The Mysterious Case of the Missing Filaments

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Coronal Mass Ejections, or CMEs, are large solar eruptions that can have major debilitating impacts on society. Typically, these eruptions have the three following key structures: the leading edge, the empty chamber known as the cavity, and the filament which often is the brightest part of the CME. When we can see all three structures clearly with a coronagraph, it is called a classic three-part CME, also referred to as a 'lightbulb' CME. According to current knowledge, when a CME erupts, a filament should also erupt or lift off the Sun in order to have the bright center within the CME. However, we do not always see a filament erupt at the surface, and yet we still get a 'filament' within the coronagraph CME. To better understand what might be occurring with these missing filaments, we looked at three-part CMEs using the SOHO LASCO CME Catalog and filaments from the SDO AIA Filament Catalog in order to create a list of 50 CMEs without a listed filament erupting at the surface. For those CMEs without filaments in the list we closely inspected the AIA images for evidence of filament eruption. To ensure that there were no filaments past the limb of the Sun, we used data from the STEREO-A and STEREO-B spacecraft's to look at the Sun from other angles. We have found numerous events where no filament erupts from the surface, but we still see the classic three-part CME. We believe this may be due to an optical illusion occurring from the twisting of the flux rope.