Automated Detection of Waves and Oscillations in Imaging Data

ROBERT A. SYCH[1], SERGEY A. ANFINOGENTOV[1] and VALERY M. NAKARIAKOV[2]
[1]*Institute of Solar-Terrestrial Physics, 126, Lermontov St., Irkutsk, Russia*
Tel: +73952564574, Email: sych@iszf.irk.ru
[2]*Physics Department, University of Warwick, Coventry, CV4 AL, UK*

A web-based interactive system for the remote processing of imaging data sets (i.e., EUV, X-ray and microwave) and the automated interactive detection of wave and oscillatory phenomena in the solar atmosphere is created. The system targets localised but spatially resolved phenomena, such as kink, sausage and longitudinal propagating and standing waves. The system implements the methods of Periodmapping for pre-analysis, and Pixelised Wavelet Filtering for detailed analysis of the imaging data cubes. The system is implemented on the dedicated data processing server http://pwf.iszf.irk.ru, which is situated at the Institute of Solar-Terrestrial Physics, Irkutsk, Russia. The input data in the .sav, .fits or .txt formats can be submitted via the local and/or global network (the Internet). The output data can be in the png, jpeg and binary formats, on the user's request. The output data are periodmaps; narrowband amplitude, power, phase and correlation maps of the wave's sources at significant harmonics and in the chosen spectral intervals, and mpeg-movies of their evolution. The system was tested by the analysis of the EUV and microwave emission from the active region NOAA 10756 on 2005 May 4 observed with TRACE and the Nobeyama Radioheliograph. The similarity of the spatial localisation of 3-min propagating waves, near the footpoint of locally open magnetic field lines determined by the potential field extrapolation, in both the transition region and the corona was established. In the transition region the growth of the 3-min amplitude was found to be accompanied by the decrease in the line of sight (LOS) angle to the wave propagation direction.

Keywords: Automated detection; coronal oscillations; coronal waves; PWF analysis; remote data processing; wavelet transform.