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Interactive comment on "Ideas and perspectives: A strategic assessment of methane and nitrous oxide measurements in the marine environment" *by* Samuel T. Wilson et al.

Anonymous Referee #1

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The ocean is the net source of both CH4 and N2O, which are the second and third largest anthropogenic greenhouse gases. However, the air-sea flux of these gases remains uncertain, due mainly to the lack of sufficient reliable measurement of marine CH4 and N2O. It is thus of urgent need to further strengthen the observation of these greenhouse gases in the ocean. To this end, the authors proposed several perspectives of improving the current observation ability to better constrain and predict the marine CH4 and N2O flux. Overall, I feel these perspectives are essential and clearly stated.

The manuscript has included the main findings of previous researches in this field.

My main concern of the manuscript is that the three initiatives been proposed here are quite similar with the main ideas of the recent study by the authors themselves (i.e., Wilson et al., An intercomparison of oceanic methane and nitrous oxide measurements, 2018; Bange et al., A harmonized nitrous oxide (N_2O) ocean observation network for the 21st Century, 2019). I would encourage more specific and further steps of practicing these initiatives, such as providing more detailed plans of developing standard operating protocols, preparing reliable reference gases and samples, planning for regular training exercises... It is also worthwhile to add some ideas for observations, e.g., episodic/ short-term event monitoring (cyclone disturbance, phytoplankton bloom...) and diel rhythm of emission in the coastal zone.

Meanwhile, to better understand and modeling marine CH_4 and N_2O, process study including molecular and isotope approaches from both lab culture and field study could also be added into the database. In addition to CH_4 and N_2O observation, the standard measurement of the parameters for air-sea flux calculation, such as the gas transfer velocity or the eddy covariance, should be incorporated to derive accurate air-sea flux.

Finally, given the profound but unclear impacts of the global change and human activities on the marine carbon and nitrogen cycles, research on CH_4 and N_2O cycling under various external forcing (i.e. deoxygenation, warming, acidification, eutrophication) are encouraged to be incorporated as a component of the database.

The O_2 threshold for denitrification is still controversial, the redox potential is likely to be a better index to explore denitrification and other redox reactions relevant to N_2O and CH_4. In this sense, the measurements of ORP may be included in sampling campaign and database. For modelers, the ORP, which can be connected to electron flow and energy loss-gain, may be useful to advance models with new parameterizations of those chemoautotrophic microorganisms.

The authors synthesized almost all recent documents, which are very useful for beginners who are interested in monitoring marine greenhouse gases. Overall, this is a well written comprehensive review. Some problems still, many of their statements or illustrations are not referred specifically to the corresponding figures, for example, Fig. 1a, 1b, 2a, 2b, 2c, 2d and 4. Figure 5a is not mentioned in the text.

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