A General View on the Physics of Large Solar and Stellar Flares

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Different kinds of stellar flares – very fast flares (0.1–10 s spikes), impulsive flares lasting 100–1000 s and flares with a long decay of the soft X-rays (LDFs) during hours–days – are described. The flare arises as a consequence of the energy input into the magnetically confined plasma. There is a reason to suppose that the impulsive flares, which occur mainly on active red dwarfs (UV Cet-type), are a result of evolution of local magnetic fields, and they are developed in low-lying loops. As for prolonged flares, which are more typical for components of the RS CVn-binaries, especially, for late-type subgiants, these events are associated, apparently, with large-scale magnetic fields. The response of the outer atmosphere of a star to impulsive heating is considered. It allows us to understand the origin of the X-ray and optical flare radiation in the framework of an uniform approach. In particular, optical radiation of sources formed during the gas-dynamic process considered does describe flare observations quite well. Long-duration flares are a result of the post-eruptive energy release. The analysis of the gas-dynamic processes in giant coronal loops indicates the existence of sustained heating during the soft X-ray flare. The total energy of such LDF can reach $10^{35} - 10^{36}$ erg, that is caused by the large scale of involved magnetic fields.