Preliminary mass loss results from a survey of stellar winds for young, Sun-like stars

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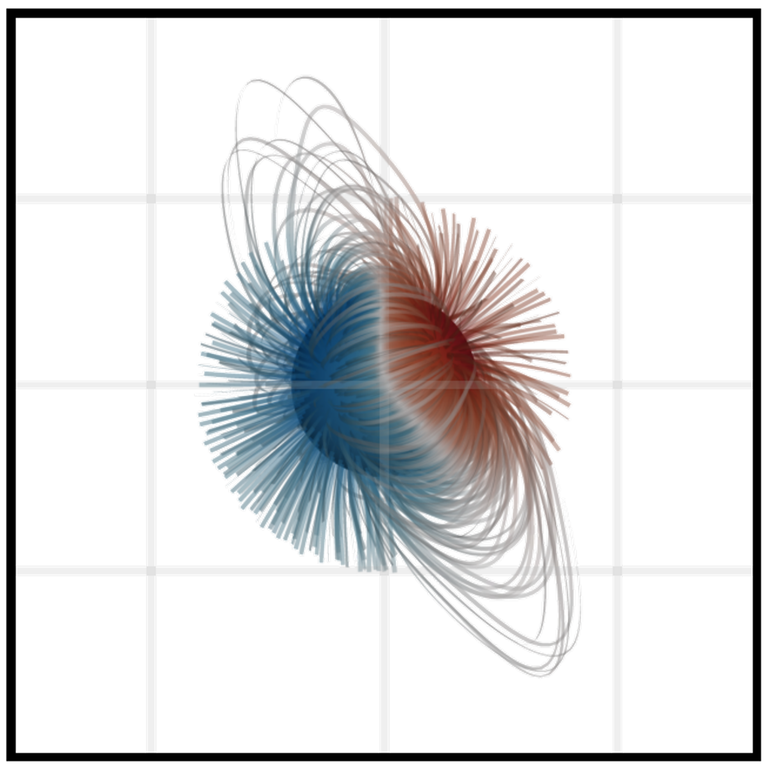
Introduction

The **Starwinds** project at the University of Southern Queensland is producing the **largest atlas of three-dimensional wind maps** of young, Sun-like stars to date.

We use numerical simulations to produce wind maps that encompass the stellar corona and the inner astrosphere. The simulations are driven by **observationally derived surface magnetic maps**.

Aggregate wind quantities such as wind mass loss, angular momentum loss and pressure determine the **rate of stellar spin-down** and may cause **atmospheric erosion** on planets orbiting young, Sun-like stars.

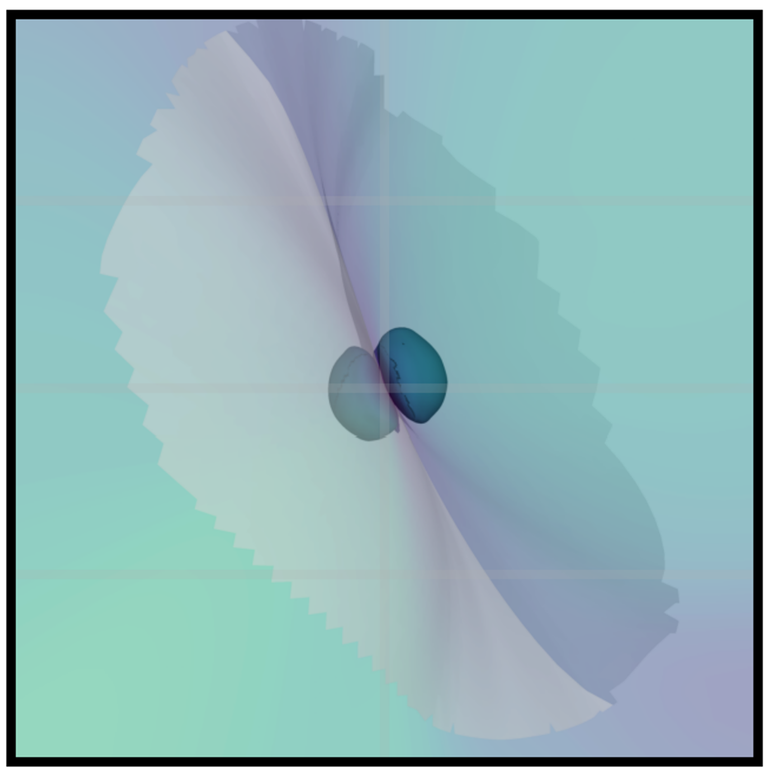


Stellar sample

We produce wind maps of 30 young, Sun-like (G-K type) stars aged between 24 and 625 Myr. The models are based on the large-scale surface magnetic fields reconstructed by Folsom et al. (2016, 2018) using **Zeeman-Doppler imaging.**

Wind maps

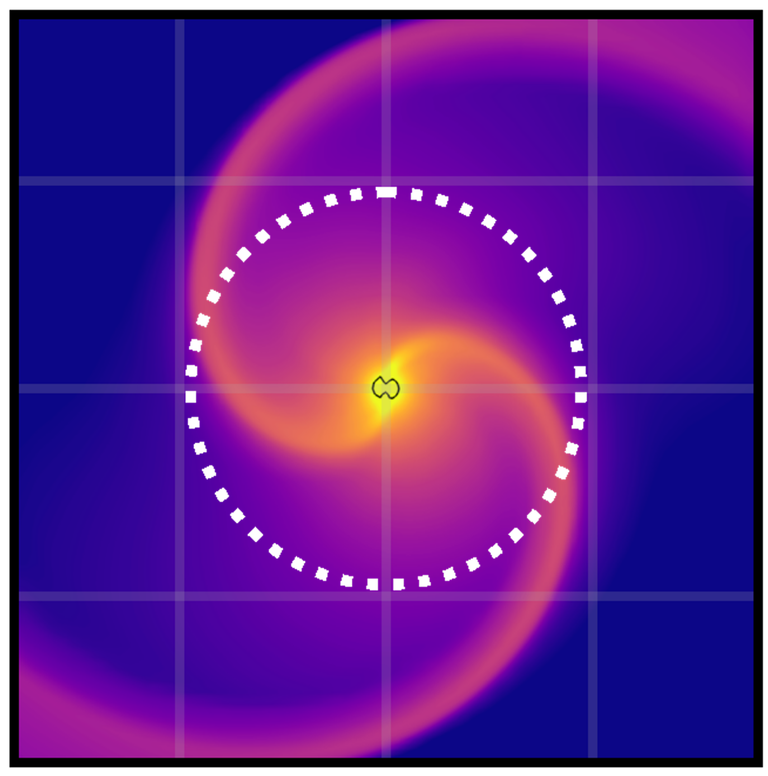
We run three-dimensional **magnetohydrodynamic simulations** using the *Alfvén Wave Solar Model (AWSoM)* of the *Space Weather Modelling Framework* until a **steady state** is reached. For each wind map we calculate the (1) coronal magnetic field structure, (2) Alfvén surface shape, and (3) the wind pressure (right figures) in the habitable zone.

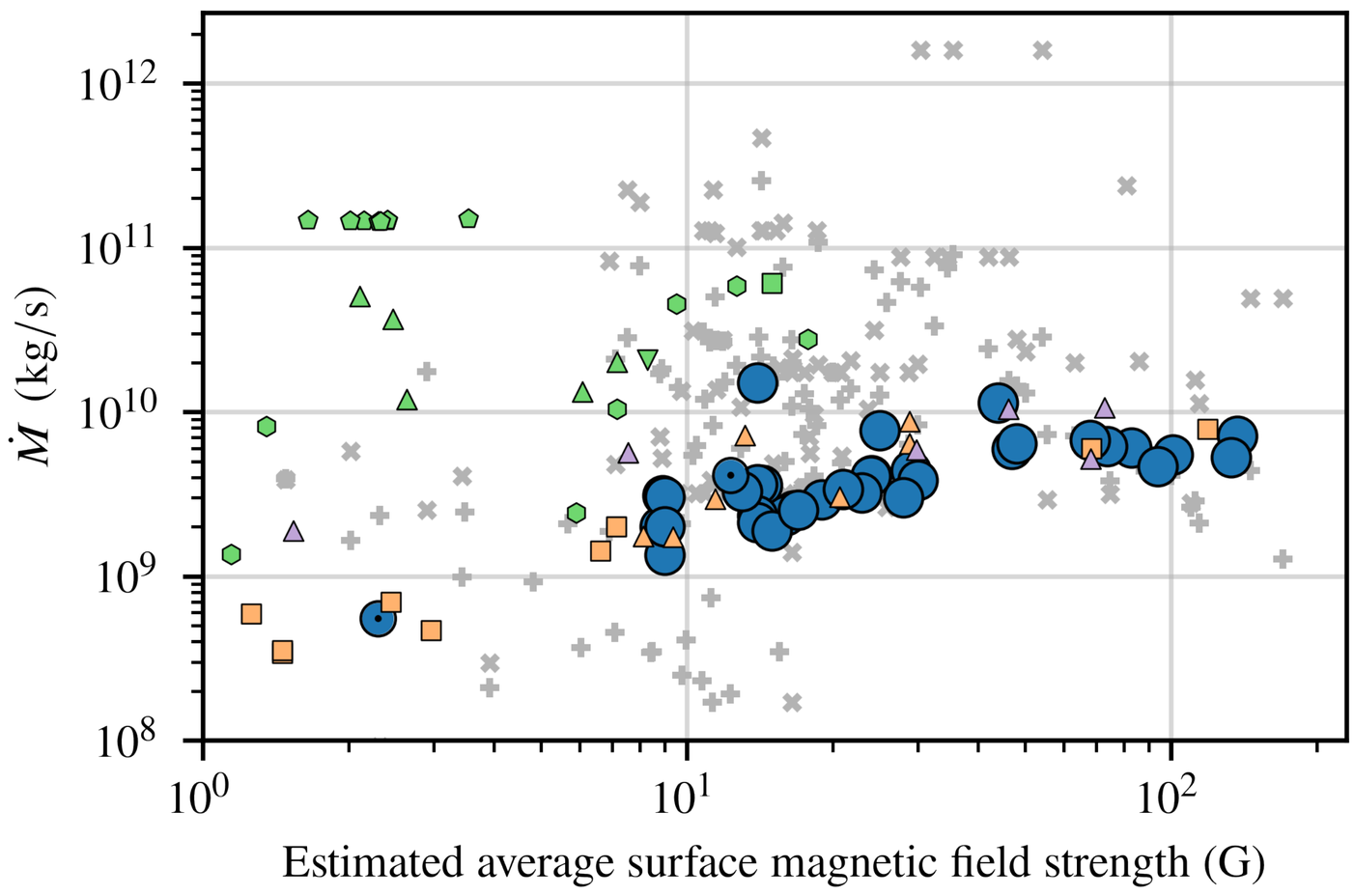


Preliminary mass loss results

Our preliminary **wind mass loss values** (blue symbols in the bottom figure) align well with published AWSoM results (orange symbols) and lie within the scatter of semi-empirical methods (gray symbols). Ideal MHD wind models (green) appear to predict higher values of mass loss. Further results will be presented in Evensberget et al. (submitted).

Our preliminary wind mass loss values do not exceed 10^{10} kg/s even for rapidly rotating stars.





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