LONGSHORE SEDIMENT TRANSPORT ASSESSMENT BASED ON WAVE SYSTEMS

Rodrigo Alonso, IMFIA-Universidad de la República, ralonso@fing.edu.uy
Sebastián Solari, IMFIA-Universidad de la República, ssolari@fing.edu.uy

INTRODUCTION

Longshore sediment transport (LST) is one of the main factors influencing coastal morphology and its comprehensive assessment constitutes a valuable input for coastal management. In this work the concept of long-term wave systems introduced by Portilla el al. (2015) is used to analyze the wave climate of the Uruguayan Atlantic coast with focus on its impact on the LST (see e.g. Almar et al. 2015).

The study site is located in the Uruguayan Atlantic coast, where waves frequently occur with multi-modal spectrum. In Solari et al. (2018) LST rates were calculated based on wave integrated parameters, showing that LST correlates with climate indexes (NINO3.4, etc.). The present work shows how LST rate estimation changes by consider wave spectral partitions, identifies which wave systems contributes most to LST and provides a more detailed insight on its intra- and inter- annual variability and its correlation with climatic indexes.

MATERIALS AND METHODS

Long-term series of wave spectra were obtained from the last wave hindcast performed for Uruguayan waters (Alonso and Solari 2019) and LST were estimated by means of the recalibrated CERC formula proposed by Mil-Homens et al. (2013). For several points along the Uruguayan Atlantic coast, long-term wave systems were identified and the LST driven by each one were estimated. Then, the annual cycle, inter-annual variability, long-term trends and the correlation with climate indexes were analyzed for LST driven by each wave system.

RESULTS

Example results are given here only for a sample point, for which seven wave systems were identified (Figure 1) with A, B and F being the most frequent ones, and E and D being the most severe. Regarding LST, approx. 90% of the transport is associated with systems B and F (Figure 2). It is observed that the correlation between the LST and the climatic indices depends on both the season of the year and on the wave system that generates the LST (Table 1), so the proposed analysis allows to better explain the observed LST variability.

Correlations (signif. at 10%)	NINO3.4		AAO	
	Annual	JFM	Annual	AMJ
LST_int.param.	---	---	0.18	0.43
LST_all.systems	---	-0.33	0.20	0.42
LST_system_B	---	---	0.26	0.43
LST_system_F	---	-0.43	0.10	0.34

REFERENCES

Almar, Kestenare, Reyns, Jouanno, Anthony, Laibi, Hemer, Du Penhoat, Ranasinghe, (2015): Response of the Bight of Benin (Gulf of Guinea, West Africa) coastline to anthropogenic and natural forcing, Part1: Wave climate variability and impacts on the longshore sediment transport. Cont. Shelf Res. 110, 48-59.

Alonso, Solari (2019): Improvement of the high-resolution wave hindcast of the Uruguayan waters focusing on the Río de la Plata Estuary. (Submitted to Ocean Modelling).

Mil-Homens, Ranasinghe, van Thiel de Vries, Stive (2013): Re-evaluation and improvement of three commonly used bulk longshore sediment transport formulas. Coastal Engineering, 75, 29-39.

Portilla-Yandún, Cavaleri, Van Vledder (2015): Wave spectra partitioning and long term statistical distribution. Ocean Modelling, 96,148-160.

Solari, Alonso, Teixeira (2018): Analysis of Coastal Vulnerability along the Uruguayan coasts. Journal of Coastal Research: SI 85 pp 1536-1540.

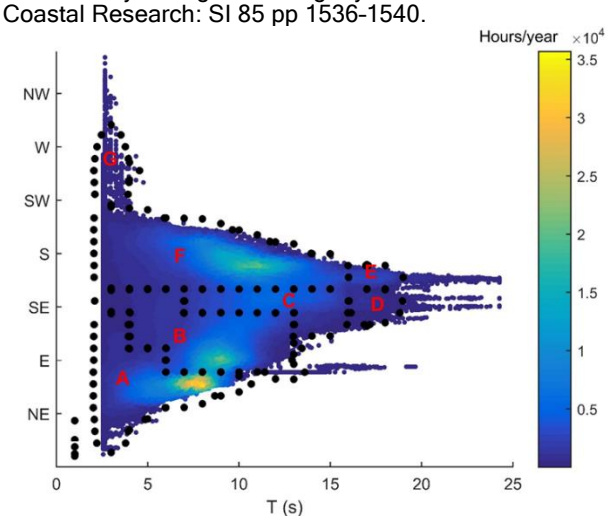

Figure 1 - Wave systems and its annual occurrence.

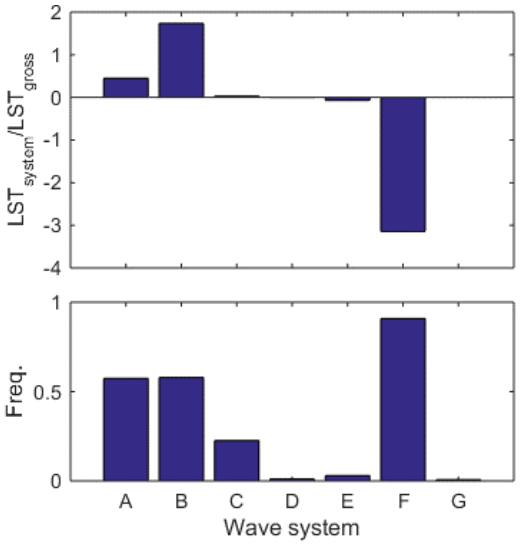

Figure 2 - LST per wave system and its frequency.