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The active Sun and its implication for the heliosphere
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Three-Dimensional Reconstuction of Four Fast CMEs from 2011 March 7-8

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Coronagraphic and heliospheric images from STEREO are used to study the morphology of four fast CMEs from 2011 March 7-8, which we label CME1-CME4. All four have appearances that can be reproduced assuming a 3-D flux rope morphology. The particularly rapid (over 1600 km/s) flux rope driver of CME2 produces a visible shock, the shape of which we also model. The CME's location near a coronal hole results in this shock expanding asymmetrically relative to the flux rope driver, both laterally and radially. This shock hits both STEREO-A and the Wind spacecraft near Earth. The morphological reconstruction of the shock based on the imaging is able to reproduce the shock arrival times at STEREO-A and Earth. At Earth there is ejecta observed following the shock, which yields a daylong magnetic storm on March 11. The morphological model implies that the ejecta following the CME2 shock may actually be the shocked flux rope of CME1 rather than the flux rope driver of CME2.