Jackson, B. V.; Hildner, E.
Forerunners - Outer rims of solar coronal transients.
Solar Physics, vol. 60, Nov. 1978, p. 155-170, **1978, File**.
The large loop or blob-like transient events viewed in the white-light corona are rimmed by broad regions where the density is slightly enhanced above the pretransient corona. Every one of the Skylab events studied for which sufficiently good Skylab coronagraph coverage is available shows this effect. The upper boundaries of these 'forerunners' blend gradually into the background corona 1-2 solar radii above the transient's leading edges. In any single event, the coronal mass enhancement represented by the forerunner comprises up to 25% of the total excess mass present in the coronagraph's field of view and includes a much larger volume of the corona than previously attributed to the underlying transient. A forerunner without an accompanying transient has not yet been seen. Clearly, forerunners must be reckoned with in any proposed models of discrete outward coronal mass motions, because they indicate the presence of disturbed corona far ahead of the denser portions of the event.

Jackson, B. V.
Forerunners - Early coronal manifestations of solar mass ejection events.
Solar Physics, vol. 73, p. 133-144, **1981, File**.
Coronal ejection transients viewed with the white light coronagraph on Skylab are studied from the times of their very earliest manifestations for clues to their origin. Excess coronal mass with a configuration like that of the eventual transient is seen in twelve events prior to the transient's associated near-surface H-alpha eruption or flare. In seven of the events, data are adequate to observe the rates of outward mass motion of coronal material prior to their surface manifestations. The observations place severe constraints on different solar mass ejection mechanisms because they spread the process responsible for the ejection over a larger region of the corona and over a longer period of time than normally considered. The observations suggest the corona is an active participant in the ejection that begins with the acceleration of the outer portion of a preexisting structure and ends with the obvious surface manifestation.

Harrison, R. A.; Waggett, P. W.; Bentley, R. D.; Phillips, K. J. H.; Bruner, M.; Dryer, M.; Simnett, G. M.
The X-ray signature of solar coronal mass ejections
Solar Physics, vol. 97, p. 387-400, **1985, File.**
The coronal response to six solar X-ray flares has been investigated. At a time coincident with the projected onset of the white-light coronal mass ejection associated with each flare, there is a small, discrete soft X-ray enhancement. These enhancements (**precursors**) precede by typically ≡20 m the impulsive phase of the solar flare which is dominant by the time the coronal mass ejection has reached an altitude above 0.5 R_sun;. The authors identify motions of hot X-ray emitting plasma, during the precursors, which may well be a signature of the mass ejection onsets. Further investigations have also revealed a second class of X-ray coronal transient, during the main phase of the flare. These appear to be associated with magnetic reconnection above post-flare loop systems.

Simnett, G. M.; Harrison, R. A.
The onset of coronal mass ejections
Solar Physics, vol. 99, p. 291-311, **1985, File.**
This study addresses the onset of coronal mass ejections from examination of sensitive X-ray images from the Solar Maximum Mission around the projected onset time of coronal mass ejections. Two important new features were identified: (1) there is usually a weak, soft X-ray

enhancement 15-30 min prior to the linearly extrapolated chromospheric departure time of the ejection; (2) this activity is generally from two widely separated parts of the sun. Possible physical mechanisms for these phenomena are examined, and it is concluded that a plausible explanation is that the initial energy release is converted first into kinetic energy of suprathermal protons, 100-1000 keV. The protons are trapped in a large magnetic loop which later breaks open as the mass ejection; Coulomb losses are the destabilizing agent, but the mass ejection is probably magnetically driven. Protons that escape into the loss cone will impact the loop footpoints, to heat the upper chromospheric material to a temperature sufficiently high to generate the weak soft X-ray emission. There will also be an H-alpha signature, and this is observed in a number of events. There is in general no radio emission or hard X-ray emission accompanying the soft X-ray **precursor**. When the coronal mass ejection is followed by a flare, then this is generally from a point close to, but not identical to, one of the points with the earlier soft X-ray enhancement.

Karpen, J. T.; Howard, R. A.
A search for forerunner activity associated with coronal mass ejections.
Journal of Geophysical Research (ISSN 0148-0227), vol. 92, p. 7227-7234, **1987.**
The authors have performed a systematic search for forerunners using the white-light coronagraph observations obtained with the Solwind instrument on board the P78-1 satellite. Forty-four bright, well-observed events were selected and analyzed, employing selection criteria and analysis methods similar to those used by Jackson and Hildner (1978). Approximately half of these events either do not exhibit low-density plateaus in front or are questionable (e.g., a frontal plateau only appears intermittently). Based on their analysis of the remaining coronal mass ejections (CMEs), the authors conclude that identification of the forerunner as a distinct entity probably is not warranted, and that the low-density plasma is an integral part of the CME itself.