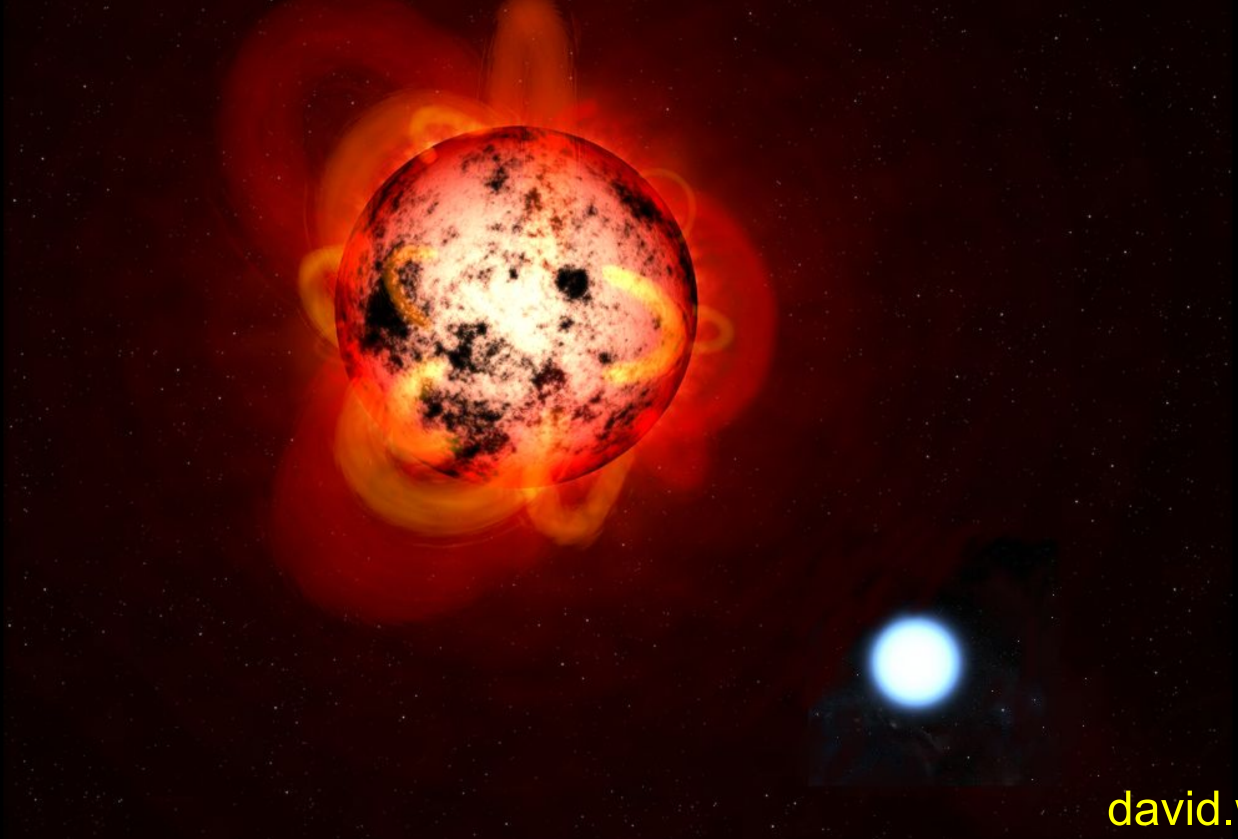
How to measure Stellar Winds



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Stellar Winds

- Winds matter for exoplanets and stellar astrophysics (see rest of the session!)

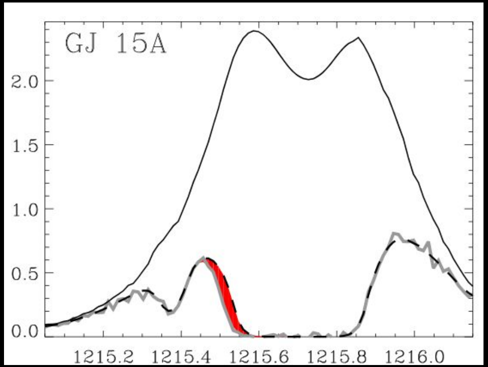
- Solar wind rate is measured in-situ - can't do this for stars

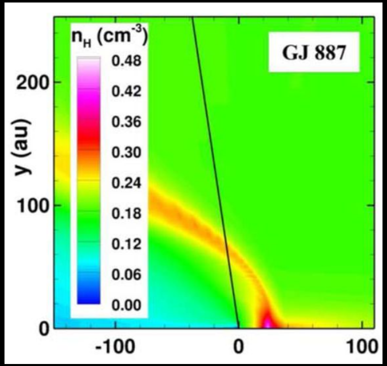
- How then?

Image: Mark Garlick

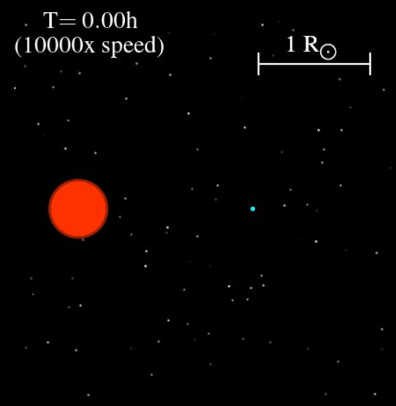
Measuring Stellar Winds

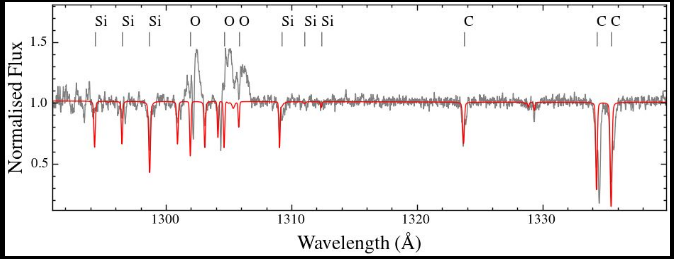
Astrosphere detections



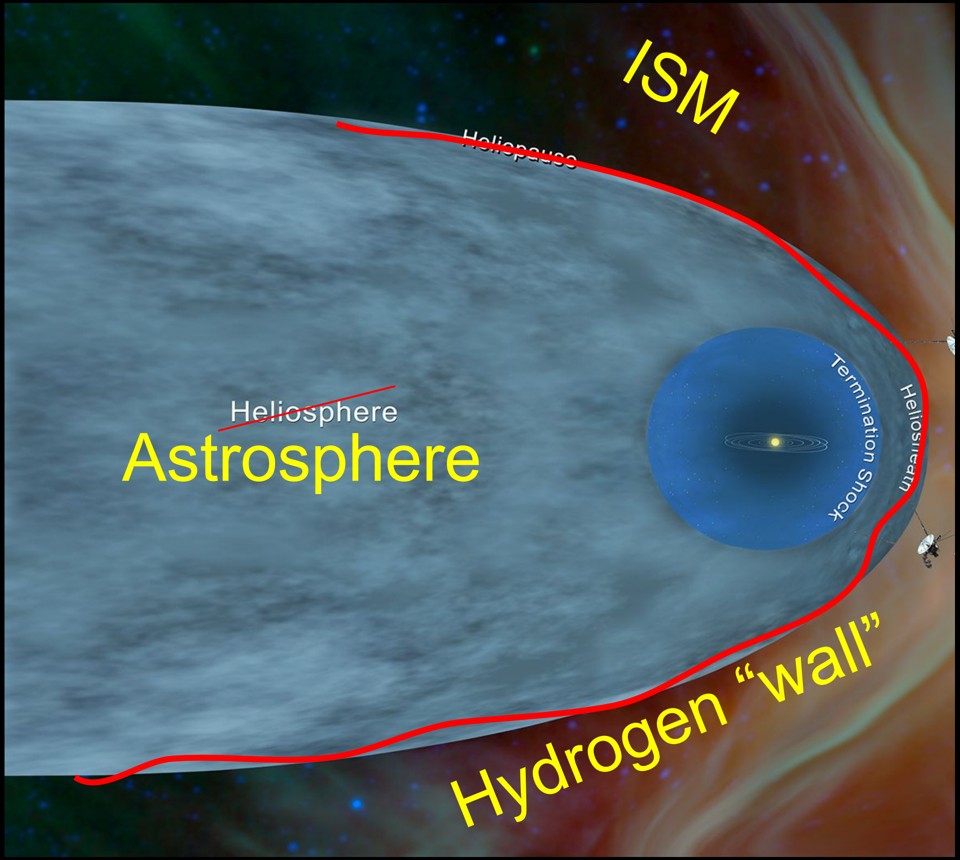


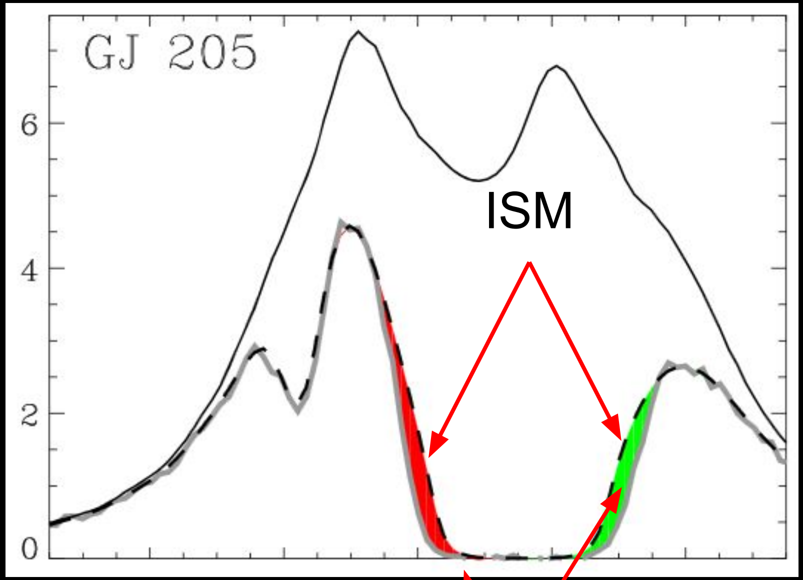
White dwarf pollution





Astrosphere detections





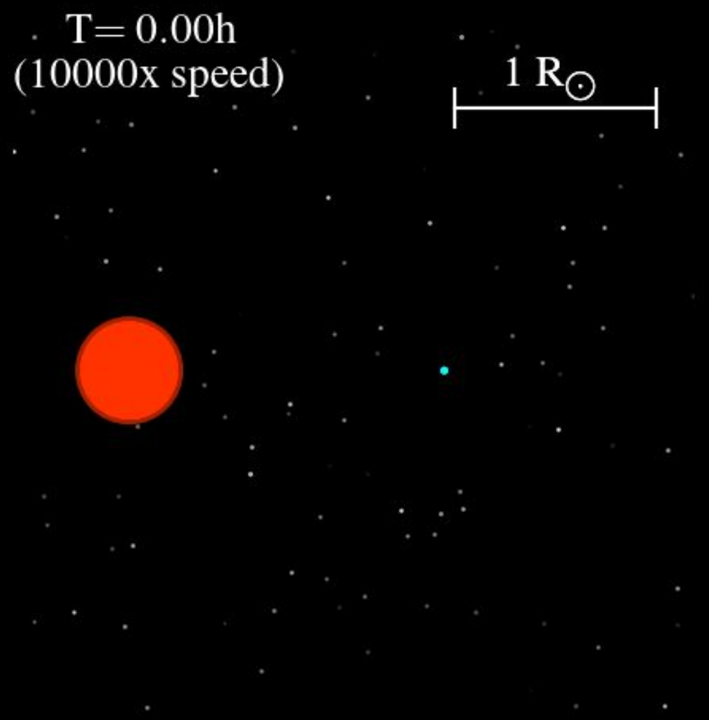
"Extra" astrosphere absorption

e.g. Wood + 21

Astrosphere detections

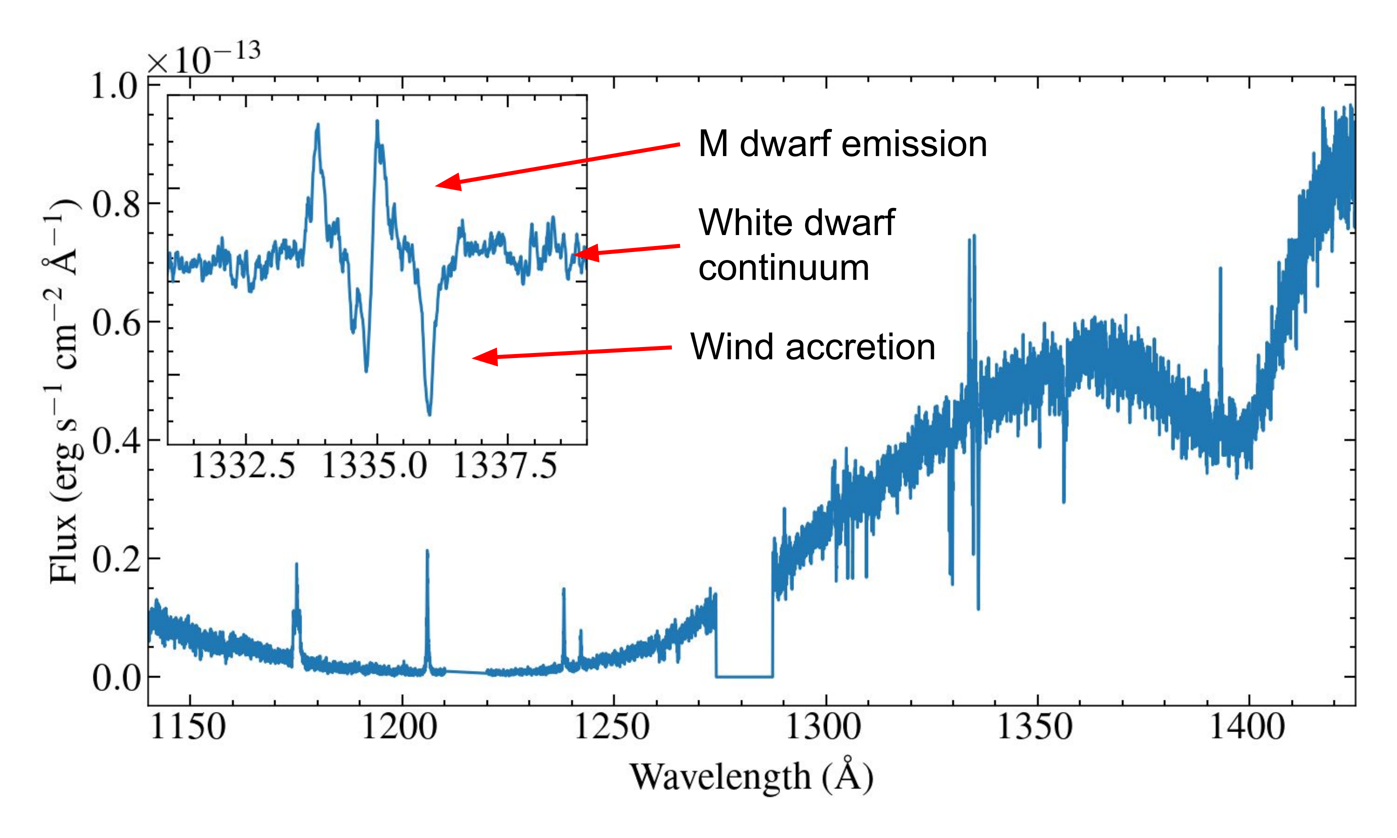
- Pros: Winds at single star, range of spectral types, “free” with UV observations of stars for other science cases.
- Cons: Need high-res UV data, depends on viewing geometry, only works out to ~7pc.

White dwarf - Main sequence binaries



e.g. Debes 06

White dwarf - Main sequence binaries

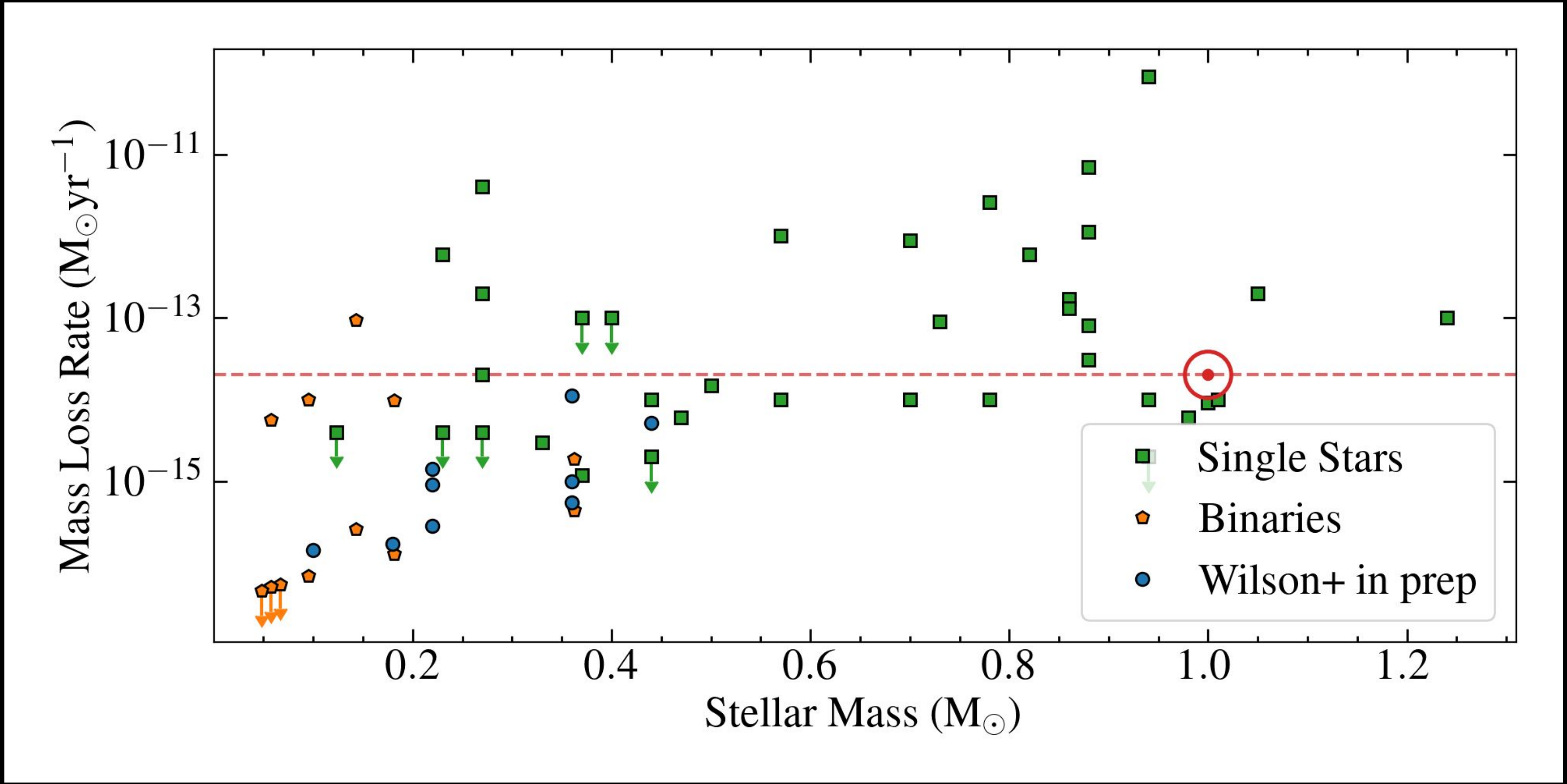


Wilson +23

White dwarf - Main sequence binaries

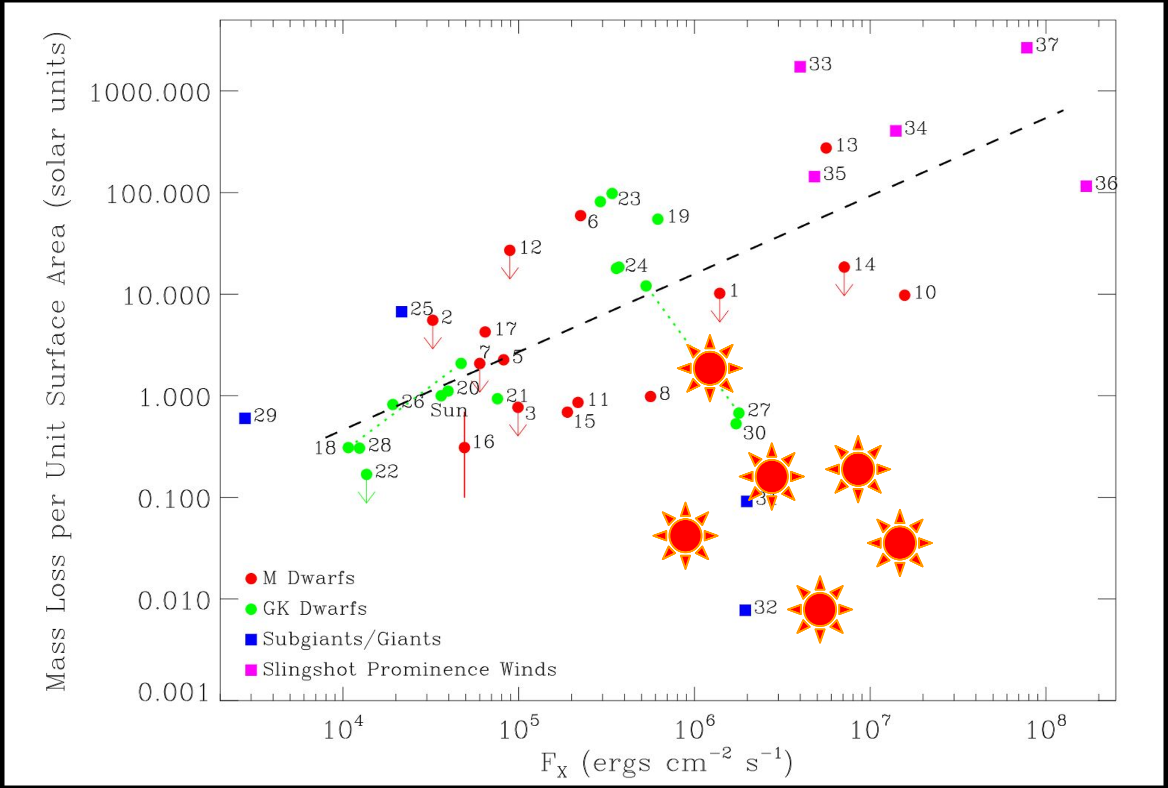
- Pros: 1000s of potential targets, range of spectral types, “simple” observations (just one spectrum).
- Cons: Still need UV ideally, stars are spun up so might not be representative of single stars, conversion from accretion to wind rate is tricky.

State of the art



Wood et al. (2021), Walters et al. (2023)

Hope from X-rays?



Wood et al. (2021), Wilson et al. in prep ( ).

Conclusions

- Measuring stellar winds is hard.
- Cannot (yet? ever?) measure the wind at any given star - must build up a representative sample of wind measurements and infer for stars of interest.
- Astrosphere detections ideal but limited in number.
- White dwarf binaries offer an increasing number of targets, but may not be representative.