Kruszynska, Katarzyna

Gravitational Microlensing seen by Gaia Space Sattelite

On 19th December of 2013 Gaia Space Satellite was launched by European Space Agency. Its main goal is to measure parallaxes of over 1 billion stars in Milky Way. However, ever since first data has been acquired in 2014, Gaia has observed much more than that. Up to this day its alerting system of sudden change in brightness of observed sources (AlertPipe) has detected around 3000 transients. Fifteen of them have been classified as microlensing candidates with spectacular Gaia16aye event among them. Unfortunately, at least one event has not been found by the alerting system – ASASSN-16oe, detected by All Sky Automated Survey for SuperNovae. The main goal of this research was to create a new alerting method for Gaia tailored specifically to detect new microlensing events, that would aid an already existing pipeline. An additional goal was to check if any other candidates have been overlooked. Because Gaia gathers enormous amounts of data, the scope of search had to be narrowed. Two 3 square degree areas along Galactic Plane have been chosen – neighborhood of Gaia16aye event and ASASSN-16oe event. Only sources published in Gaia Data Release 1 have been taken into account, which summed up to 1.5 million stars. Also all known publicly microlensing candidates have been added to the sample. Additionally, in order to facilitate the search, 1 million microlensing light curves with photometric error and time of observations similar to data found in Gaia have been simulated. Their Einstein time t_E has been randomly chosen from range between 20 and 200 days, brightness in base line m_0 from range between 14.5 mag and 19.5 mag and impact parameter u_0 from 0 to 1. For all light curves six statically parameters have been calculated: mean, median, standard deviation and amplitude of brightness, skewness of the brightness histogram γ and von Neumann parameter η for light curves. The latter one shows how new points in data set depend on the older ones. The results showed that microlensing event occupy a well defined region of $\log10(-\gamma)$ – $\log10(\eta)$ plot. One can observe that ongoing events move from one part of the plot to another during the time of event. An area has been chosen, in which contamination of events that are not microlensing candidates is the lowest and most microlensing events fall in. This works as a base, for an additional tool that will be applied to AlertPipe.