



Evaluation of the level of detection of very weak geodynamics signals with the HiCum.

M.van Ruymbeke (1) and A. Somerhausen (1)

* Royal Observatory of Belgium, Avenue Circulaire,3,B1180 Brussels, Belgium
(labvruy@oma.be/tel +32 273 02 86)

ABSTRACT

The HiCum stacking method of analysis is applied to investigate harmonic components for different periodicities related to the orbital patterns of Sun and Moon. It concerns mainly the earth-tides spectrum which is partly common with climatic inductions.

We describe different cases to show the potentiality of this very effective method to isolate in a long record, weak signatures with stable periodic components.

Selectivity of HiCum is illustrated by results obtained with superconducting gravimeter and micro-barometer records.

Comparison of micro-thermometer signals set-up side-by-side in the Rochefort cave, confirmed the access to micro degree level of precision for the histogram. We could also evaluate the modulation by Lunar tides M2, of the water flow through stalactites, which could explain the temperature variability on the M2 period.

Comparisons of the records are achieved in the Lanzarote laboratories. Monitoring of sea level sensor and various sites thermometry allows managing X-Y graphs between HiCum histograms of two sensors, to establish the transfer function existing between parameters. Dissipative or non-linear processes are well characterized with these graphs.

If we adjust cosine functions with fundamental and harmonics periods to the HiCum histogram, it becomes easier to evaluate interactions by comparison of different amplitudes and phases. An application of this approach consists to inter-compare the tidal

components of the water level variations in the three aquifers monitoring of the ROB boreholes with the barometric and gravimeter records.

Another way to apply HiCum is based on the comparison of synthetized periodic modulations of a signal sent at the input of a system, and on the monitoring of its output signals. The HiCum on the different series give a synchronous detection which reject strongly uncertainties and noise. This is the technique applied to the data registered on an oscillating platform inducing well known acceleration to gravimeter with the purpose of calibration.

Various papers and posters applying HiCum should be presented during this EGU-Vienna meeting, demonstrating the interest of this approach.

Key words:, HiCum method, earth-tides, seismic hazard, volcanology, synchrone detection.