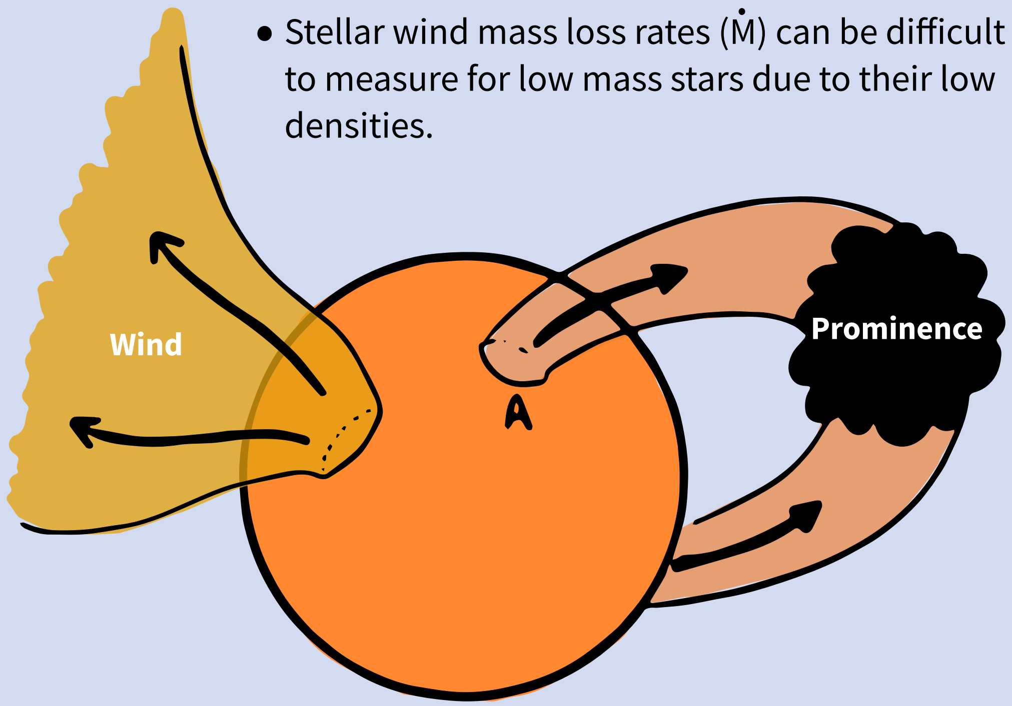
Predicting the mass loss rates of Mdwarfs

Rose F.P. Waugh and Moira M. Jardine
University of St Andrews, Scotland
rw47@st-andrews.ac.uk

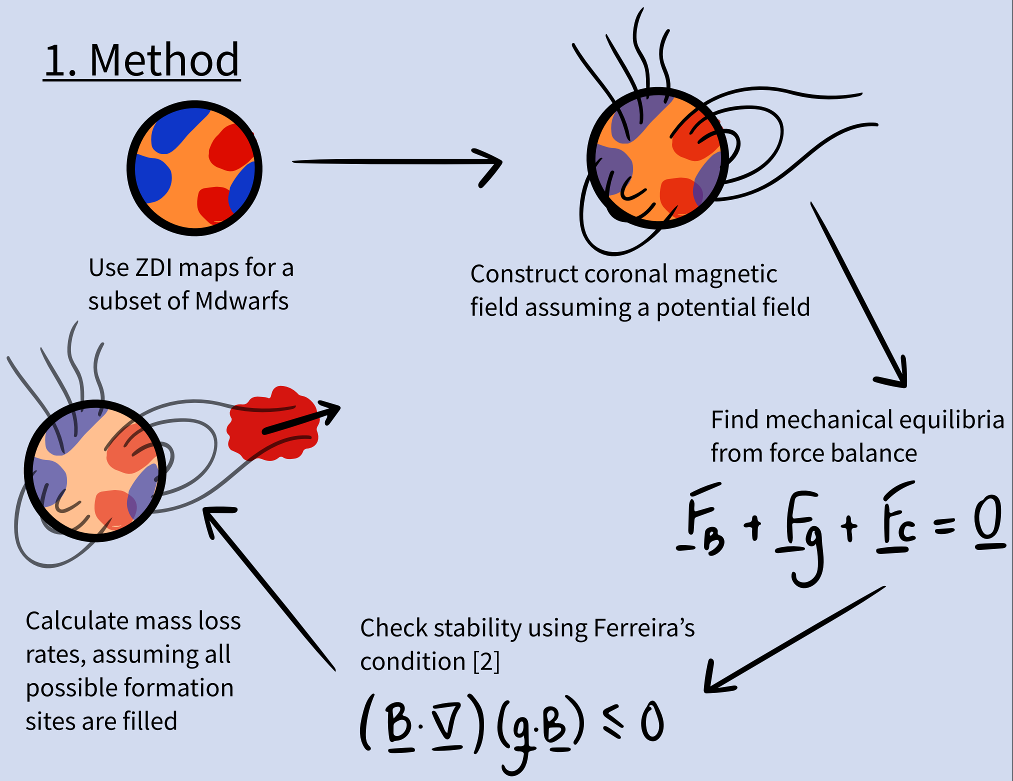
0. Introduction



- Stellar wind mass loss rates ($\dot{M}$) can be difficult to measure for low mass stars due to their low densities.

- Prominences can be used as 'wind gauges' to predict the wind $\dot{M}/A$ (mass loss rate per unit area) [1]. Prominence material is likely supplied in the same way as the wind - blowing up the field lines.

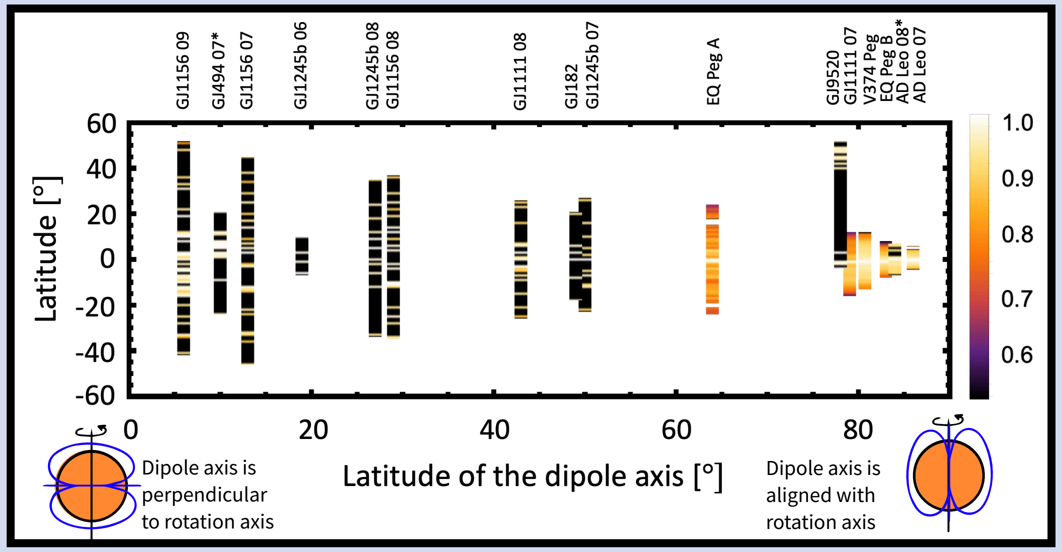
1. Method



References
[1] Jardine +, MNRAS, 482(3), 2019 [2] Ferreira, MNRAS 316(3), 2000 [3] Wood +, ApJ, 628(2), L143, 2005

2. Results

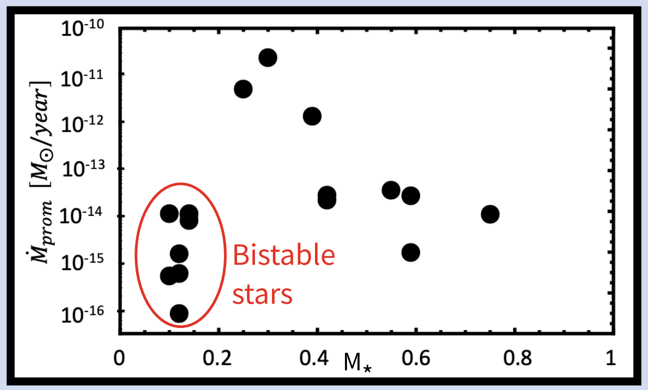
2.1 The prominence mass distribution around these stars



* AD Leo has been shifted 1 degree right and GJ494 has been shifted 4 degrees left, as the distributions overlap.

- The distribution of prominence mass around a star is dependent on the tilt of the dipole axis.
- Highly tilted dipoles support material at high latitudes
- More aligned dipole fields supports material at only low latitudes, but the distribution is much smoother.

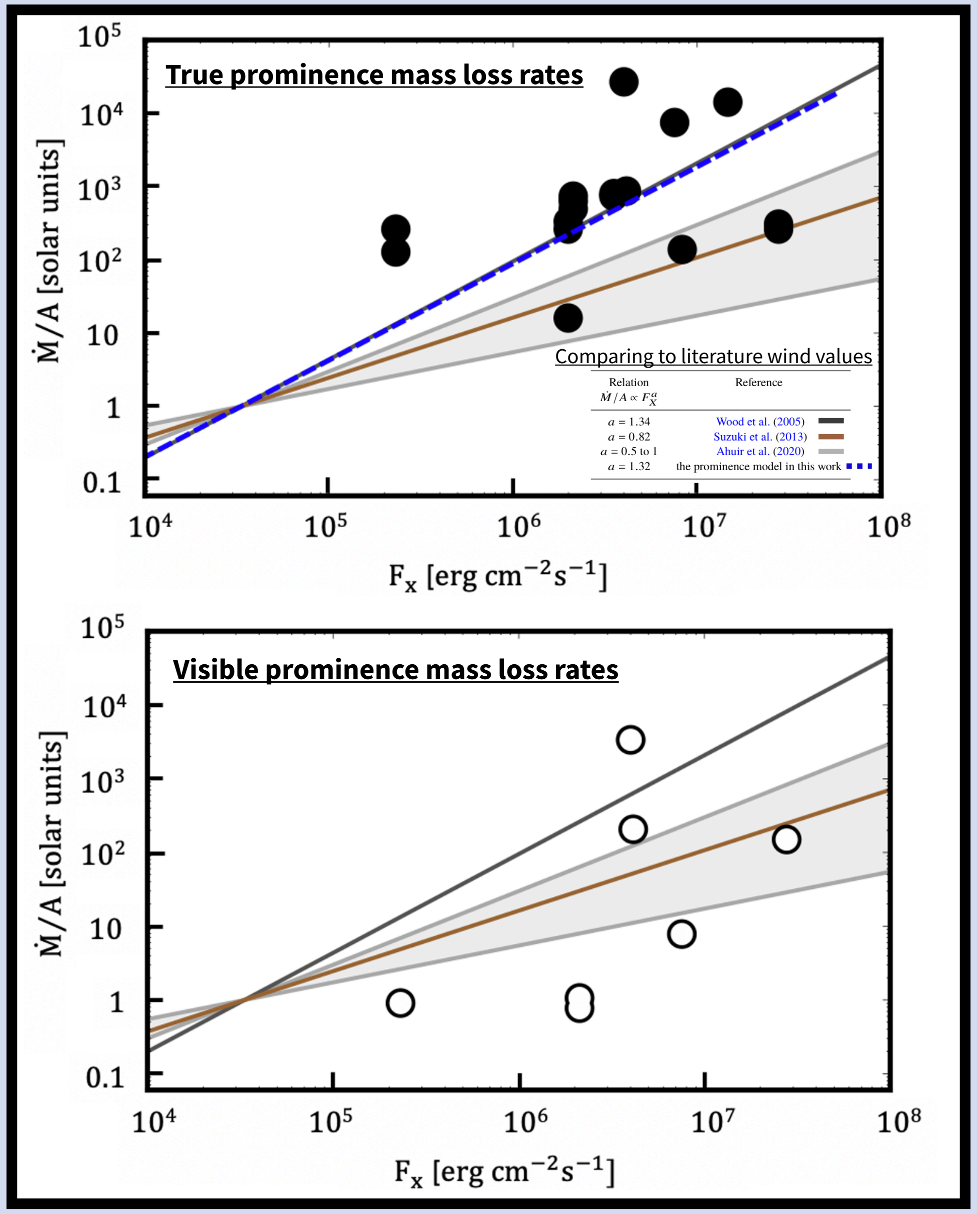
2.2 Prominence mass loss rates with stellar mass



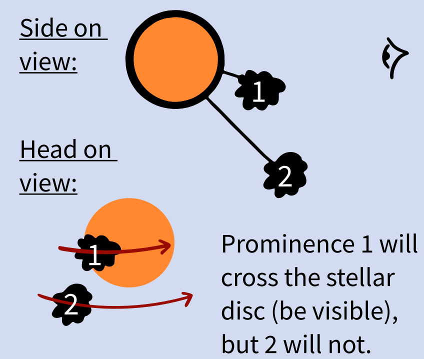
Typically, prominence mass loss rate increases with decreasing stellar mass.

- The exceptions are the bistable (very low mass) stars which show lower than expected $\dot{M}$s. This is due to their weak and complex magnetic field structure, that are not able to support significant prominence mass.

2.3 comparing prominence and wind mass loss rates



- Top panel: Plotting prominence $\dot{M}/A$ against X-ray flux (Fx) as Wood 2005 [3] we find a line of best fit (blue dashed line): $\dot{M}/A \propto F_x^{1.32}$
- Considering the prominence mass that would be visible, it becomes apparent that the $\dot{M}$s would be underestimated, though the scatter remains.



3. Conclusions

- Most prominence mass is not visible to us
- Our modelling has yielded a similar relation for $\dot{M}/A$ as a function of Fx for prominences as for stellar winds.