**Response to Reviewer 2 comments for manuscript ID egusphere-2024-175. The comments are given in an italic typeface, and the responses are given in a bold typeface. The corresponding changes in the revised manuscript are highlighted in red.**

***2.1) General comments:***

*The authors have made significant efforts to address my concerns and improve the manuscript. However, a few critical parts still require attention before the manuscript can be accepted for publication.*

**Response : We thank the reviewer for thoroughly reviewing the manuscript again. The specific comments given by reviewer are answered one by one and the corresponding changes are made in the manuscript.**

**Specific comments:**

*2.1.1) Trend analysis is necessary to match the manuscript with the title. The DMS emission flux is theoretically determined by the seawater concentrations and gas transfer parameterization. Environmental factors, such as wind speed, affect the gas transfer rate. While the manuscript highlights the discrepancies in seawater concentrations as the main contributor to uncertainty in global emission flux, it is crucial to present spatial variations in emission flux trends or at least global emission trends. This is important due to the role of DMS in climate, and incorporating this analysis would greatly enhance the contribution of this work.*

**Response: New figures related to the flux trend analysis are now added in the supplementary text (Figures S8 and S9). The following text has also been added in the discussion section (L329 – L333):**

**"From 1998 to 2010, both G18 and W20 show an increasing trend in seawater DMS (Joge: Part A). Using the calculated seawater DMS concentrations, G18 and W20 DMS flux trends are also calculated for each parameterization method using the bootstrap resampling method (explained in Part A). The DMS flux trend also shows an increase for all the parameterizations (Figures S8 and S9). DMS flux values are between 3 μmol $m^{-2}$ $d^{-1}$ and 6 μmol $m^{-2}$ $d^{-1}$ for E93 and Ho06, but lower in LM86. GM12 and W14 show a similar range while N00b shows a larger range compared to N00a."**

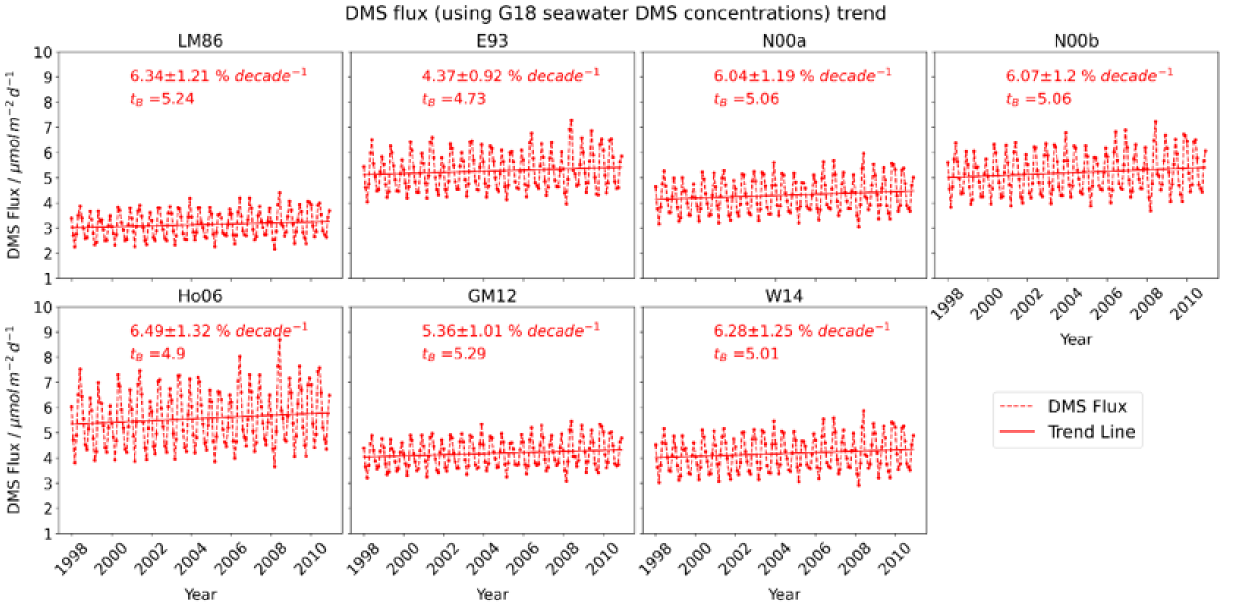


**Figure S8 :** DMS flux trend using seawater DMS concentrations of G18 for each parameterization method. Trend is calculated using bootstrap resampling method. The trend is significant if $t_B > 2$.

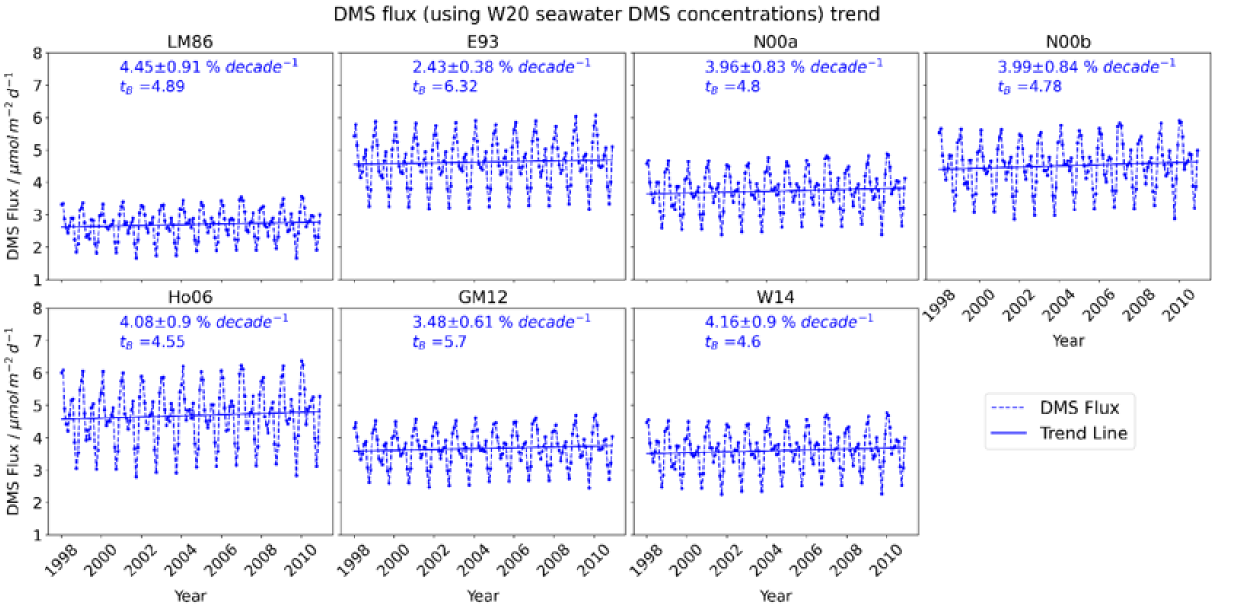


**Figure S9 :** DMS flux trend using seawater DMS concentrations of W20 for each parameterization method. Trend is calculated using bootstrap resampling method. The trend is significant if $t_B > 2$.

*2.1.2) Reviewer 3 provided excellent suggestions for a figure to illustrate the differences between parameterizations. Although the authors have included Figure S1-S7 using monthly data, it remains difficult for readers to follow. I recommend adding a figure in the main text with three subfigures: the first subfigure should show the wind speed dependence of the gas transfer rate; the second subfigure should display the temperature dependence; the third should illustrate the temperature dependence of the Schmidt number (Sc). The figure should be derived from theoretical estimates, and monthly data are not needed for their creation.*

**Response: A new figure is added in the main text (Figure 1) as suggested by reviewer 3, and the following text is also added at the end of section 2.1 (L157 – L165).**

**"$Sc_{n00a}$, $Sc_{n00b}$ and $Sc_{gm12}$ use the same formulation as that of $Sc_{lm86}$. LM86 shows three linear regions when comparing $k$ vs $u$, as defined by Eq.1-3. GM12 shows a linear dependency on the**

windspeed, while other formulations show a nonlinear dependency (Figure 1a). When the temperature is changed from -2 °C to 33.2 °C, then there is am increase and a spread between the k values. This is due to the temperature dependence of *Sc*, which nonlinearly decreases with temperature (Figure 1b). *Sc* is the ratio of kinematic viscosity (*v*) and molecular diffusivity (D) i.e., *Sc* = *v*/D (Liss and Merlivat, 1986). So, as *Sc* decreases with temperature, the molecular diffusion rate increases from higher concentrations (seawater) to lower concentrations (atmosphere) and hence the value of *k* increases with windspeed (Figure 1). Note that even though Ho06 is independent to the *Sc*, there is a small spread in the values of *k* with temperature. This is due to the Ostwald solubility coefficient for DMS according to McGillis et al. (2000) used in Ho06, and this coefficient has a temperature dependence."

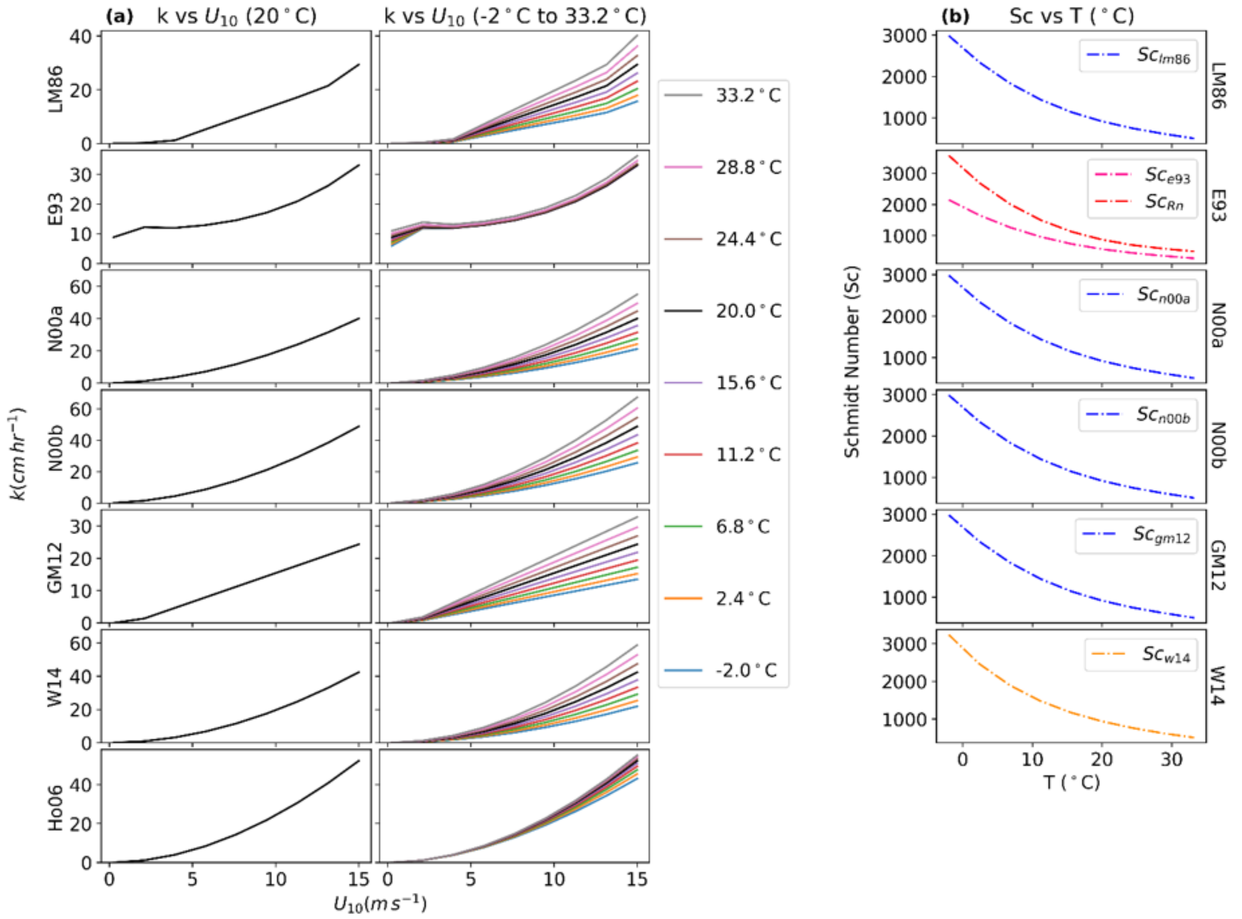


**Figure 1: (a)** Coefficient of gas transfer velocity (*k*) vs windspeed at 10 m from sea surface ($U_{10}$) at constant temperature (20 °C) and at different temperature values (-2 °C to 33.2 °C). **(b)** Schmidt number (*Sc*) vs temperature (T) for each flux parameterization methods. $Sc_{n00a}$, $Sc_{n00b}$ and $Sc_{gm12}$ has same equation as that of $Sc_{lm86}$. $Sc_{Rn}$ is the Schmidt number for radon used in E93 parameterization. Schmidt number (*Sc*) decreases with increase in temperature and hence gas transfer coefficient (*k*) increases.