

ABSTRAK

(Sulthan Alany Raihansyah. 26050120130083. Analisis Karakteristik Marine Heatwaves di Laut Sulawesi: Pendekatan Spasial dan Temporal. Anindya Wirasatriya dan Dwi Haryo Ismunarti).

Marine Heatwaves (MHW) merupakan fenomena pemanasan ekstrem di laut yang dapat berdampak signifikan terhadap ekosistem laut. Laut Sulawesi memiliki keanekaragaman hayati yang tinggi dan rentan terhadap fenomena tersebut. Penelitian ini bertujuan untuk menganalisis distribusi spasial dan tren temporal MHW, mengetahui klasifikasi serta faktor yang memengaruhi pola dan distribusinya, serta menganalisis hubungan dan mekanisme fisis antara MHW, angin, *heat flux*, dan topografi lokal di Laut Sulawesi. Penelitian menggunakan data selama 40 tahun (1982–2021), meliputi Suhu Permukaan Laut (SST) dari OSTIA, angin dari CCMP, dan *heat flux* dari ERA5. Identifikasi MHW dilakukan berdasarkan ambang persentil ke-90 melalui analisis deret waktu dan komparatif spasial. Hasil penelitian menunjukkan bahwa karakteristik MHW berbeda secara spasial dan temporal, dengan wilayah pesisir memiliki frekuensi dan durasi lebih tinggi, sedangkan wilayah lepas pantai memiliki intensitas tahunan lebih tinggi dan relatif merata. Durasi MHW terlama mencapai 57 hari di Laut Sulawesi secara keseluruhan dan 55 hari di wilayah pesisir pada tahun 2019. MHW yang teridentifikasi berada pada kategori *Moderate* hingga *Strong*. Pola dan distribusi MHW dipengaruhi oleh kecepatan angin, radiasi matahari, *heat flux*, dan topografi lokal. Secara fisis, pelemahan angin mengurangi pelepasan panas melalui *surface latent heat flux* (SLHF) dan pencampuran vertikal, sehingga meningkatkan akumulasi panas dari *surface net solar radiation* (SSR) dan mempertahankan net *heat flux* (Q_{net}) positif. Di wilayah pesisir, proses tersebut diperkuat oleh efek *wind shadow* akibat topografi pegunungan.

Kata kunci: *Marine Heatwaves*; Laut Sulawesi; Suhu Permukaan Laut; Angin; *Heat Flux*

ABSTRACT

(Sulthan Alany Raihansyah. 26050120130083. *Analysis of Marine Heatwaves Characteristics in the Sulawesi Sea: A Spatial and Temporal Approach.* Anindya Wirasatriya and Dwi Haryo Ismunarti).

Marine Heatwaves (MHWs) are extreme ocean warming events that can significantly affect marine ecosystems. The Sulawesi Sea has high marine biodiversity and is vulnerable to this phenomenon. This study aims to analyze the spatial distribution and temporal trends of MHWs, determine their classification and the factors influencing their patterns and distribution, and analyze the physical relationships and mechanisms between MHWs, wind, heat flux, and local topography in the Sulawesi Sea. The study used 40 years of data (1982–2021), including Sea Surface Temperature (SST) data from OSTIA, wind data from CCMP, and heat flux data from ERA5. MHW events were identified using the 90th percentile threshold through time-series and spatial comparative analyses. The results show that MHW characteristics vary spatially and temporally, with coastal areas exhibiting higher frequency and duration, while offshore areas show higher and relatively uniform annual intensity. The longest MHW event lasted 57 days in the Sulawesi Sea as a whole and 55 days in the coastal area in 2019. The identified MHWs were classified as Moderate to Strong. The patterns and distribution of MHWs were influenced by wind speed, solar radiation, heat flux, and local topography. Physically, weakened winds reduced heat loss through surface latent heat flux (SLHF) and vertical mixing, thereby increasing heat accumulation from surface net solar radiation (SSR) and maintaining positive net heat flux (Q_{net}). In coastal areas, this process was further enhanced by the wind shadow effect associated with mountainous topography.

Keywords: *Marine Heatwaves; Sulawesi Sea; Sea Surface Temperature; Wind; Heat Flux*