RAINFALL TIME SERIES ANALYSIS WITH WAVELETS AND HUANG HILBERT TRANSFORM

ATHANASIOS ZERIS [1] and PANAGIOTIS PRINOS [2]

[1]Post Doctoral Fellow, Hydraulics Lab., Dept. of Civil Engineering,
Aristotle Univ. of Thessaloniki, Greece,
(e-mail: athzeris@otenet.gr)
[2] Professor, Hydraulics Lab., Dept. of Civil Eng.
Aristotle University of Thessaloniki, Greece
(Tel: +30-2310-995689, Fax: +30-2310-995672, e-mail: prinosp@civil.auth.gr)

In the present study, rainfall time series analysis is presented with state of the art methods as wavelets analysis and Huang Hilbert Transforms method. Data from three cities of Northern Greece, (Thessaloniki, Kozani, Alexandroupolis) are analyzed and studied in the time frequency plane. Morlet wavelet is implemented for wavelet transform and global and scale averaged representation of monthly rainfall from 1958 to 2000. For the same time period, Empirical Mode Decomposition and Huang Hilbert is performed for the city of Alexandroupolis.

Wavelet power spectrum and global wavelet power spectrum are presented for the three cities.with Morlet wavelet in predefined number of scales. Strong events, above significant level are recognized for Alexandroupolis time series transformation in the region of 1 year period with a dry period from 1982 to 1995 (Fig. 1). Comparative scale averaged wavelet power is presented for cycle of 0.8-2 years for the three cities.

Also, Empirical Mode Decomposition (3) and Huang Hilbert Transform is used for Alexandroupolis data. Seven IMFs and a trend are extracted from the initial signal. The third represents the annual cycle. The number of zero crossings in each IMF is presented for comparison with the dyadic approach of the white noise. The localization properties of Huang Hilbert spectrum in the sense of Amplitude Frequency Time domain is used for identification of the strong events.
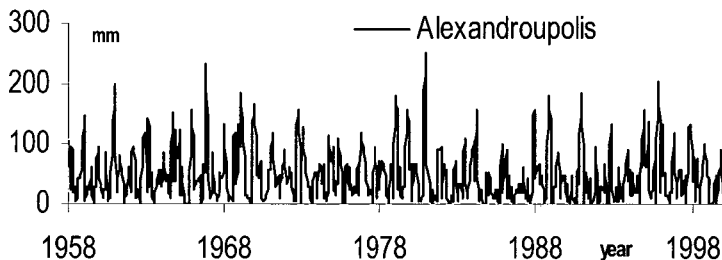

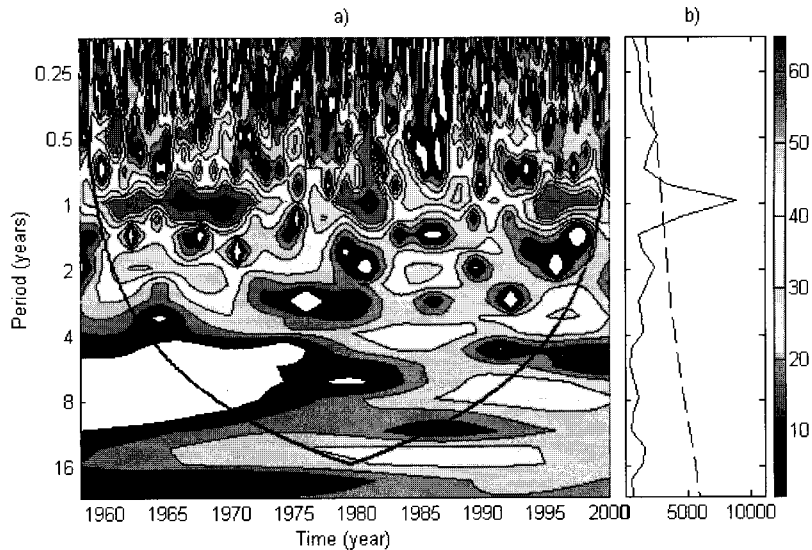Fig. 1 Rainfall time series for the city of Alexandroupolis

Fig. 2 (a) Wavelet power spectrum and (b) Global Wavelet spectrum for the city of Alexandroupolis

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