Prominence instability and CMEs caused by massive coronal rain in the solar atmosphere

Vashalomidze, Z.[1;2;3], Zaqarashvili, T.V.[1;2;3], Kukhianidze, V.[1;3], Ramishvili, G.[1;3], Hanslmeier, A.[2], Gömöry, P.[4]

1. Ilia State University, Kakutsa Cholokashvili Ave 3/5, 0162 Tbilisi, Georgia
   e-mail: zurab.vashalomidze.1@iliauni.edu.ge
2. IGAM, Institute of Physics, University of Graz, Universitätsplatz 5, 8010 Graz, Austria
3. Abastumani Astrophysical Observatory, Mount Kanobili, Abastumani, Georgia
4. Astronomical Institute, Slovak Academy of Sciences, P.O. Box 18, 05960 Tatransk´a Lomnica, Slovak Republic

➢ Introduction

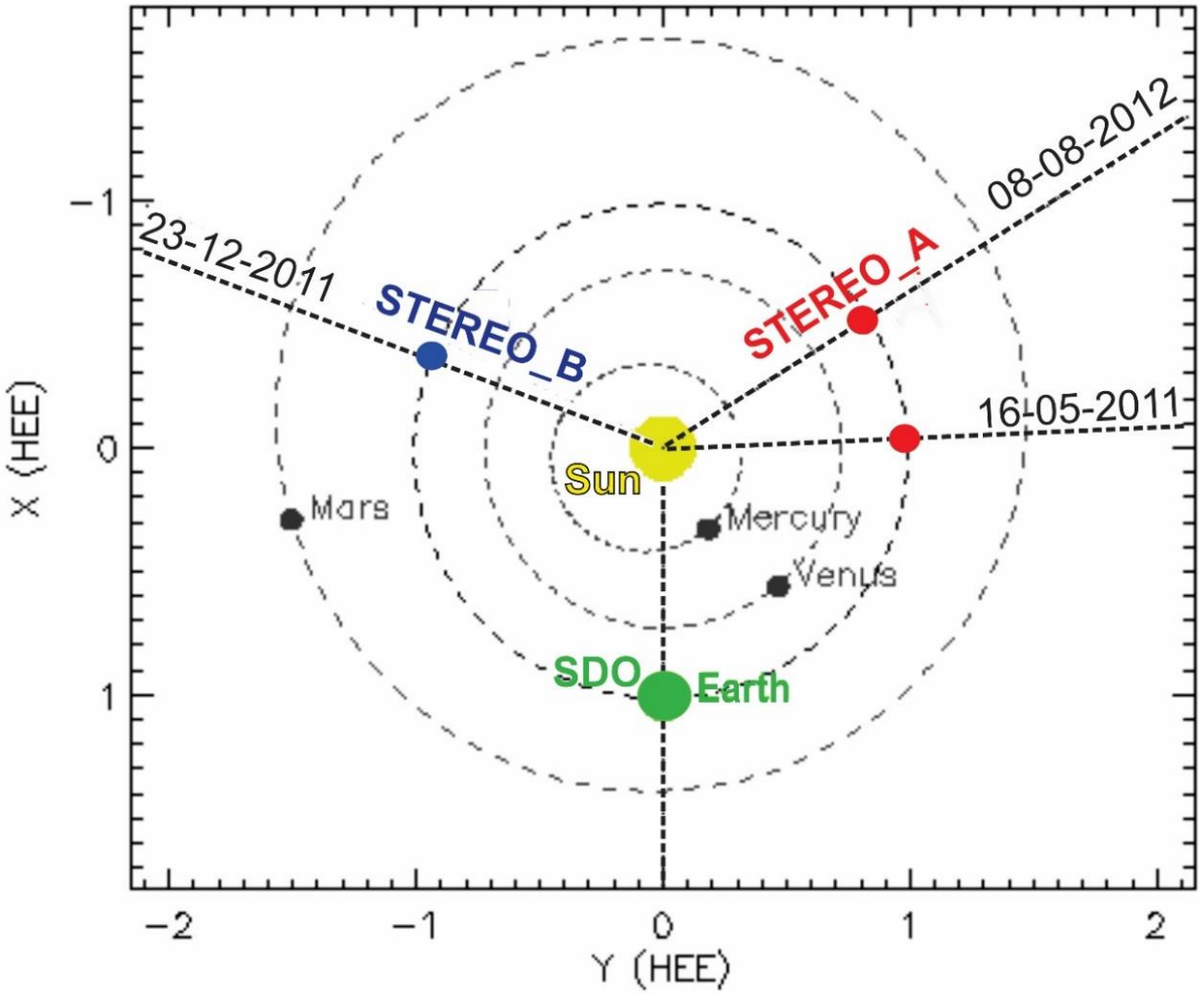
- Prominence instability, the initiation of CMEs (Priest et al. 2002), as well as an interconnection between CMEs and erupting prominences are not clearly understood (Chae et al. 2000, Zhang et al. 2017a, Zirker et al. 1998).

- Another phenomenon in the solar atmosphere is a **coronal rain**, cool and dense material condensing at solar coronal loops falling along its legs. The condensations are probably caused by thermal instability (Parker 1953, Field 1965). Another type of **coronal rain** is related to solar prominences.

- We present several observational evidences of prominence instability as triggered by massive downflows in form of coronal rain.

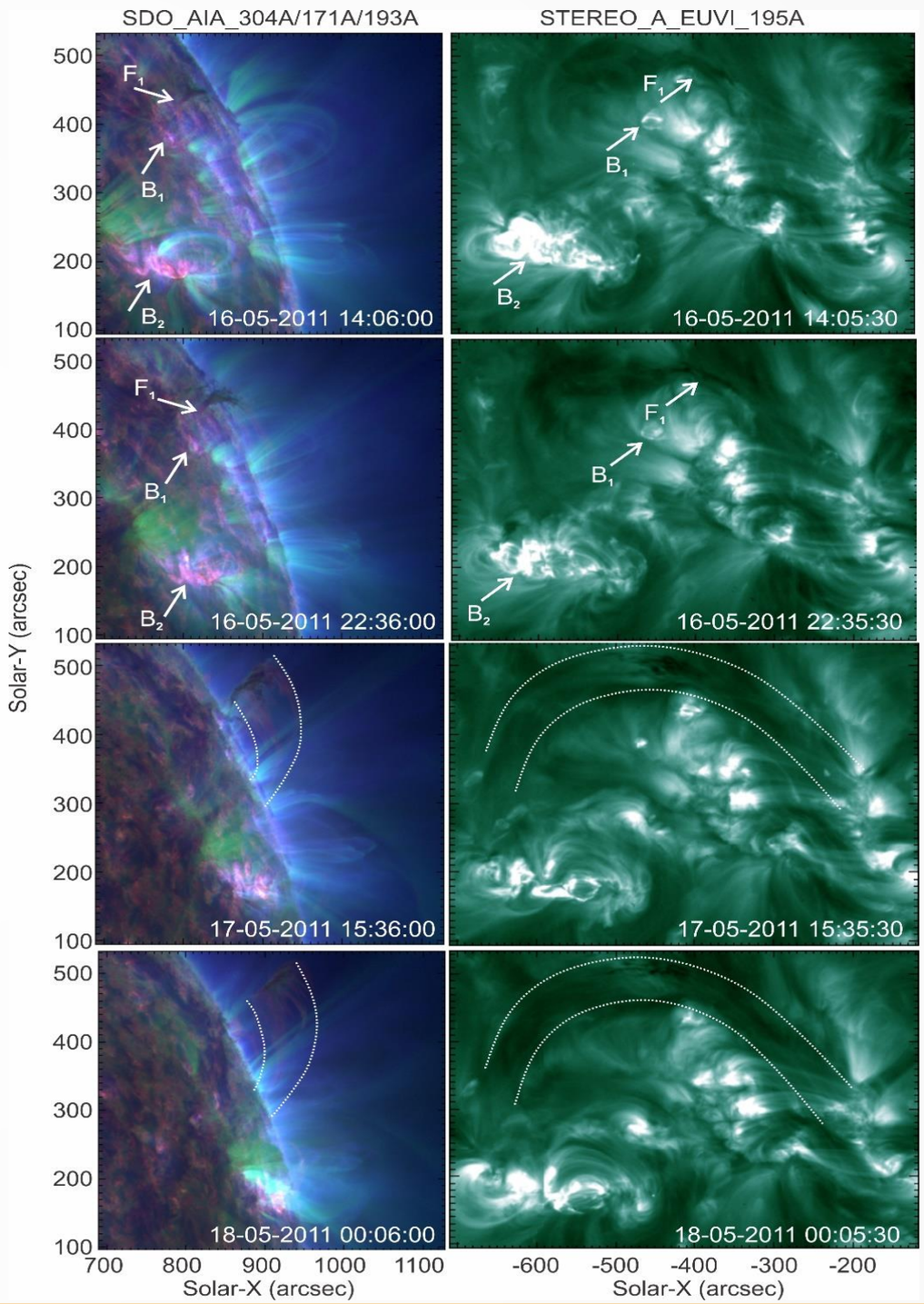
➢ Observation and Data Analysis

- We analysed three different events observed during the years of 2011-2012: on May 16-18, 2011, December 22-24, 2011 and August 07-08, 2012.

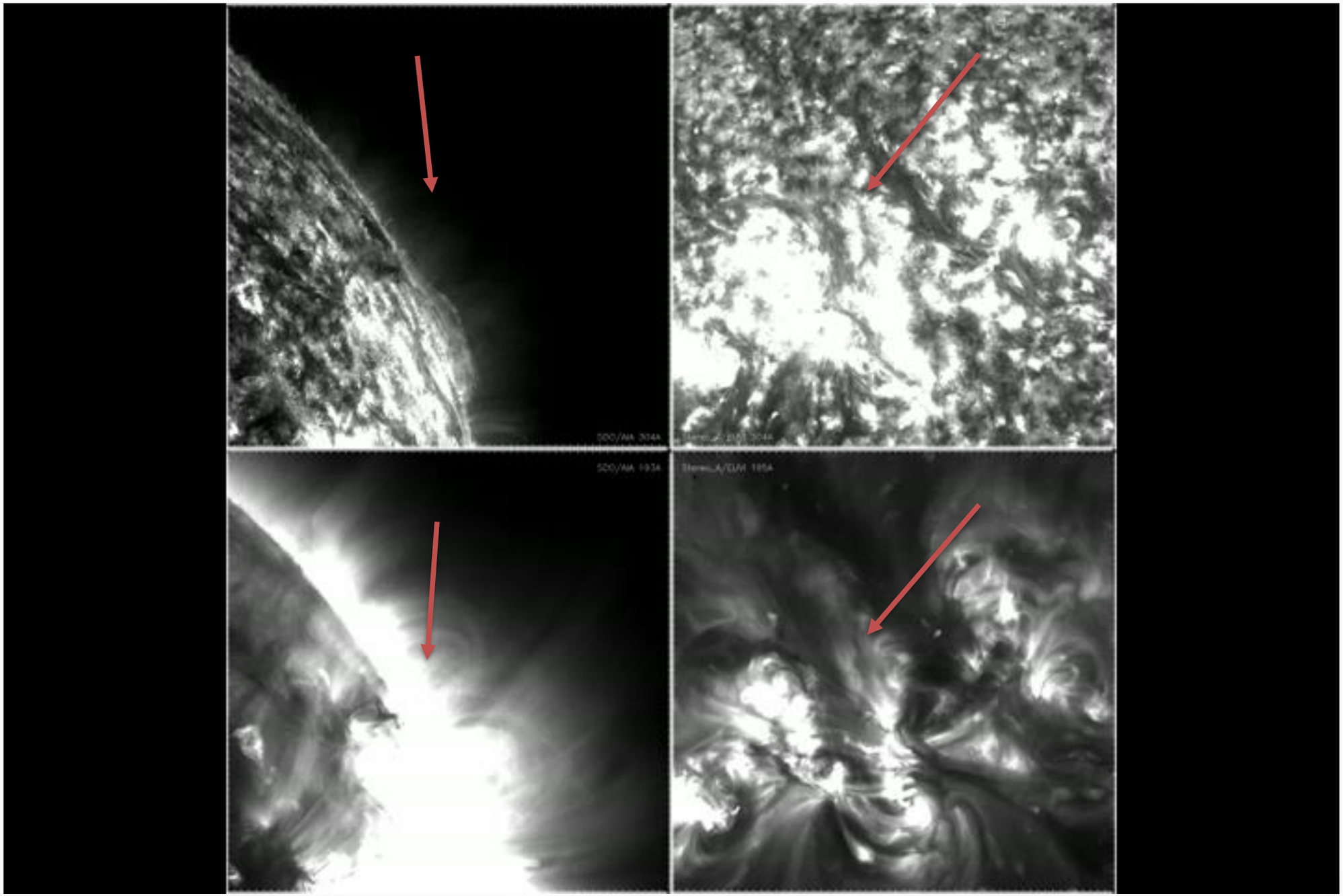


➢ The event of May 16-18, 2011

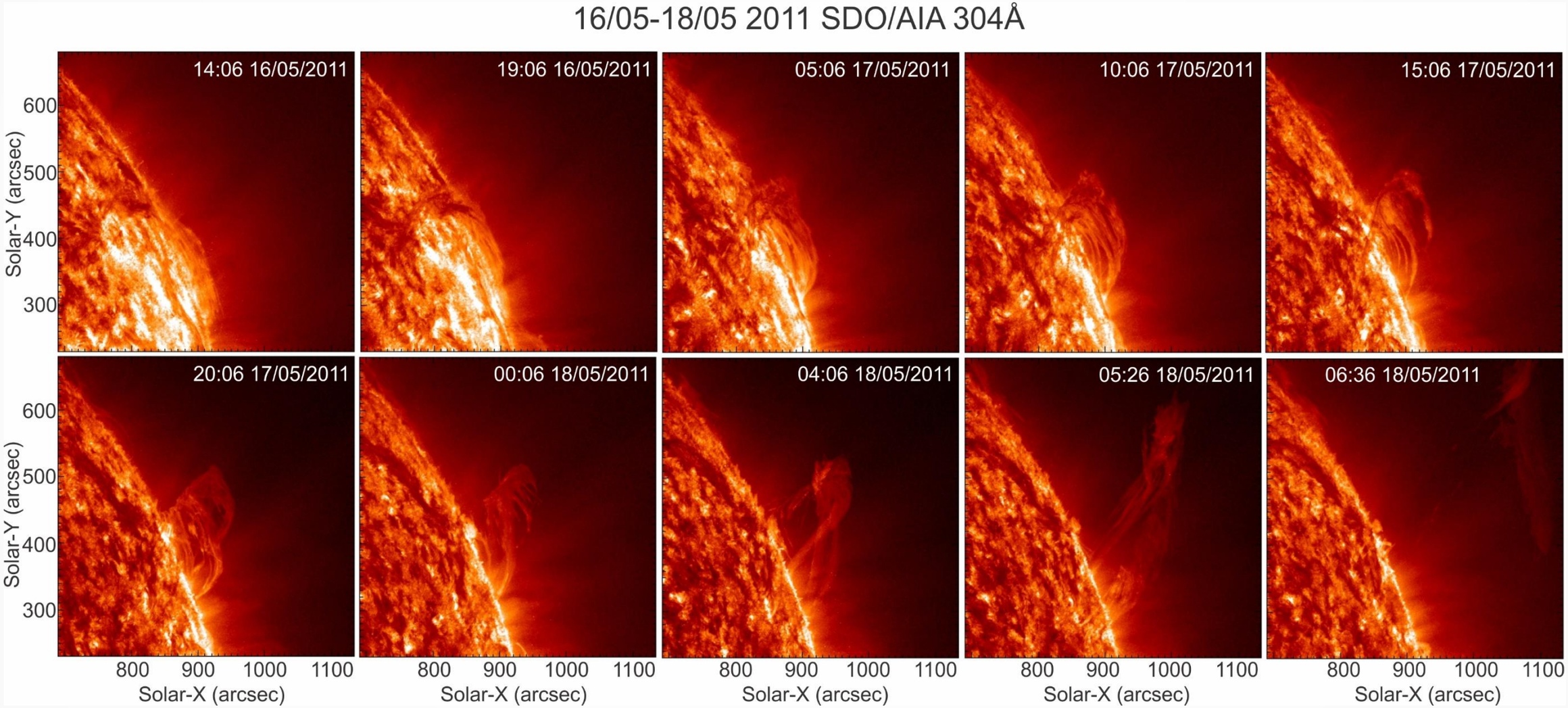
- Figure shows the evolution of the prominence from SDO and Stereo A during 14:06 UT 16 May and 00:06 UT 18 May, 2011.



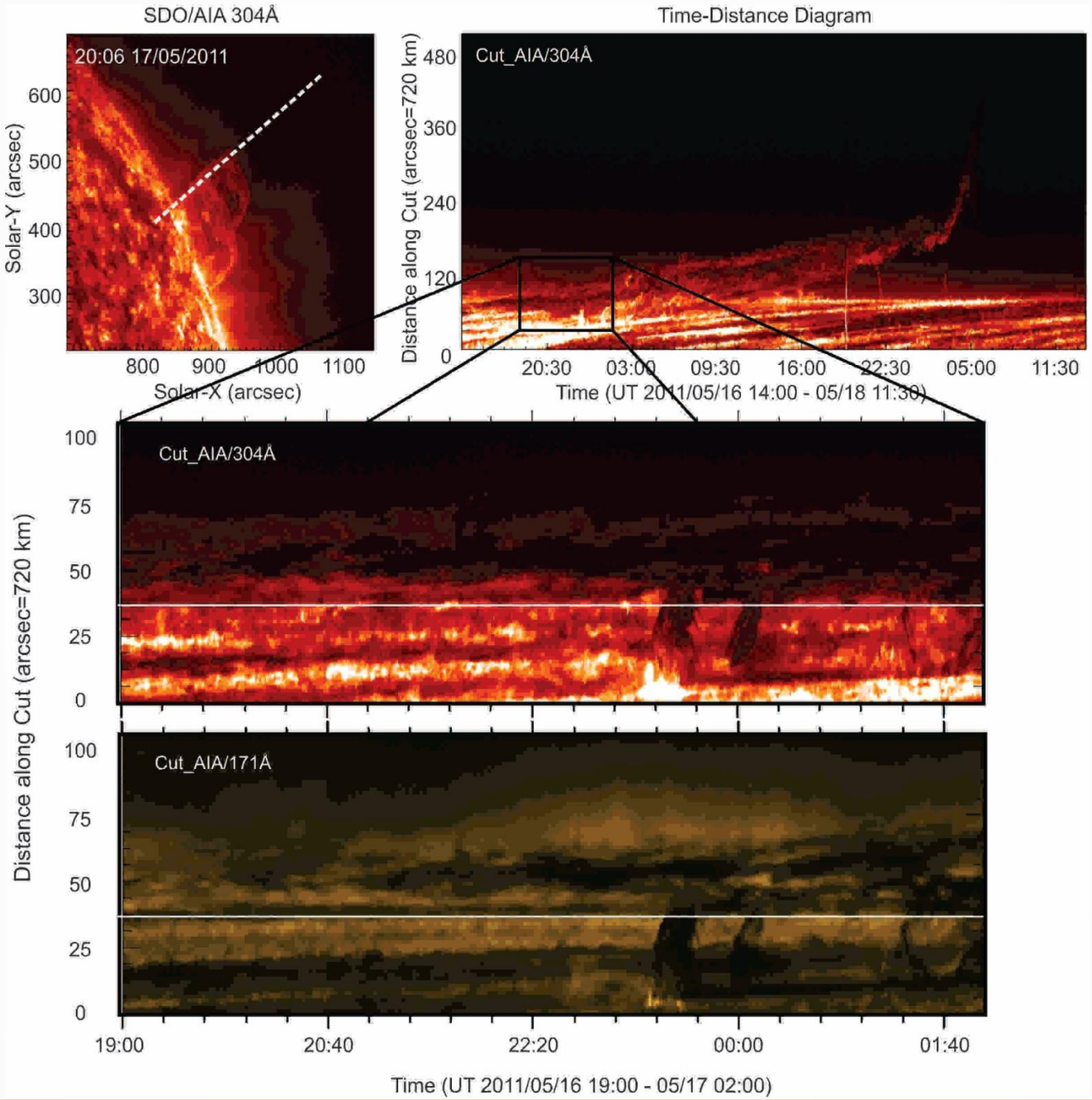
- 4 panel movie of prominence structure.



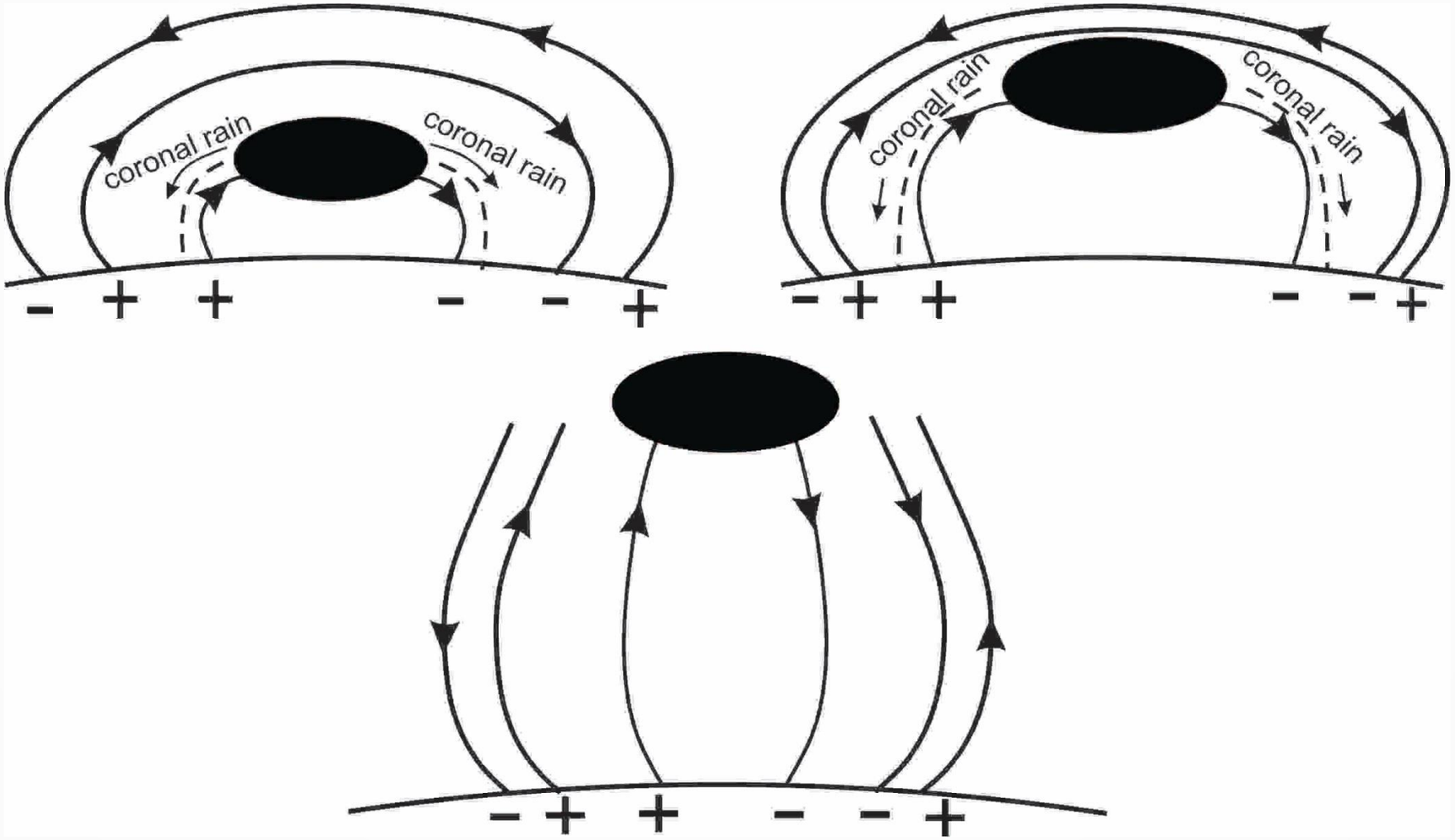
- After almost 28 hrs of coronal rain, the prominence started to be destabilised and finally erupted as a CME on May 18, 2011.



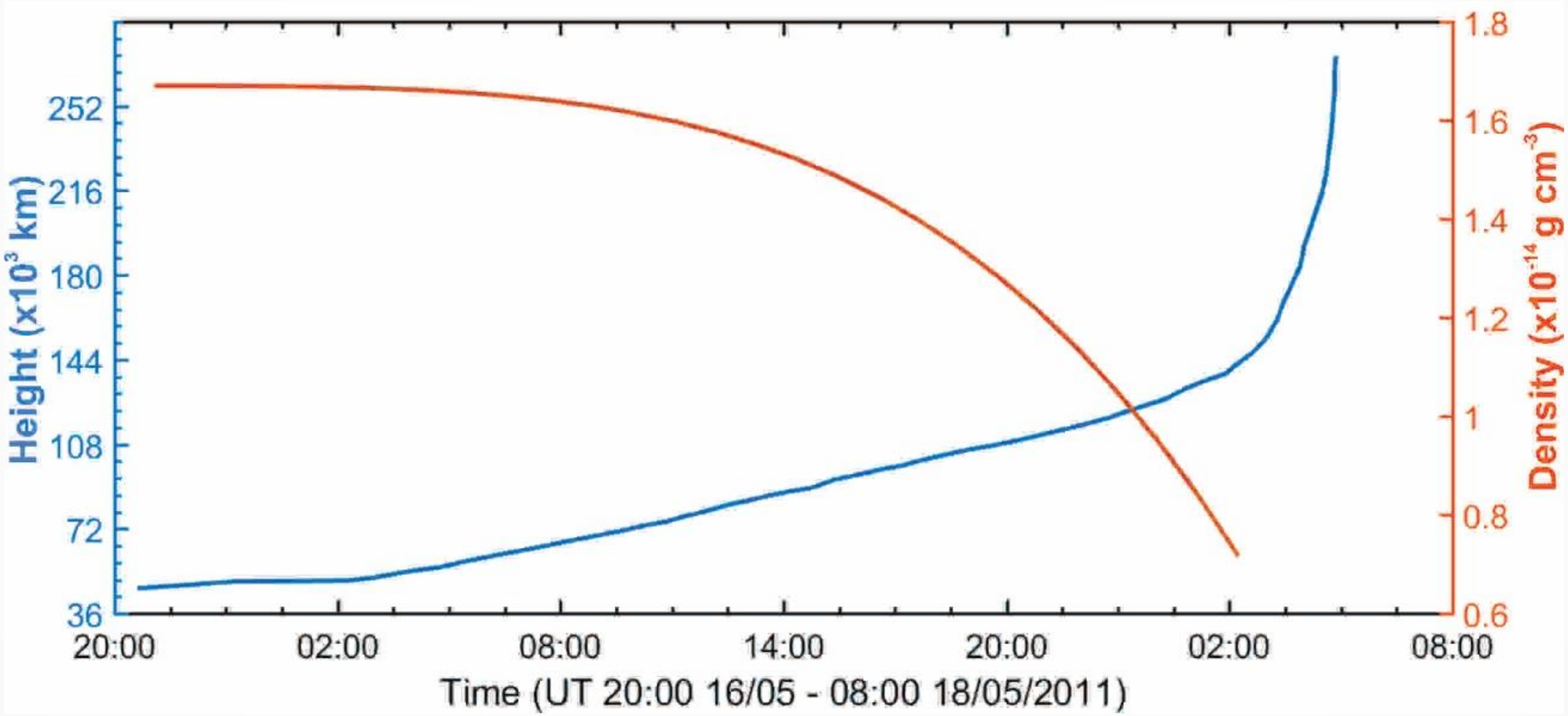
- The Figure shows a process of prominence rise in detailed using a vertical space-time.



- The Figure shows the schematic picture of the whole process, which may be relevant to our case.



- The Figure shows the observed dynamics of prominence height and estimated decrease of density.



➢ Conclusion

If future analysis show the similar behaviour for many prominences then the coronal rain may be used to predict the prominence instability and hence CMEs. This will help to improve the space weather predictions.