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The active Sun and its implication for the heliosphere
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Modeling the coronal expansion of CME cavities

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We present MHD simulations of flux rope CMEs which address the strong expansion of a cavity in the inner corona recently found for the first time in stereoscopic SECCHI data of a fast CME (Patsourakos et al. 2010). The expansion is found to consist of two components. The first of these is due to an ideal MHD effect. The information of decreasing flux rope current in the course of the rope's ascent propagates into the medium surrounding the flux rope and causes it to expand all around the rope by virtue of flux conservation. The second is due to the addition of flux to the rope by flare reconnection. The ideal MHD effect dominates initially if the ambient field is only weakly sheared, producing a cavity outside of the growing flux rope. This rapidly growing "outer cavity" is a prime candidate for the formation of coronal EUV waves and shocks. Subsequently, the growth of the rope due to flare reconnection leads to an approach of the rope and outer-cavity edges. We conclude that the CME cavity may be larger than the CME flux rope low in the corona if the ambient field is only weakly sheared and that cavity and rope tend to coincide in the outer corona and solar wind.