Geophysical Research Abstracts, Vol. 9, 06877, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-06877

Detrend effect on the scalograms of GPS amplitude scintillation

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The study of amplitude scintillation on GPS radio links is usually done after detrending the time series of the transmitted power so to define scintillations as the chaotic fluctuation around a unitary value. In a sense, the choice of how to detrend the time series is part of the definition of scintillation.

Here we analyse how far the continuous wavelet analysis of the detrended signal is influenced by the choice of detrending. This study is done using amplitude raw data from the GPS receivers held by INGV and the University of Bath in the Northern polar region, with a sampling time of 0.02 s. Two rather loose detrending procedures are presented here: polynomial detrending and a high-pass filter with detrending period as twice the length of the time series considered. We show that there exists a "threshold time scale" of about half minute under which the differences between the scalograms from the signals detrended in the two ways are less than 50% of the scalogram value. This is not changed by applying the same detrending procedures to the segment of length halved or divided by four, i.e. nominally varying the detrending frequency f as 2f or 4f.

Consequences in terms of scintillation definition and practical applications are given.