

## Investigating the early evolutions of non-radial solar eruptions

Qingmin Zhang<sup>1</sup>

<sup>1</sup> Purple Mountain Observatory, CAS, P.R. China

e-mail: [zhangqm@pmo.ac.cn](mailto:zhangqm@pmo.ac.cn)

Non-radial prominence eruptions and coronal mass ejections (CMEs) are widespread in the solar atmosphere. The directions of eruptions play an important role in determining the geoeffectiveness of these eruptions. Single-view observations in extreme-ultraviolet (EUV) and white light (WL) wavelengths are strongly affected by the projection effect.

In this talk, I will show the recent progress in three-dimensional (3D) reconstructions of prominences and CME leading edges using multiwavelength and multi-view observations. Two geometrical models are proposed to perform reconstructions and tracking, including the **revised cone model** (Zhang 2021) and **revised graduated cylindrical shell (GCS) model** (Zhang et al. 2023).

The revised cone model (Figure 1) is characterized by four parameters: the length ( $r$ ) and angular width ( $\omega$ ) of the cone, the deflection angles in longitude ( $\phi_1$ ) and latitude ( $\theta_1$ ) directions, respectively. It has been successfully applied to the 3D reconstructions and tracking of bright fronts of CMEs (Zhang 2022) and the leading edges of prominences (Zhang et al. 2024).

The revised GCS model (Figure 2) is characterized by six parameters: angle ( $2\alpha$ ) between two identical legs with lengths of  $h$ , aspect ratio ( $\kappa$ ), tilt angle ( $\gamma$ ) of the PIL of the source region, the deflection angles in longitude ( $\phi_1$ ) and latitude ( $\theta_1$ ) directions, respectively.

A couple of typical non-radial eruptions are investigated using these two models. Characteristics of their early evolutions are derived, including the angular width, propagation direction, position, and velocity. Based on these parameters, expansion, acceleration, and deflection processes are uncovered, which are important to the space weather forecast.

### References

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- [2] Q. M. Zhang 2021, A&A, 660, A144
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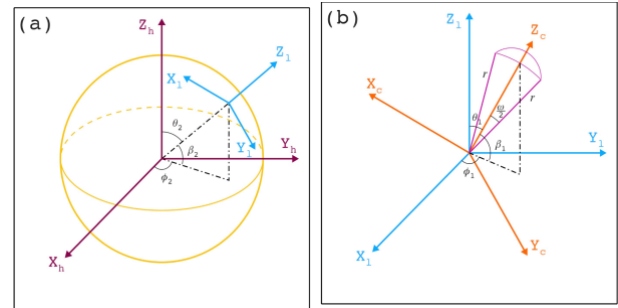


Figure 1. Revised cone model.

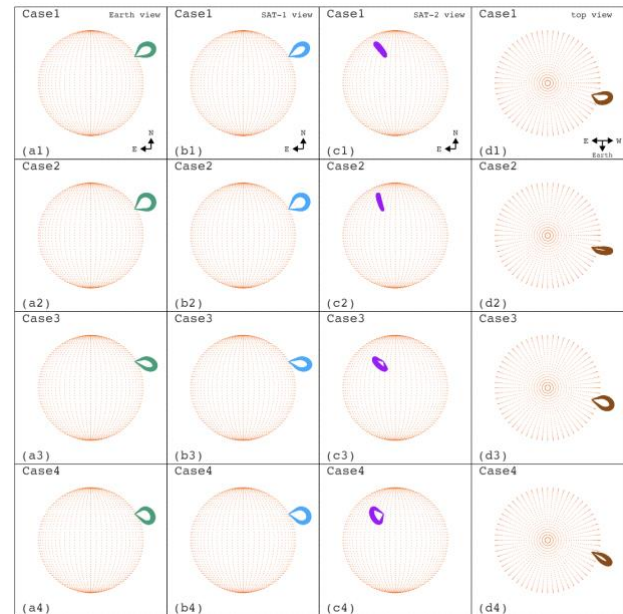


Figure 2. Revised GCS model.