

ABSTRAK

Kedudukan tinggi muka air laut (SSH) berpengaruh terhadap kondisi lingkungan pesisir, khususnya aktifitas dan transportasi laut di Selat Madura. Oleh karena itu, perlu pemahaman memadai tentang karakteristik SSH, menggunakan data altimetri dan pengukuran *tide gauge* pada tiga stasiun pengukuran (Surabaya, Kalianget, dan Probolinggo) di Selat Madura dengan waktu pengamatan pada Agustus 2022. Pendekatan dan metode yang digunakan ialah metode statistik dan *Fast Fourier Transform* (FFT), sehingga diperoleh nilai MSL. Variasi nilai SSH di perairan Indonesia berkisar 0.3 - 0.8 m dan ± 0.6 m di Selat Madura, sedangkan hasil analisa *tide gauge* menunjukkan 1.2 – 1.4 m. Ada perbedaan signifikan, ditunjukkan oleh nilai RMSE pada stasiun Surabaya 0.81; Kalianget 0.98; dan Probolinggo 0.94. Data *tide gauges* diolah menggunakan metode FFT sehingga diperoleh 15 komponen harmonik, meliputi komponen diurnal [M_1 , K_1 , O_1 , P_1 , Q_1 , J_1 , OO_1], semidiurnal [M_2 , S_2 , K_2 , N_2 , L_2 , $2N_2$], dan *shallow water* [M_4 , dan MS_4], sehingga diketahui dominasi komponen diurnal (P_1 dan K_1) di stasiun Surabaya dan Kalianget maupun komponen semidiurnal (N_2 dan L_2) di stasiun Probolinggo. Hasil analisis FFT di Selat Madura tergolong tipe pasang surut campuran condong ganda/semidiurnal. Nilai HHWL tertinggi di stasiun Probolinggo (3.3455 m) dan LLWL terendah di Kalianget (0.5493 m). Nilai MSL pada stasiun Surabaya 1.4262 m; Kalianget 1.2616 m; dan Probolinggo 1.8541 m. Adanya perbedaan nilai MSL diantara kedua data dapat disebabkan karena lokasi penelitian merupakan wilayah pantai, di mana data altimetri kurang valid jika digunakan pada wilayah tersebut. Mengatasi hal itu, dapat dilakukan dengan menginterpolasi data altimetri dengan data *tide gauge*.

Kata Kunci: Altimetri, *Fast Fourier Transform* (FFT), Pasang Surut, *Tide Gauges*

ABSTRACT

Sea Surface Heights (SSH) affects the condition of the coastal environment, especially marine activities and transportation in the Madura Strait. Therefore, it is necessary to adequately understand the characteristics of SSH, using altimetry data and tide gauge measurements at three measurement stations (Surabaya, Kalianget, and Probolinggo) in the Madura Strait with observation time in August 2022. The approach and methods used are statistical methods and Fast Fourier Transform (FFT), so that the MSL value is obtained. The variation of SSH values in Indonesian waters ranged from 0.3 - 0.8 m and ± 0.6 m in the Madura Strait, while the results of tide gauge analysis showed 1.2 - 1.4 m. There is a significant difference, indicated by the RMSE value at Surabaya station 0.81; Kalianget 0.98; and Probolinggo 0.94. The tide gauges data were processed using the FFT method to obtain 15 harmonic components, including diurnal components [M1, K1, O1, P1, Q1, J1, OO1], semidiurnal [M2, S2, K2, N2, L2, 2N2], and shallow water [M4, and MS4], so that the dominance of diurnal components (P1 and K1) at Surabaya and Kalianget stations and semidiurnal components (N2 and L2) at Probolinggo station were known. The results of the FFT analysis in the Madura Strait are classified as mixed tidal type with double/semidiurnal inclination. The highest HHWL value at Probolinggo station (3.3455 m) and the lowest LLWL at Kalianget (0.5493 m). MSL values at Surabaya station were 1.4262 m; Kalianget 1.2616 m; and Probolinggo 1.8541 m. The difference in MSL values between the two data can be caused because the research location is a coastal area, where altimetry data is less valid if used in the area. Overcoming this can be done by interpolating altimetry data with tide gauge data.

Keywords: Altimetry, Fast Fourier Transform (FFT), Tidal, Tide Gauges