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Faraday amplitude modulation of solar radio emission in the ionosphere and method of its correction

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Registration of solar radio emission intensity at fixed frequencies and in all spectral VHF band is very important along with other methods of monitoring of coronal mass ejections (CME). Considerable time shifts (up to 20 minutes) of the intensity maxima of solar radio emission were registered during solar flares M86 January 15, and X38 January 17, 2005, on 6 fixed frequencies of VHF band (142-415 MHz) at 4 stations, spaced at distance not more than 150 km in Greece. The effect is not caused by peculiarities of generation process at the Sun but most likely manifests distortions of signals in the Earth's ionosphere. The essential difference of the profiles form and spread of maxima on different frequencies decreases at increase of frequency, which indirectly indicates the ionospheric genesis of this phenomenon.

In this report on the basis of a polarization-interference model for radioastronomical signals (Afraimovich, Astron. Astrophys., 1981, V.97, N2, 366-372) we prove that founded phenomenon is manifested by an amplitude modulation of solar radio emission caused by a rotation of the polarization plane in an ionosphere (Faraday effect). For comparison we used the data of RNST solar radio spectrographs (San Vito, Jtaly; Learmonth, Australia), ARTEMIS-IV (Greece) and WIND WAVES, and GPS monitoring data of ionosphere for the above time periods.

The relevant method of corrections permitting to repair an initial profile of intensity of solar flare radio emission is presented using ionosphere GPS monitoring data and IRI-2001 modeling for specific experiment conditions.