




Perspectives of observing the color indices of optical afterglows of gamma-ray bursts with ESA *Gaia*

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Abstract We propose a strategy for detecting and analyzing optical afterglows (OAs) of long gamma-ray bursts (GRBs) without the need to obtain their light curves. This approach is useful for the *Gaia* satellite, which provides sampled optical ultra-low-dispersion spectroscopic observations of the sky. For this purpose, we show that most OAs of long GRBs display specific values of some of their color indices, representing synchrotron emission of the jet. They are stable in time during the event. These indices, which can be determined from the spectra, are very similar for the ensemble of OAs with redshift $z < 3.5$ and display a strong clustering in some color-color diagrams. These indices also enable to constrain the properties of the local interstellar medium of GRBs. The long-lasting mapping of the sky with the *Gaia* instruments also gives us a hope to search for the so-called orphan afterglows, which, according to some authors, can be considerably more numerous than OAs of the observed GRBs.

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