X-ray and optical monitoring of HD108

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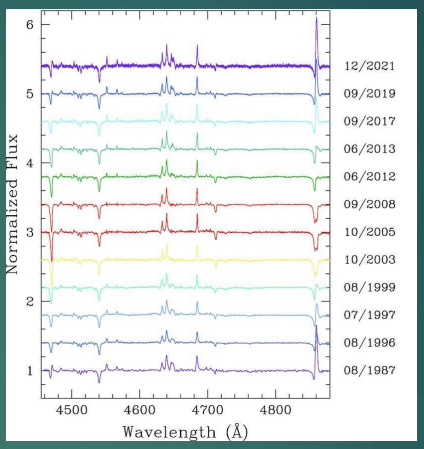
X-rays from magnetic massive stars

- ~10% of massive stars are magnetic with strong (kG) dipolar fields
- Stellar winds channelled towards equator → shocks → X-rays
- MHD simulations and observations generally agree

(e.g. Nazé et al. 2014, ApJS, 215, 10)



HD108

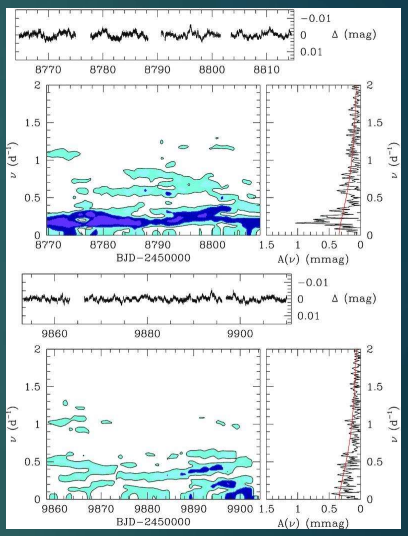
- Type = Of?p
- Cyclic spectral changes with P=54yr → an extreme case of magnetic braking !

Optical spectroscopic monitoring

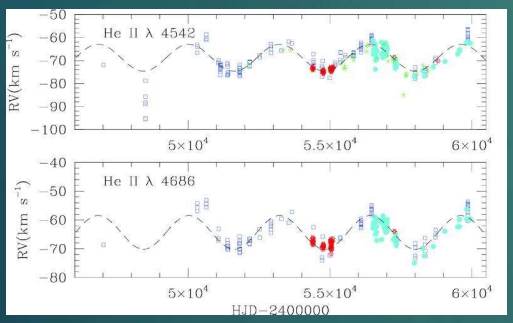
- New data from OHP/Aurélie, TIGRE/Heros, TBL/Narval, CFHT/Espadons
- Short-term variations exist but not stable, timescales : a few d to a week (as in TESS)
- Radial velocities change : Binary with P=8.5yrs, e=0, M_{comp}=4-12 M_{sol} (B1-B5)
- Long-term variations:
  - Minimum on HJD 2454284.5, P=54±3 yrs
  - Extended maximum and short minimum, opposite of HD191612
  - Line strength variations reproduced by ADM models with i+β=85°, B_d~4kG

Optical TESS photometry

- Sectors 17-18 in 2019, sectors 57-58 in 2022
- No stable frequency
- Red noise as in other massive stars, in line with macroturbulence

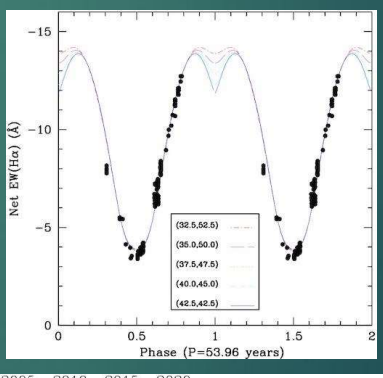


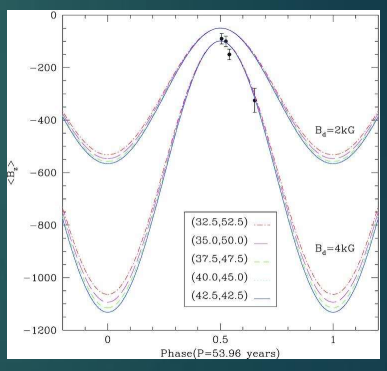
TESS lightcurves and periodograms of HD108



Left: RV changes as a function of time

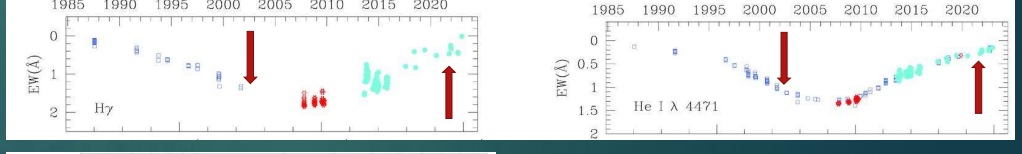
Right: ADM model compared to observed equivalent width changes + observed and predicted strength of the longitudinal magnetic field for different (i,β) pairs.



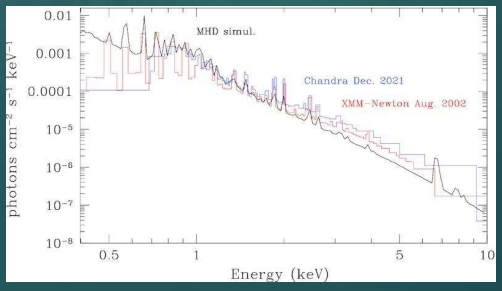


X-ray changes

- XMM in 2002 and Chandra in 2021
- Flux in 0.5-10keV is 28% larger in 2021 (50% in 2-10 keV→ slight hardening)
- Spectral shape in line with MHD simulations



Equivalent width changes as a function of time, with arrows indicating the times of X-ray observations



Unfolded X-ray spectra

Reference:
Rauw et al. 2023, MNRAS, 521, 2874
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