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2D wavelet and GPA cartography of the solar surface

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A research project on the study and practical implementation of the 2D Wavelet and GPA analysis method for obtaining spectral characteristics of time series of two-dimensional solar images is presented. Within the context of investigating the oscillatory processes of coronal loops, a spatial-analysis technique for two-dimensional images of EUV emission sources (TRACE, 171 A) is suggested. It is based on identifying two-dimensional sources of quasi-periodic fluctuations, both within the frequency band and at separate harmonics. The use of direct and inverse Wavelet transform as the frequency band filter for each spatial point forms a groundwork for identification. It enables determination (in time and in space) the areas of the image which make the main contribution to the emission at selected frequencies. Dynamic and phase characteristics of two-dimensional variations of sources are obtained. It is shown that the principal source of the variations at high frequencies lies at the loop footpoints. The low-frequency component is basically concentrated within thin tubes delineating magnetic field lines. These magnetic lines are internal structures of the loops. Emission surges of solar material along the loops were observed to occur at some of the harmonics.

Keywords: **wavelet analysis**, **solar images**, **GPA analysis**, **cartography**, **TRACE**

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