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A new look at a polar crown cavity as observed by SDO/AIA

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(Submitted on 18 Jul 2011)

The Solar Dynamics Observatory (SDO) was launched in February 2010 and is now providing an unprecedented view of the solar activity at high spatial resolution and high cadence covering a broad range of temperature layers of the atmosphere. We aim at defining the structure of a polar crown cavity and describing its evolution during the erupting process. We use high cadence time series of SDO/AIA observations at 304\AA (50000 K) and 171\AA (0.6 MK) to determine the structure of the polar crown cavity and its associated plasma as well as the evolution of the cavity during the different phases of the eruption. We report on the observations recorded on 13 June 2010 located on the North-West limb. We observe coronal plasma shaped by magnetic field lines with a negative curvature (U-shape) sitting at the bottom of a cavity. The cavity is located just above the polar crown filament material. We thus observe the inner part of the cavity above the filament as depicted in the classical three part Coronal Mass Ejection (CME) model composed of a filament, a cavity and a CME front. The filament (in this case a polar crown filament) is part of the cavity and makes a continuous structuring from the filament to the CME front depicted by concentric ellipses (in a 2D cartoon). We propose to define a polar crown cavity as a density depletion sitting above denser polar crown filament plasma drained down the cavity due to gravity. As part of the polar crown filament, plasma at different temperatures (ranging from 50000K to 0.6 MK) is observed at the same location on the cavity dips and sustained by a competition between the gravity and the curvature of magnetic field lines. The eruption of the polar crown cavity as a solid body can be decomposed into two phases: a slow rise at a speed of 0.6 km/s, and an acceleration phase at a mean speed of 25 km/s.

Comments: 4 figures
Subjects: **Solar and Stellar Astrophysics (astro-ph.SR)**; Earth and Planetary Astrophysics (astro-ph.EP)
Cite as: **arXiv:1107.3451 [astro-ph.SR]**
(or **arXiv:1107.3451v1 [astro-ph.SR]** for this version)

Submission history

From: Stephane Regnier [view email]
[v1] Mon, 18 Jul 2011 14:37:46 GMT (4590kb)