

BABURRIZQIYAH. NPM. 220341100004. Variasi Klorofil-a dan *Particulate Organic Carbon* (POC) berdasarkan Posisi BGC-Argo Float terhadap Struktur Eddy di Samudera Hindia. Dibawah bimbingan Ary Giri Dwi Kartika, S.Kel., M.Si

ABSTRAK

Samudera Hindia merupakan wilayah dengan dinamika oseanografi yang kompleks akibat interaksi SEC, ITF, sistem monsun, dan IOD yang memicu terbentuknya mesoscale eddy. Keberadaan eddy memengaruhi distribusi nutrisi, produktivitas primer, serta mekanisme BCP melalui perubahan konsentrasi klorofil-a dan POC. Penelitian berfokus pada respons vertikal kedua parameter tersebut terhadap posisi pengamatan di dalam struktur eddy masih terbatas karena sebagian besar studi hanya memanfaatkan data satelit permukaan. Penelitian ini bertujuan menganalisis variasi klorofil-a dan POC berdasarkan posisi BGC-Argo Float terhadap struktur eddy di Samudera Hindia bagian timur pada periode Januari–April 2024. Data yang digunakan meliputi BGC-Argo Float ID 2903467, data SLA dan arus geostropik, serta data GlobColour sebagai pendukung distribusi spasial dan validasi. Identifikasi eddy dilakukan menggunakan parameter *Okubo–Weiss* dan EKE, sedangkan estimasi POC dihitung menggunakan parameter optik *bbp700*. Hasil penelitian menunjukkan bahwa variasi posisi BGC-Argo Float terhadap struktur eddy menghasilkan perbedaan karakteristik fisik kolom air, meliputi suhu, densitas potensial, MLD, dan stratifikasi yang berpengaruh terhadap distribusi vertikal klorofil-a dan POC. *Cyclonic eddy* cenderung meningkatkan konsentrasi klorofil-a dan POC melalui proses *upwelling*, sedangkan *anticyclonic eddy* menunjukkan penurunan konsentrasi di lapisan permukaan akibat proses *downwelling* disertai pembentukan maksimum bawah permukaan. Hasil validasi juga menunjukkan bahwa data GlobColour memiliki kesesuaian yang baik terhadap data BGC-Argo sehingga dapat digunakan sebagai data pendukung analisis spasial. Penelitian ini menunjukkan bahwa posisi BGC-Argo Float terhadap struktur mesoscale eddy berperan penting dalam mengontrol variasi vertikal klorofil-a dan POC serta memberikan pemahaman mengenai keterkaitan dinamika fisik dan proses biogeokimia di Samudera Hindia.

Kata kunci : *Mesoscale eddy*; BGC-Argo; klorofil-a; POC

BABURRIZQIYAH. NPM. 220341100004. *Variations in Chlorophyll-a and Particulate Organic Carbon (POC) Based on the Position of BGC-Argo Floats Relative to Eddy Structures in the Indian Ocean.* Supervised by Ary Giri Dwi Kartika, S.Kel., M.Si

ABSTRACT

The Indian Ocean is characterized by complex oceanographic dynamics driven by the interaction of the South Equatorial Current (SEC), Indonesian Throughflow (ITF), monsoon system, and Indian Ocean Dipole (IOD), which promote the formation of mesoscale eddies. These eddies play a crucial role in regulating nutrient distribution, primary productivity, and the Biological Carbon Pump (BCP) by influencing chlorophyll-a and particulate organic carbon (POC) concentrations. However, studies investigating the vertical response of these biogeochemical parameters to different positions within eddy structures remain limited, as most previous research has relied primarily on satellite-derived surface observations. This study aimed to analyze the variations in chlorophyll-a and POC based on the position of a Biogeochemical-Argo (BGC-Argo) Float relative to mesoscale eddy structures in the eastern Indian Ocean during January–April 2024. The analysis utilized observations from BGC-Argo Float ID 2903467, Sea Level Anomaly (SLA) and geostrophic current data, and GlobColour products for spatial distribution analysis and validation. Eddy structures were identified using the Okubo–Weiss parameter and Eddy Kinetic Energy (EKE), while POC concentrations were estimated from the optical backscattering coefficient at 700 nm (bbp700). The results indicate that differences in the BGC-Argo Float position relative to eddy structures produced distinct water-column characteristics, including variations in temperature, potential density, mixed layer depth (MLD), and water-column stratification, which subsequently affected the vertical distribution of chlorophyll-a and POC. Cyclonic eddies generally enhanced chlorophyll-a and POC concentrations through upwelling, whereas anticyclonic eddies were characterized by lower surface concentrations associated with downwelling and the development of subsurface maxima. These findings demonstrate that the position of the BGC-Argo Float relative to mesoscale eddy structures is a key factor controlling the vertical variability of chlorophyll-a and POC, providing valuable insights into the coupling between physical oceanographic processes and marine biogeochemistry in the Indian Ocean.

Keywords : Mesoscale eddy; BGC-Argo; chlorophyll-a; POC.