Analysis of Long-Term Sea Level Variation in the Italian Seas

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In this study long time series of recorded sea level (1928-2006) have been investigated in order to analyse the sea level variation in three selected Italian coastal areas. Any analysis aimed to the identification of sea level trends requires long time series and a statistical method able to decompose the seasonal component from the long-term, non-periodic part. The analysis here proposed, based on the Seasonal Trend decomposition using Loess (STL) method, has been applied to the long sea level time series recorded at Genoa, Venice and Trieste. These time series, all extended over more than 70 years, are the longest available in Italy, and are the only possible choice for any long-term statistical analysis in Italy. The STL technique consists in a series of consecutive applications of a Loess smoother with different moving windows; the different width of the windows allows the separation of the different frequencies present in the time series. STL involves an iterative algorithm which progressively refine and improve the estimate of the trends and the seasonal components. The Loess filter is based on a locally weighted regression smoothing technique (Cleveland, 1979). The results of the STL analysis highlight a rise in the mean sea level during the last 80 years (1928 – 2006) and show that the sea level rate of growth was greater during the decade 1986 – 1996 than during the decade 1996 -2006. The same result was found in all the three time series considered. Even though the reason is still an open matter of investigation, the findings are consistent with a global sea level rise associated with climate change.