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## Observations of photospheric signatures for pre-eruptive coronal structures

The buildup of the pre-eruptive coronal structure and the eruption onset mechanism are the two most critical yet poorly understood problems. Coronal structures like sigmoids and filaments have been identified as pre-eruptive structures; their associated pre-flare motions as well as pre-flare brightenings have been identified as precursor signatures, yet none of these definitively leads to eruptions, and the cause and effect is always questionable. Most importantly, the associated photospheric magnetic field dynamics are elusive. Here we report the development of pre-flare ribbons of electric currents associated with the buildup of a pre-eruptive structure observed as a bundle of hot low-lying coronal loops collectively taking a sigmoidal shape. Two ribbons of strong vertical electric currents at two sides of the major polarity inversion line (PIL) of the host active region are observed several hours ahead of the appearance of the pre-eruptive structure. More impressively, the buildup of the pre-eruptive structure in the corona is simultaneous with the gradual extension of current ribbons in the photosphere. It is reminiscent of the current-carrying magnetic flux rope (MFR). Continuous brightening were observed along the MFR in the corona when the extension of current ribbon ended in the photosphere, implying the onset of magnetic reconnection. The brightening lasted for 4 hours until the MFR erupted. Quantitative measurements indicate that the MFR's feet, which were well identified by conjugate dimmings occurred during the eruption, possess significant non-neutralized current. Our observations provide a new definitive photospheric signature for the buildup of pre-eruptive structures and imminent eruptions.

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