

Interactive comment on “Development of a formalism for computing in situ transits of Earth-directed CMEs. Towards a forecasting tool II” by Pedro Corona-Romero and Pete Riley

Anonymous Referee #2

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This paper discusses a scheme to forecast the 1 AU properties of coronal mass ejections, at least those that are relatively fast (so the “piston approximation” can be assumed) land aunched near central meridian, that is based on an analytical model and empirical relationships. The major part of the paper describes an exhaustive comparison of the predicted and observed CME parameters. I did perhaps find this discussion overlong, given that this is just one model with limitations, such as the CMEs should be launched near central meridian, and am not sure whether it will be of interest beyond a limited audience. Also, I wasn’t really sure what I learned from reading the paper. However, the paper is generally clearly written other than some minor English errors and overall, I recommend publication subject to consideration of a few minor points.

Line 16: Is Moldwin really the correct reference for the NSWSP? Is there a specific reference for the Plan?

Line 22: CIRs and high speed streams can also be responsible for geomagnetic effects of course.

Line 23: Also give a couple of references to refereed journal articles since the reader might not have access to Howard's book.

Line 42: I don't believe this 1990 paper is the correct reference for the Wang-Sheeley-Arge model; Arge only arrived on the scene later (early 2000s?).

This is the third study, but numbered "II". Maybe an additional phrase could be added to the title to describe what aspect this paper discusses, e.g. "... II: Test of the model against observations" or whatever's appropriate.

Line 89: "Rising phase duration" of what aspect of the flare, e.g. soft X-rays, or something else? This is finally clarified in line 730.

Line 102: believed

In Figure 1 (left), theta is indicated as the full angular width, not the semi-angular width. Perhaps the dashed arc should extend only to the horizontal line?

Line 145: This isn't the simplest of CMEs, with structures in the CME. Is there a particular reason it was chosen as an example? This also applies to many of the other events. Later it is mentioned that the modeling doesn't predict these details.

Line 155: Give the CME parameters and mention which CME is associated with this in situ CME.

In Figure 2, why are certain sections of the data (inside the CME boundaries) shown as dashed rather than solid lines? This isn't mentioned in the caption.

Figure 2 caption, line 4: The CME boundary lines aren't dotted, but are short dashes

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vs. long dashes for the center line.

Caption, line 6: Lopez (1987) doesn't actually discuss the expected temperature. I believe the expected temperature was introduced by Richardson and Cane 1993 (DOI: 10.1029/93JA01466) and 1995 (DOI: 10.1029/95JA02684), who used a T_p vs. V fit from Lopez and the observed solar wind speed to calculate T_{exp} , which was then compared with the observed T_p . Lopez is also referenced several other times in the paper in this way.

Line 174: Multiple coronagraph observations are not available for this event (the STEREOs were launched in 2006), so the speed can't be "fixed" in this way.

Line 181: Missing reference at "??"? 12% seems too high for the alpha component of most CMEs, e.g., Figure 5 of doi:10.1029/2004JA010598, and enhanced He/p isn't a consistent signature of CMEs. In any case, there should be observations for the events of interest to check this ratio.

Line 195: "and many others" isn't useful for the reader.

Line 226: Explain briefly how the accumulative magnetic flux is calculated. The reader might expect this to be a sum of the measured intensity or something similar and hence continue to increase with time, but clearly this is not the case.

Table 1: How are the CME associations with the in situ CMEs made? E.g., are they well-established in the literature or inferred by the authors? Obviously, they have to be correct, otherwise the analysis breaks down, so this deserves a few words of explanation.

Footnote b: Is there a missing reference or a query at the "??"?

Line 256: Not quite sure what is meant by "when we neglect the events affected by interacting currents of solar wind".

Figure 4 caption: "Dotted red lines . . ." mentioned twice.

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Line 376: I don't understand "The certainest on the trajectory of a CME as a whole may help to know the transit of the CME boundaries as well as the closest approach to the CME center."

Line 378: do not necessarily

Line 386: Undefined figure?

Line 430: Not sure what "conditions that derived into the short bars shown in the histogram" means.

Line 469: Missing reference?

Line 673: The curve is only determined by one point, so how reliable/useful is this fit?

Line 717: Of course this requires other information, for example, on Bz in the sheath which isn't within the capabilities of such models.

Line 755: "redaction" doesn't seem the correct word -production?

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2019-163>, 2020.

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