Negative Flare Emissions Observed in EUV by SDO/AIA

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In this study, we present a large flare showing negative emissions in the EUV passbands observed by SDO/AIA. Contrary to ordinary flare emission represented by an increase of intensity, negative flare emission refers to as a decrease of intensity during flares. In the literature, negative flare emissions were usually reported by stellar observations. Only a few negative solar flares were observed in He I D3 in 1970s and one event observed in the near Infrared at 8542 Å in 2001. On 07 January 2014, an X1.2 flare occurred near the solar disk center with a complex magnetic configuration, showing multiple flare ribbons. Among them a remote flare ribbon is located to the southwest from the flare core region. A small portion of the remote ribbon became darkened from about 18:45 UT, while the rest of the ribbon remained bright. This darkening lasted for more than one hour and did not show obvious motion. Therefore, we exclude the possibility of transient coronal hole associated with EUV waves. By comparing with SDO/HMI LOS magnetograms, we find that the negative flare regions are associated with weak magnetic fields, lower than 50 Gauss. In contrast, the bright flare ribbons are co-spatial with strong magnetic fields above 200 Gauss. Furthermore, we investigate the properties of the negative emission by examining the temporal evolution of its intensity and area. Finally, we discuss the possible mechanisms in generating the negative emissions.