太陽フレアのimpulsivityと白色光フレア・CMEとの関係
Solar flare impulsivity and its relationship with white-light flares and with CMEs

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There are many types of classification in solar flares. One of them is a classification by flare duration in soft X-rays; so-called impulsive flare and long duration event (LDE). Typically, the duration of an impulsive flare is shorter than 1 hour, and that of an LDE is longer than 1 hour. These two types of flare show different characteristics. In soft X-rays, impulsive flares usually have a compact loop structure. On the other hand, LDEs show a relatively large-scale loop, sometimes a large arcade structure. In hard X-rays, the difference appears clear, too. The former shows a strong and short-time (<10 minutes) emissions and intense double footpoint sources and sometimes a weak loop-top source. LDEs have relatively weaker and longer (>10 minutes) emissions and show a large coronal source. These facts suggest that hard X-ray observation becomes one of a good indicator to classify solar flares, especially for the study on the particle acceleration and the related phenomena. However, hard X-ray data do not always exist due to the satellite orbit and the small sensitivity of hard X-ray instruments. So, in this study, based on the concept of the Neupert effect (Neupert, 1968), we use soft X-ray derivative data as the proxy of hard X-ray. From this data, we define impulsivity (IP) for each flare. Then we investigate solar flares using this new index. First we apply IP index to our white-light flare research. We have already performed a statistical analysis of white-light flare to reveal the physical conditions to generate white-light enhancements. We investigate how white-light enhancement depends on IP, then it is found that white-light flares tend to have large IP values. So the flare impulsivity (IP) is one of the important factors if white-light enhancement appears or not in a solar flare. Next we investigate how CME physical parameters depend on IP index. It has been believed that most of CMEs are associated with LDEs, but we found that there is only a weak correlation between the existence of CME and IP index. We couldn’t find any relationship between CME physical parameters (speed, mass, energy) and IP. Finally, we also search for the relationship between white-light flare and CME as a function of IP and discuss the physical condition of white-light flare.

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