i, OS_m, and OS_a abundances…

2. There have been some studies on the seasonal variations of seawater isoprene or other

VOCs. I may suggest the authors combining the observation results on the seawater VOCs to validate the seasonal variations of satellite-derived Chl-a and calculated isoprene concentration reported here. Does the data here follow the same seasonal variation trend as reported in previous studies?

Response: We greatly appreciate your comments. The variation patterns among sea surface temperatures, seawater isoprene levels, and Chlorophyll-a obtained from empirical formulas or satellite data presented here are consistent with actual observation results in the South China Sea (Zhai et al., 2018).

Lines 326–329: The variation patterns among SST, seawater isoprene levels, and Chlorophyll-a obtained from empirical formulas or satellite data presented here are consistent with actual observation results in the South China Sea (Zhai et al., 2018).

Specific comments:

1. Lines 287-291: The authors argue that the much lower NH4+ aerosols lead to the limited formation of Re-NOCs. Is the gaseous NH3 lower in Sansha than in other cities? Reactions between carbonyl compounds and gaseous NH3 could also form CHON+. Considering the higher air temperature in Sansha, the fraction of NH3 in the gas phase could be much higher in Sansha than in other cities.

Response: The gaseous NH_3 level in the South China Sea region is usually lower than that in investigated inland cities (Dong et al., 2023; Pan et al., 2018). More references have been cited in the revised manuscript (Lines 287–290).

Some updated descriptions have been added to the revised manuscript.

Lines 287–290: …Presumably, the significantly lower levels (up to ten times lower) of aerosol NH_4^+ (**Table S1**) and gaseous NH_3 in the Sansha area relative to other cities (Ma et al., 2025; Pan et al., 2018; Dong et al., 2023) may be one of the important factors constraining Re-NOC formation.…

2. The authors compare the NOCs compositions in Sansha and other sites. However, different analysis MS instruments or measurement parameters were used in different studies. This might be the primary reason for the different NOC compositions.

Response: The NOC data used for comparison were derived from our research group (Ma et al., 2025), and all NOC data showing in Figure 1 were obtained with the same instruments, methodology, and operators.

Lines 164–166: …an intercomparison of the relative abundance of compounds identified with the same analytical approach and instrument by the same person was performed in the present study (Ma et al., 2025)…

Lines 239–240: …The NOC data were identified using the identical analysis methodology (Ma et al., 2025)…

Once again, we deeply appreciate the time and effort you've spent in reviewing our manuscript.

References

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