[2-7]

# FLUX ROPE STRUCTURES OF THE SOLAR WIND ASSOCIATED WITH TWO INTENSE GEOMAGNETIC STORMS IN 2015: THE 17 MARCH AND THE 22 JUNE STORMS

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We have analyzed the solar wind magnetic field structures associated with the two intense geomagnetic storms in 2015: the 17 March storm (minimum Dst = -223 nT, provisional) and the 22 June storm (minimum Dst = -195 nT, real-time). In both cases, flux rope structures are found in the solar wind data during the storm main phase. The flux rope analysis for the 17 March event yields two possible flux rope geometries, one cylinder model and one torus model. Of the two geometries, the result from the torus model well matches the observations of the solar source related to the storm, if it is assumed that the axis direction of the flux rope was parallel to the polarization inversion line (PIL) of the active region 12297 when erupted, and that it propagated through interplanetary space without change of the axis direction (See Marubashi et al. 2015). In case of the 22 June storm, the flux rope fitting provides two possible flux rope geometries from the torus model: one with left-handed chirality and the other with right-handed chirality; and no satisfactory result from the cylinder model. In this case however, we find that the photospheric magnetic field polarity change across the PIL in the solar source region is opposite to that suggested from the solar wind observation. Thus, the 22 June event is a very challenging case to our understanding of connection between the solar eruption and the interplanetary magnetic flux rope. It suggests three possibilities: (1) There is some uncertain effect in the process of the flux rope analysis; (2) The parallelism does not always hold true between the flux rope axis and the PIL; and (3) The solar source event may be different from that we assumed. We are still making an effort to find evidence for the third possibility, and expect reliable results from more detailed studies during this Data Analysis Workshop.

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## REFERENCES

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