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Prominence instability and CMEs caused by massive coronal rain in the solar atmosphere

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The triggering process for prominence instability and consequent CMEs is not fully understood. Prominences are maintained by the Lorentz force against the gravity, therefore reduction of the prominence mass due to the coronal rain may cause the change of the force balance and hence destabilization of the structures.
We aim to study the observational evidence of the influence of coronal rain on the stability of prominence and subsequent eruption of CMEs.
We used the simultaneous observations from AIA/SDO and SECCHI/STEREO spacecrafts from different angles to follow the dynamics of prominence/filaments and to study the role of coronal rain in their destabilization.
Three different prominences/filaments observed during the years 2011-2012 were analyzed using observations acquired by SDO and STEREO. In all three cases, massive coronal rain from the prominence body led to the destabilization of prominence and subsequently to the eruption of CMEs. The coronal rain triggered the initial slow rise of prominences, which led to the final instability (probably by magnetic reconnection) after 18-28 hours in all cases. The estimated mass flux carried by coronal rain blobs showed that the prominences became unstable after 40 % of mass loss.
We suggest that the initial slow rise and the consequent instability of prominences could be connected with their mass loss by massive coronal rain and breakout model, respectively. If this is the case, then the coronal rain can be used to predict the CMEs and hence to improve the space weather predictions.

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