

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2022-593

Anonymous Referee #1

Referee comment on "Impact of cruising speed on the ship-based sampling of marine fog frequency" by Li Yi and King-Fai Li, Atmos. Chem. Phys. Discuss.,
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The authors have taken on a great task to extract climatic signals from the ICOADS data set. They are to be complemented for taking on this difficult challenge. Unfortunately, I am positive about the results.

The authors thesis that a significant proportion of the ships reduce speed in fog is unsupported. Cognoscenti say that most ships, especially those with radar or in unrestricted areas do not reduce speed in poor visibility. Occasionally, this is reported in news papers such as the New York Times. This possibility seems even more plausible considering the enormous pressure to make a time schedule has increased over the decades. Regardless of the suppositions, some sort of tests are needed over selected representative areas and different time periods to show that the number of individual ships actually slowing in fog statistically stands out against a background of large variability. It is emphasized that the errors must be computed and presented as well as aggressive smoothing avoided.

The authors are incorrect in their statement, around Line 23: "To date, most of the operational fog detection are provided by weather stations located along coastlines or on islands. However, only marine fog that moves over land can be detected by these stations and the characteristics of marine and land fog may be very different". In fact, coastal station can and do report fog not at the station but over water. The authors could locate low, near coastal and island stations, and compare the land station fog occurrence with the local ship measured fog over water. Then a comparison could be made to see if ship speed makes a significant difference in the reported fog occurrence.

The authors did not mention, but should include in their study, oil platforms and other structures in the ocean that take and report weather observations to the international networks.. There is a group of three such platforms on the eastern side of the Grand Banks which have appeared in the literature (Isaac et al., 2020, Weather and Forecasting, 35, p 347-365; Bullock et al., 2016, Arctic Technology Conference, Improvement of visibility and severe sea state forecasting on the Grand Banks of Newfoundland and Labrador.

Arctic Technology Conf., St. John's, Newfoundland and Labrador, Canada, Offshore Technology Conference Doc. OTC-27406-MS, <https://doi.org/10.4043/27406-MS>). These report summer fog occurrences ~ 50 % similar to ship measured occurrences (Dorman et al., 2017: Worldwide marine fog occurrence and climatology. Marine Fog: Challenges and Advancements in Observations, Modeling, and Forecasting, D. Koracin and C. E. Dorman, Eds., Springer, 7–152.). There are also platforms in the North Sea that report weather. In addition there are Korean weather platforms in the Yellow Sea and there is a Chinese weather structure off the SE China Coast.

Another assumption inconsistent with the ICOADS record, is that ships record weather data once a minute since this is possible for land stations (around line 76). Few ships, even research vessels, report to the international network data at this frequency. Most ship data is far less – three hourly if we are lucky. Many more of the historical reports are only 6-hourly or twice a day. The result is that it is only with great difficulty can one find the same ship in the same fog area for their next observation. This flies in the face of the author's basic assumption that a significant number of ships slow down and report the same fog event more than once. The authors need to examine this aspect and report the statistics and error bands of this central assumption to their manuscript.

The authors method of computing the long-term average fog occurrence over 1x1 degree areas and then multiplying by a coefficient determined by the ships mean speed in fog divided by the mean speed in non-fog ignores the unsorted reasons for the variability. Further, large scale smoothing of 9 X 5 degrees alters the signals in unknown and unexamined ways. This sort of smoothing distorts and suppresses the structure of the smaller scale fog maxima centers where most of the world's marine fog occurs. Particularly egregious are the crushing of coastal high fog areas centered over the inner shelves, a distance of less than 1 degree, maybe more like 30 km. In any event, the effects are not examined.

I do not understand how that the resulting "correction" of average ships speed in fog divided by average ships speed in non-fog can be both positive and negative (Fig. 4b). This flies against the authors basic thesis that ships slow down in fog causing more fog reports. The author's explanation of this conflict around Line 200 is incomprehensible. More likely the "correction" variations are a consequence of the large scale smoothing and undifferentiated ship data over large areas with different synoptic weather climatology for many shifting reasons, settings and circumstances. If the authors feel that this is not so, then they need to present the statistics with error estimates to support their case.

I regret to say that the summary of my review is that this manuscript should not be accepted and should not be encouraged.