5th Asia-Pacific Conference on Plasma Physics, 26 Sept-1Oct, 2021, Remote e-conference

Mass ejections and winds in solar-like stars

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Although our present day Sun is a relatively slow rotator, producing moderate flares and mass ejections, in the past we believe it was much more active. In order to understand the evolution of the Sun's activity in a wider context, we have mapped the surface magnetic fields of around 100 solar-like stars, revealing strong trends with mass and rotation rate[1] that challenge our understanding of how magnetic fields are generated and how they evolve.

Mapping the magnetic helicity density across the surfaces of these stars has also revealed the role of stellar internal structure in determining the efficiency with which stars can generate large-scale helicity density[2,3]. On long timescales, the evolution of stellar magnetic fields is driven by the spin down of the star as its wind removes angular momentum. These winds are however difficult to observe directly[4]. In this talk I will describe recent advances in using observations of stellar prominences (known as 'slingshot prominences') to trace the structure of stellar coronae and as a means of measuring the wind mass-loss rates[5,6].

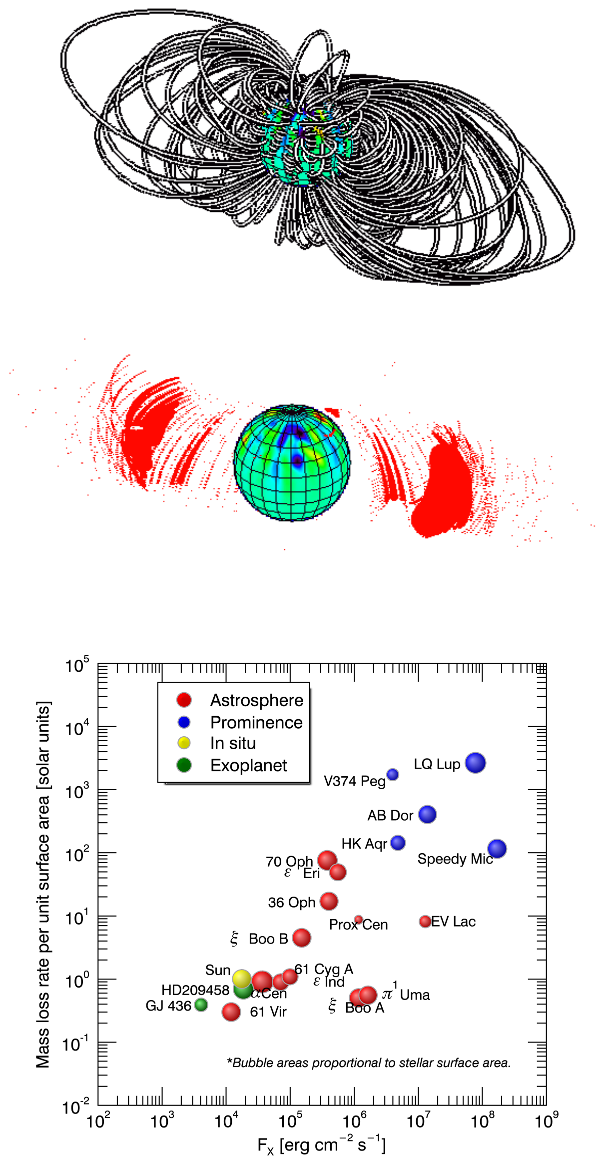

Figure 1. Top: Potential field extrapolation of the young rapidly-rotating solar-like star AB Dor using Zeeman-Doppler images of the surface magnetic field as input. Middle: Predicted prominence locations are shown red. The radial magnetic field at the surface is also shown with red denoting positive polarity and blue negative. Bottom: Wind mass loss rates per unit surface area (in solar units) determined by various methods. Results using slingshot prominences are shown in blue.

References

[1] Vidotto, A et al, 2014, MNRAS,441,2361

[2] Lund, K et al, 2020, MNRAS, 493,1003

[3] Lund, K et al, 2021, MNRAS, 502,4903

[4] Wood, B et al, 2005, ApJ, 628,143

[5] Jardine, M and Collier Cameron A, 2019, MNRAS, 482, 2853

[6] Jardine, M. et al, 2020, MNRAS, 491, 4076