***Supplementary Material***

According to Garratt 1977, the following formulas were used to standardize the observed wind speed to a 10 m height above the surface:

 (1)

 (2)

where *k* is the von Karman constant (0.41 ± 0.025), *z* is the height of the anemometer. V(*z*) is the wind speed at height *z*. is aerodynamic roughness length (2–3×10-4 m), represents the drag coefficient.

At 10 m height above the sea surface:

 (3)

 (4)

Transform formulas (2) and (4) and then divide:

 (5)

Then, substitute formulas (1) and (3) into formula (5) to get the wind speed at a 10 m height above the sea surface.

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**Figure S1**. The vertical distributions of temperature (°C), salinity (psu),dissolved oxygen (μmol L-1),chlorophyll-*a* (μg L-1),N2O (nmol L-1), andNH2OH (nmol L-1) along the continental slope.

**Table S1.** The results of PCA show the loadings of biogeochemical variables for the principal components in the SYS and ECS, the nearshore area, and the shelf area.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | PC1 | PC2 | PC3 |
|  | Eigenvalues | 2.84 | 2.40 | 1.60 |
| SYS and ECS | % of Variance | 31.5 | 26.6 | 17.8 |
|  | Cum. % of Variance | 31.5 | 58.1 | 75.9 |
|  | Eigenvalues | 4.49 | 3.17 |  |
| Nearshore area | % of Variance | 49.8 | 35.2 |  |
|  | Cum. % of Variance | 49.8 | 85.0 |  |
|  | Eigenvalues | 2.97 | 2.21 | 1.77 |
| Shelf area | % of Variance | 33.0 | 24.5 | 19.7 |
|  | Cum. % of Variance | 33.0 | 57.5 | 77.2 |

Note. Components with eigenvalues less than 1.0 were ignored.

Principal component analyses were performed at a significance level of Bartlett’s test of *p < 0.05* and the sampling adequacy of the KMO test of > 0.5.

**Table S2.** The results of PCA show a component matrix of biogeochemical variables for the SYS and the ECS.

|  |  |  |  |
| --- | --- | --- | --- |
|  | PC1 | PC2 | PC3 |
| N2O | 0.963 |  |  |
| AOU | 0.914 |  |  |
| NO3- | 0.828 |  |  |
| NH2OH |  | 0.917 |  |
| Chl-a |  | 0.771 |  |
| NO2- |  | 0.751 |  |
| S |  |  | 0.829 |
| T |  |  | 0.644 |
| NH4+ |  |  |  |

Note. Principal component analyses were performed at a significance level of Bartlett’s test of *p < 0.05* and the sampling adequacy of the KMO test of > 0.5.

**Table S3.** The results of PCA show a component matrix of biogeochemical variables for the nearshore region.

|  |  |  |
| --- | --- | --- |
|  | PC1 | PC2 |
| N2O | -0.948 |  |
| NO2- | 0.935 |  |
| T | 0.907 |  |
| S | 0.906 |  |
| NO3- | -0.790 |  |
| Chl-a |  | 0.977 |
| AOU |  | -0.920 |
| NH2OH |  | 0.689 |
| NH4+ |  | 0.615 |

Note. Principal component analyses were performed at a significance level of Bartlett’s test of *p < 0.05* and the sampling adequacy of the KMO test of > 0.5.

**Table S4.** The results of PCA show a component matrix of biogeochemical variables for the continental shelf region.

|  |  |  |  |
| --- | --- | --- | --- |
|  | PC1 | PC2 | PC3 |
| T | 0.837 |  |  |
| N2O | -0.811 |  |  |
| NO3- | -0.810 |  |  |
| NH4+ | 0.715 |  |  |
| AOU |  | 0.906 |  |
| Chl-a |  | -0.813 |  |
| S |  | 0.652 |  |
| NO2- |  |  | 0.831 |
| NH2OH |  |  | 0.817 |

Note. Principal component analyses were performed at a significance level of Bartlett’s test of *p < 0.05* and the sampling adequacy of the KMO test of > 0.5.