

ABSTRAK

Pasang surut merupakan fenomena naik turunnya muka air laut yang dipengaruhi oleh gaya tarik gravitasi Bulan dan Matahari serta kondisi lokal perairan. Perbedaan karakteristik perairan pesisir utara dan selatan Madura dapat menyebabkan variasi komponen harmonik pasang surut. Penelitian ini bertujuan menganalisis amplitudo dan fase komponen harmonik, membandingkan karakteristik komponen pasang surut antara Stasiun Pasean dan Stasiun Taddan, menentukan tipe pasang surut berdasarkan bilangan *Formzahl*, serta mengevaluasi kesesuaian model rekonstruksi pasang surut menggunakan metode *Least Square*. Data penelitian diperoleh dari Badan Informasi Geospasial (BIG) berupa data pengamatan 15 hari bulan Desember 2024 dan data deret waktu satu tahun periode Agustus 2024 hingga Juli 2025. Analisis harmonik dilakukan menggunakan metode *Ordinary Least Squares* (OLS) melalui *library UTide* dengan koreksi nodal otomatis. Hasil penelitian menunjukkan komponen dominan Stasiun Pasean adalah K_1 , sedangkan Stasiun Taddan adalah M_2 . Komponen diurnal lebih dominan di Stasiun Pasean, sedangkan komponen semidiurnal lebih dominan di Stasiun Taddan. Validasi model menghasilkan RMSE dan MAPE Stasiun Pasean sebesar 0,06 m dan 2,80% (15 hari) serta 0,11 m dan 5,14% (1 tahun). Stasiun Taddan menghasilkan RMSE dan MAPE sebesar 0,08 m dan 7,40% (15 hari) serta 0,14 m dan 11,18% (1 tahun). Analisis *Formzahl* menunjukkan tipe pasang surut di Pasean didominasi tipe diurnal, sedangkan Taddan bertipe campuran condong semidiurnal.

Kata kunci: pasang surut, *least square*, amplitudo harmonik, *formzahl*, RMSE, MAPE, Madura.

ABSTRACT

Tides are the periodic rise and fall of sea level influenced by the gravitational forces of the Moon and the Sun, as well as local water conditions. Differences in the characteristics of the northern and southern coastal waters of Madura may cause variations in tidal harmonic components. This study aims to analyze the amplitude and phase of harmonic components, compare tidal component characteristics between Pasean Station and Taddan Station, determine tidal types based on the *Formzahl* number, and evaluate the suitability of tidal reconstruction models using the *Least Square* method. The data were obtained from the Geospatial Information Agency (BIG), consisting of 15-day observation data in December 2024 and one-year time series data from August 2024 to July 2025. Harmonic analysis was performed using the *Ordinary Least Squares* (OLS) method through the *UTide library* with automatic nodal correction. The results show that the dominant harmonic component at Pasean Station is K_1 , while Taddan Station is dominated by M_2 . Diurnal components are more dominant at Pasean Station, whereas semidiurnal components are more dominant at Taddan Station. Model validation resulted in RMSE and MAPE values at Pasean Station of 0.06 m and 2.80% (15 days), and 0.11 m and 5.14% (1 year). Taddan Station produced RMSE and MAPE values of 0.08 m and 7.40% (15 days), and 0.14 m and 11.18% (1 year). The *Formzahl* analysis indicates that Pasean Station is dominated by a diurnal tidal type, while Taddan Station has a mixed tide prevailing semidiurnal type.

Keywords: tides, *least squares*, harmonic amplitude, *Formzahl*, RMSE, MAPE, Madura.