REFAG 2022 THESSALONIKI - GREECE
17-20 October 2022
IAG

Tide and storm surge analysis in Thermaikos Gulf, Greece

Nestoras Papadopoulos (Hellenic Military Geographical Service), Vassilis Gikas (National Technical University of Athens)

Abstract. Sea level monitoring is a key element for reference frame establishment and realization as it represents the actual signal whereby the height datum originates from. Tide gauge stations provide time series of sea level observations tied to a local geodetic benchmark on the shore. Sea level measurements consist of two primary elements: an astronomical tide signal and a meteorological component. Astronomical tide is the consequence of the combined gravitational effects of the moon and the sun as their position alters in relation to the rotating earth. Atmospheric effects including variations in the air pressure and the wind result in storm surges which contribute to sea level fluctuations too. In this study a methodological approach for sea level estimation has been formulated and standardized taking into account the combination of the astronomical tide and storm surge effects. Implementation of the proposed model was realized using a dataset of tide gauge and meteorological observations spanning 21 years of observations. Field data originate from Thessaloniki (Greece) tide gauge and Thessaloniki National Airport meteorological station respectively. Harmonic analysis of sea level time series concluded in 68 tidal constituents. Synthesis of all contributing constituent parameters revealed the hourly tidal predictions due to astronomical effects. Also, meteorological data have led to the hourly storm surges. Extensive inspection of the raw observables and evaluation of the results obtained and their associated statistical analyses revealed the tidal behavior of Thermaikos Gulf. It is concluded that tides in Thermaikos Gulf are characterized as mixed predominating the semi-diurnal ones (F=0.254). Tidal ranges in each cycle vary from 60 mm (minimum neap range) to 833 mm (maximum spring range). Finally, further statistical analysis of the adopted model based on the Willmott Skill factor show a high (97%) agreement between the raw tidal observations and their predicted suggesting the high performance of the model.