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Jet-CMEs in three dimensions: STEREO observations and interpretation

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We are using recent STEREO twin spacecraft observations (EUVI, COR1 and COR2 high cadence movies) to evaluate the three-dimensional shape, the internal structure and dynamics of small transient and twisted multithread loops emanating sometimes from big circumpolar coronal holes as helical ray-like structures. We term these eruptive events “jet-CMEs” because they resemble orders of magnitude larger eruptions known for many years known as ordinary coronal mass ejections. The summits of these CMEs accelerate, twist, rotate and continue to move along large scale magnetic field as jet-like features when viewed in two dimensions. High magnetic fields in a low beta regime are guiding them and forming a transient ray structure associated with curved polar plumes seen in white light and finally diluted in the ambient solar wind. We estimate velocities and masses of jet-CMEs moving inside coronal holes. Association of jet-CMEs with X-ray bright points (XBPs) and ephemeral magnetic knots exists, but not one-to-one. It is because not all seen XBPs and ephemeral magnetic regions are in an erupting stage to produce jet-CMEs. We assume that electric fields and electric currents are needed for this purpose to brighten them via Joule heating and to excite ExB plasma drift motion, rotation and expansion. We consider an explanatory three-dimensional theoretical model of the phenomenon with the essential role of electric and magnetic fields in the non-axially symmetric and time-dependent magnetic field geometry. The analogy between non-locally coupled elements like active region/streamer/coronal hole and like XBP/jet-CME/coronal hole exists under appropriate rescaling of orders of magnitudes in different parameters and sizes. The work

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