HELIOSEISMOLOGY SPACE AND GROUND-BASED STUDIES

R. I. Kostik[1], S. N. Osipov[1], E. V. Khomenko[1], N. I. Lebedev[2]

[1] *Main Astronomical Observatory, NAS of Ukraine*
27 Akademika Zabolotnoho Str., 03680 Kyiv, Ukraine
e-mail: kostik@mao.kiev.ua

[2] *IZMIRAN, Russian Academy of Sciences, Troitsk, Russia*
e-mail: lebedev@rssi.izmiran.ru

We give a preliminary report on the observations of solar irradiance fluctuations with the DIFOS photometer aboard the Russian–Ukrainian satellite CORONAS-F launched in 2001. In addition, the parallel ground-based spectral observations (VTT, Tenerife) carried out with 20-day observing space campaign are described.

The Russian–Ukrainian satellite CORONAS-F was launched on July 31, 2001. The orbit is quasi-synchronous with a height of 500–550 km and period of 95 min. The photometer DIFOS-F is among experiments aboard. The design performs the continuous registration of solar irradiance within six spectral bands (range 350–1600 nm) with a high flux resolution. Real measurements of the solar irradiance started on August 22. The CORONAS-F provides 20 days of continuous observing time without gaps by sunset. The observed data is being reduced now. The sets of power spectra with moderate resolution had been obtained as a result of observations using the photometer DIFOS-F (Fig. 1). They demonstrate an increase of power with the photosphere height. The behaviour of individual modes of oscillation has some differences (Fig. 2).

There was a possibility to coordinate the space observations aboard the CORONAS-F and ground-based observations obtained with a high spatial resolution. The latter observations were carried out on August 20–26, 2001 simultaneously with the first 20-day observing campaign of the DIFOS-F photometer. The ground-based instrument was the 70-cm German Vacuum Tower Telescope (VTT) of the Observatorio del Teide (Instituto de Astrofísica de Canarias). The photospheric velocity and intensity oscillations of the different patterns of the solar surface were recorded with a high spatial (0.5 arcsec) and temporal (9.3 s) resolution. We used time series of CCD spectrograms in the range from 30 to 120 min. A CCD camera, with 1024×1024 photosensitive elements, collected the spectral data. The observed images contained the Fe I $\lambda\lambda$ 532.4 nm and 639.3 nm spectral lines with good height coverage from the low photosphere up to the temperature minimum region.

The similar data was obtained using the SOHO-MDI experiment. The study of acoustic waves propagation through granulation patterns has been carried out. Both the ground-based and space data (Fig. 3) lead to the following results:

- Strong oscillations occur well separated temporally and spatially.
- Oscillations above granules and intergranular lanes occur with different periods.
- On the average, the most energetic intensity oscillations occur above intergranular lanes; however, the situation is not so simple for the velocity oscillations. Namely, the powerful oscillations may occur above granules as well.
- Velocity oscillations at the lower layers of the atmosphere lead oscillations at the upper layers in intergranular lanes. In granules the phase shift is nearly zero.

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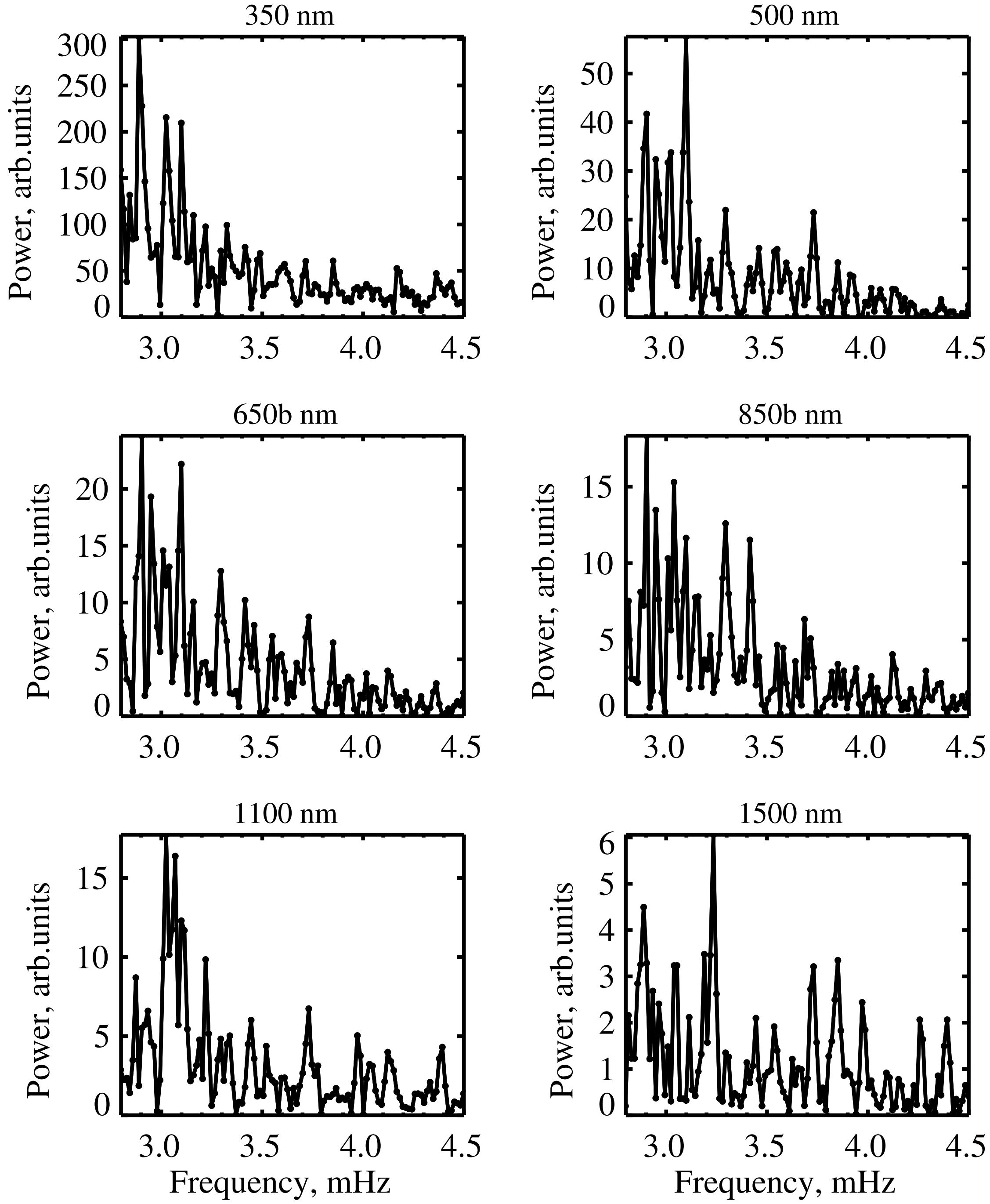

Figure 1. Power spectra of brightness fluctuations of the Sun for six spectral channels

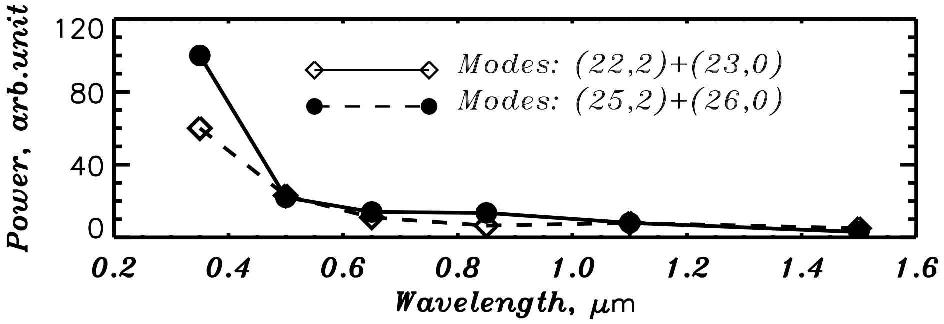

Figure 2. The power of individual modes in different channels of the photometer DIFOS-F

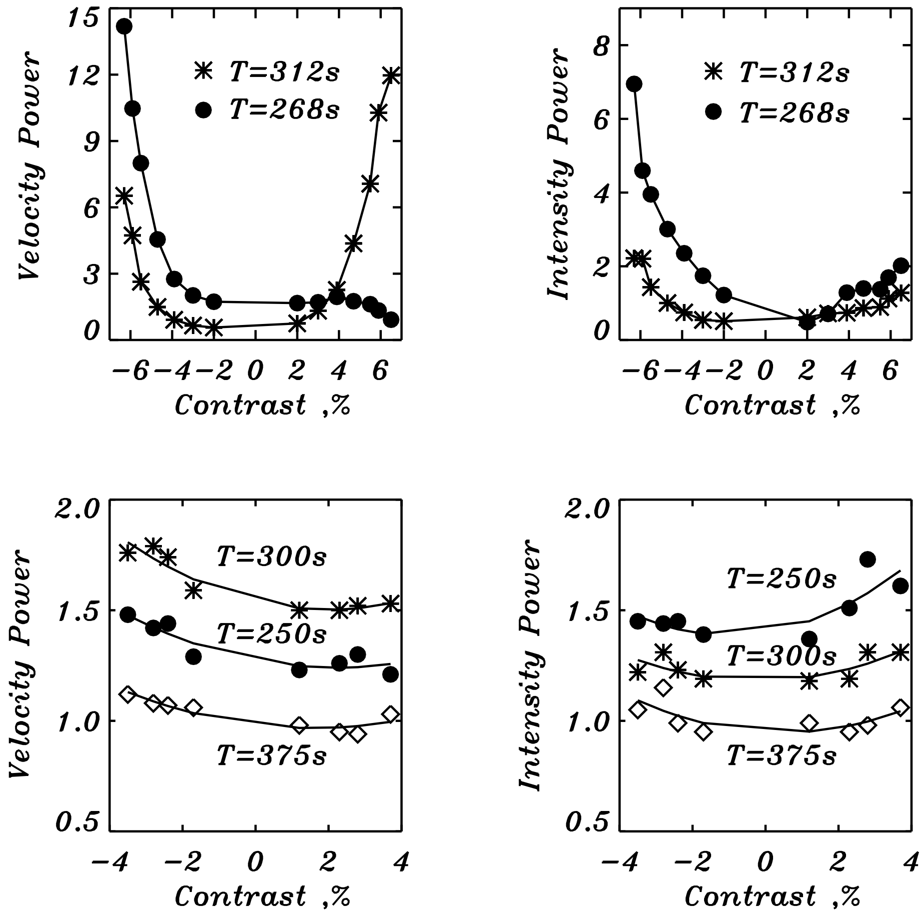

Figure 3. The power of velocity and intensity oscillations over granules and intergranular lanes from VTT data for two periods (upper two panels) and from SOHO-MDI data for three periods (bottom two panels)