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Investigating the driving mechanisms of coronal mass ejections

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Abstract. Our objective was to first examine the kinematics of coronal mass ejections (CMEs) using EUV and coronagraph images, and then to make a comparison with theoretical models in the hope to identify the driving mechanisms of the CMEs. We have examined two CMEs which occurred on 2006 December 17 (CME06) and 2007 December 31 (CME07). The models studied in this work were catastrophe, breakout, and toroidal instability model. A few points from our results are as follows: CME06 lasted over eight hours while CME07 released its energy in less than three hours. After the eruption. Both events exhibited a deceleration phase before being accelerated again. Their observationally derived peak accelerations coincided the peak soft X-ray emissions, and were $\sim$60 m s^{-2} for CME06 and $\sim$600 m s^{-2} for CME07. Our comparisons with the theories suggested that CME06 can be best described by a hybrid of the catastrophe model and breakout model while CME07 is most consistent with the breakout model. Based on the catastrophe model, we deduced that the reconnection rate in the current sheet for CME06 was intermediate, the onset of its eruption occurred at a height of $\sim$200 Mm, and the Alfvén speed and the magnetic field strength at this height were approximately 130-250 km s^{-1} and 7 Gauss, respectively.