Ocean Kinetic Energy and Photosynthetic Biomass are important drivers of Planktonic Foraminifera Diversity in the Atlantic Ocean

Rufino, M.M.[1,2†], Salgueiro, E.[1, 3], Voelker, A. H. L. [1, 3], Polito, P.[4], Cermeno, P.[5], Abrantes, F.[1,3†*]

1 – Instituto Português do Mar e da Atmosfera (IPMA). Lisboa, Portugal
2 – Centro de Estatística e Aplicações da Universidade Lisboa (CEAUL), Lisboa, Portugal
3 – Centro de Ciências do Mar (CCMAR), Universidade do Algarve, Faro, Portugal
4 – Instituto Oceanográfico da Universidade de São Paulo (IOUSP), São Paulo, Brasil
5 – Institut de Ciències del Mar (ICM) – CSIC, Barcelona, Spain

Corresponding authors: marta.m.rufino@gmail.com and fatima.abrantes@ipma.pt

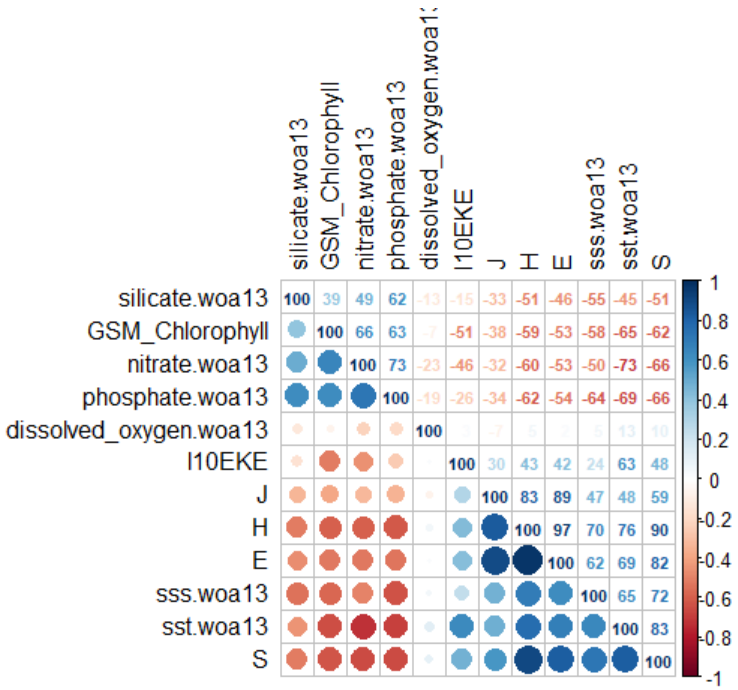
Supplementary Material

Metadata Standardization

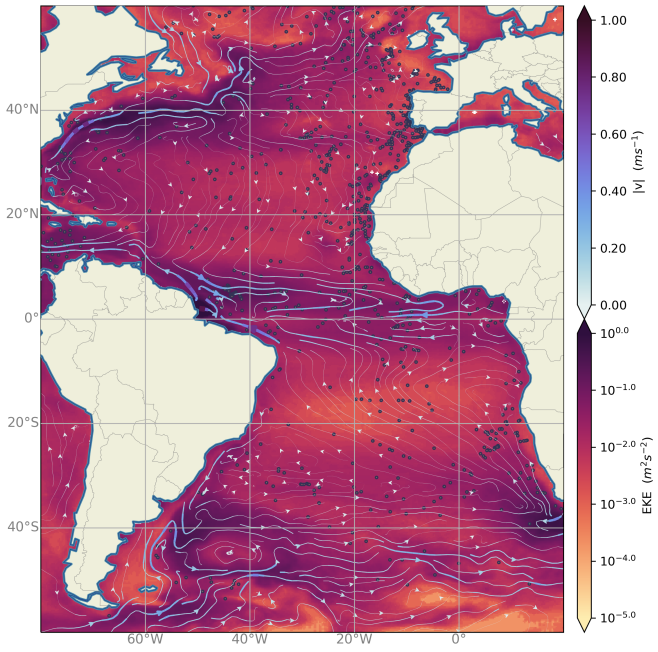
Samples with different ID but equal location encountered in the ForCenS database were treated as follows:

- Equal location (to the 4th decimal place), but different sampling device, the sample collected with the device more reliable for retrieving the surface sediment was the one selected.
- Equal location (to the 4th decimal place), and same device, we followed the criteria of Siccha and Kucera. (2017), and kept the sample with the higher number of species;
- Equal location (to the 4th decimal place), same device and same nº of species, assemblage data was averaged;
- Equal location to the 4th decimal place, and a N/A device for one of the samples, or the same device, we followed Siccha and Kucera *(*2017) and kept the older one (dataset year from the table in the paper: CLIMAP, BUFD, ATL947, MARGO…).

Supplementary Figures

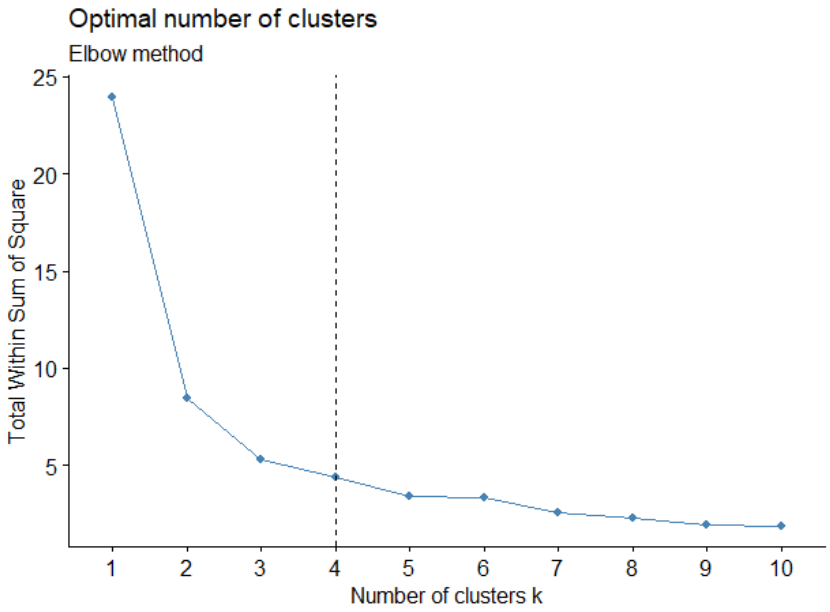


Supplementary Figure 1 – Correlation matrix between different variables and nutrients tested in the preliminary analysis.

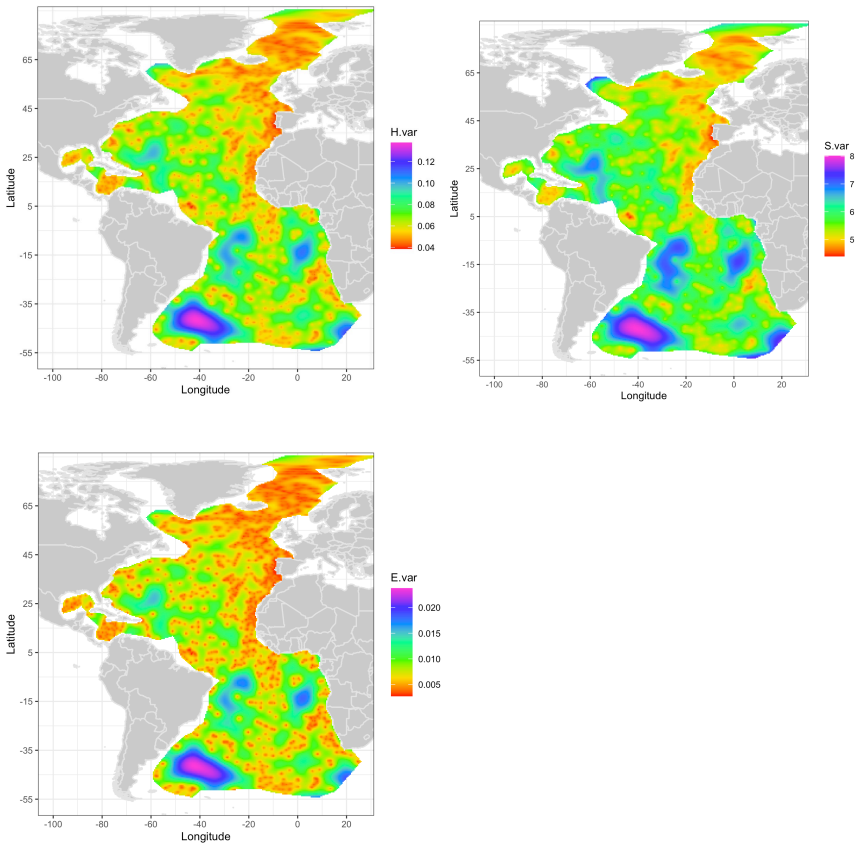


Supplementary Figure 2 - EKE distribution in the Atlantic as estimated from the sea surface height anomaly, based on multi-satellite altimetry and thus should be interpreted as vertically averaged velocities dominated by the upper layer. Pseudo-streamlines (in light blue) are

estimated from the geostrophic velocity field based on the absolute dynamic topography to visualize the mean currents.

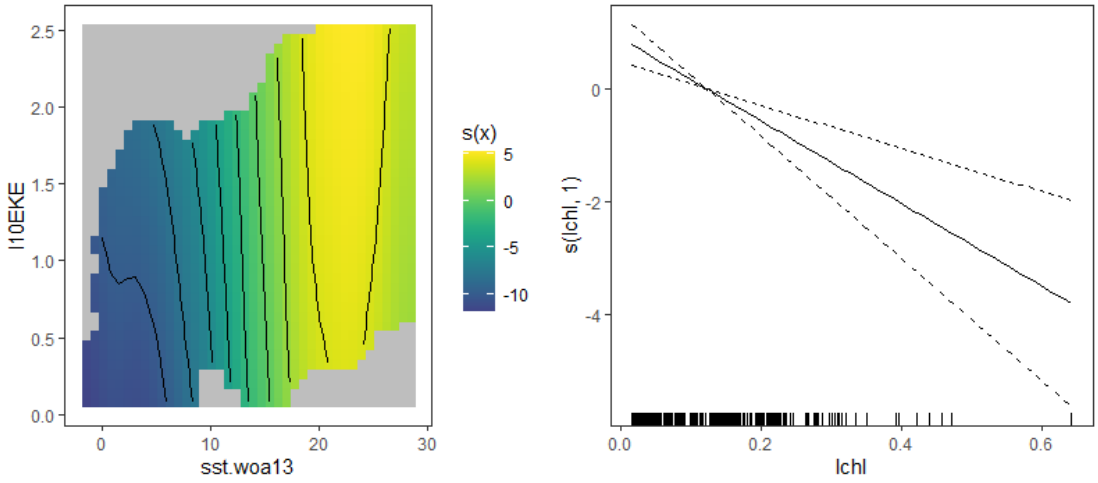


Supplementary Figure 3 - Elbow plot to define the optimal number of clusters.

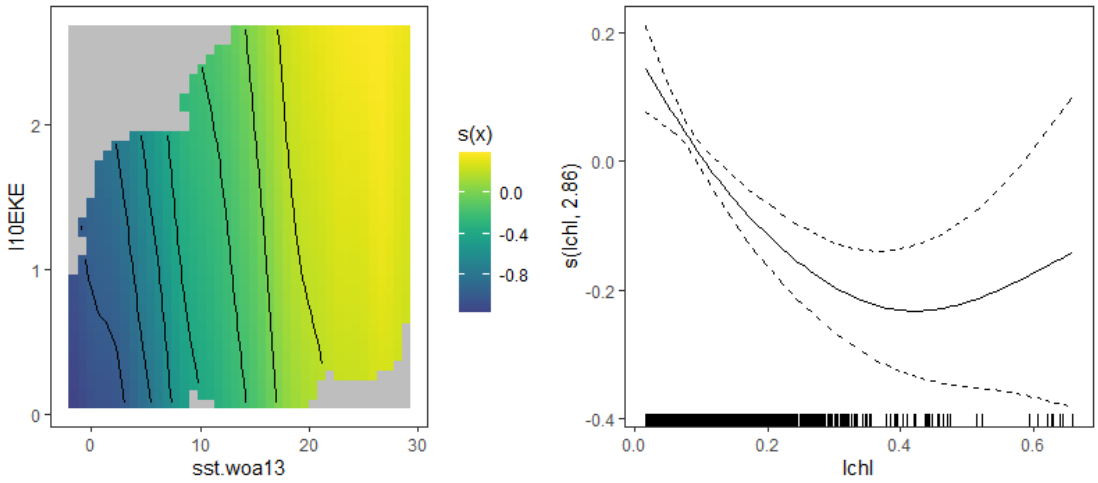


Supplementary Figure 4 - Variances of the interpolated alpha diversity indices, produced by kriging.

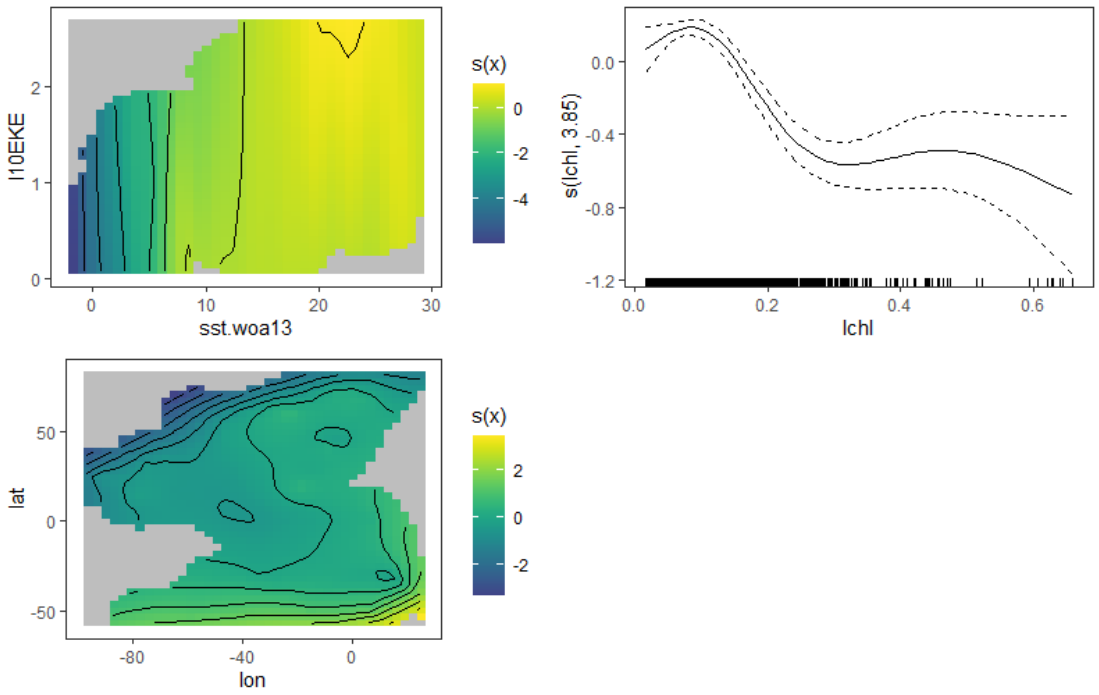
A. S Species Richness



B. H diversity



C. E Evenness



Supplementary Figure 5 -5A & B) H and S GAMM results; The panel on the left side shows the predicted smooth of the interaction between EKE and SST, where the shaded color (blue to yellow) and black contour lines represent the diversity index. In the second panel, the continuous central line shows the predicted smooth of the diversity index, whereas the dashed lines (bands) represent the 95% confidence interval of the predictions, and the grey points, the observed values.
5C) E GAMM results. The panel on the left side shows the predicted smooth of the interaction between EKE and SST, where the shaded color (blue to yellow) and black contour lines represent the diversity index. In the second panel, the continuous central line shows the predicted smooth of the diversity index, whereas the dashed lines (bands) represent the 95% confidence interval of the predictions, and the grey points, the observed values. The panel below shows the interaction term between latitude and longitude.

Species names and abbreviations for the 28 species used in the Gradient Forest Analysis:

Globo crass - *Globorotalia_crassaformis*
Glob hirs - *Globorotalia_hirsuta*
Globo mena - *Globorotalia_menardii*
Globo scit - *Globorotalia_scitula*
Globo trunc - *Globorotalia_truncatulinoides*
Globo tumi - *Globorotalia_tumida*
Glob infl - *Globoconella_inflata*
Neogl dute - *Neogloboquadrina_dutertrei*
Neog inco - *Neogloboquadrina_incompta*
Neogl pach - *Neogloboquadrina_pachyderma*
Pulle obli - *Pulleniatina_obliquiloculata*
Globi bull - *Globigerina_bulloides*

Globi falc - *Globigerina_falconensis*
Globi cong - *Globigerinoides_conglobatus*
Globi rube - *Globigerinoides_ruber*
Globi whit - *Globigerinoides_white*
Trilo sacc - *Trilobatus_sacculifer*
Globi tene - *Globigerinoides_tenellus*
Orbul univ - *Orbulina_universa*
Beell digit - *Beella_digitata*
Globi siph - *Globigerinella_siphonifera*
Globi cali - *Globigerinella_calida*
Turbo quin - *Turborotalita_quinqueloba*
Turbo humi - *Turborotalita_humilis*
Globo rube - *Globoturborotalita_rubescens*
Sphae dehi - *Sphaeroidinella_dehiscens*
Cande niti - *Candeina_nitida*
Globi glut - *Globigerinita_glutinata*