

Population studies of OBA stars with the MAGIC+LST-1 Stellar Intensity Interferometer

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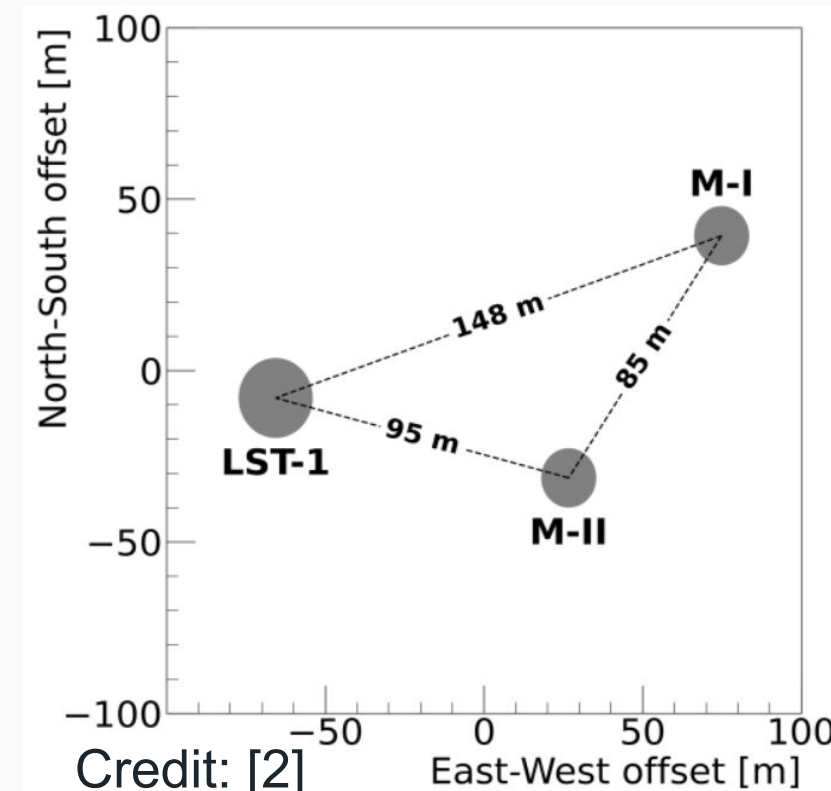
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THE MAGIC+LST-1 STELLAR INTENSITY INTERFEROMETER

- The **MAGIC+LST-1 Stellar Intensity Interferometer** system features **three telescopes** with diameters of **17 m (MAGIC)** and **23 m (LST-1)**, providing baselines ranging from **85 to 150 m**.
- It is the **most sensitive Stellar Intensity Interferometer** implemented to date, is capable of resolving stars down to a systematic limit of **~0.3 mas** angular diameter and **magnitude 4** with a **10% error** over a **2.5-hour observation** [1].
- The **MAGIC+LST-1 system** has been operating since **2024**, accumulating **~200 h** of observations [2].

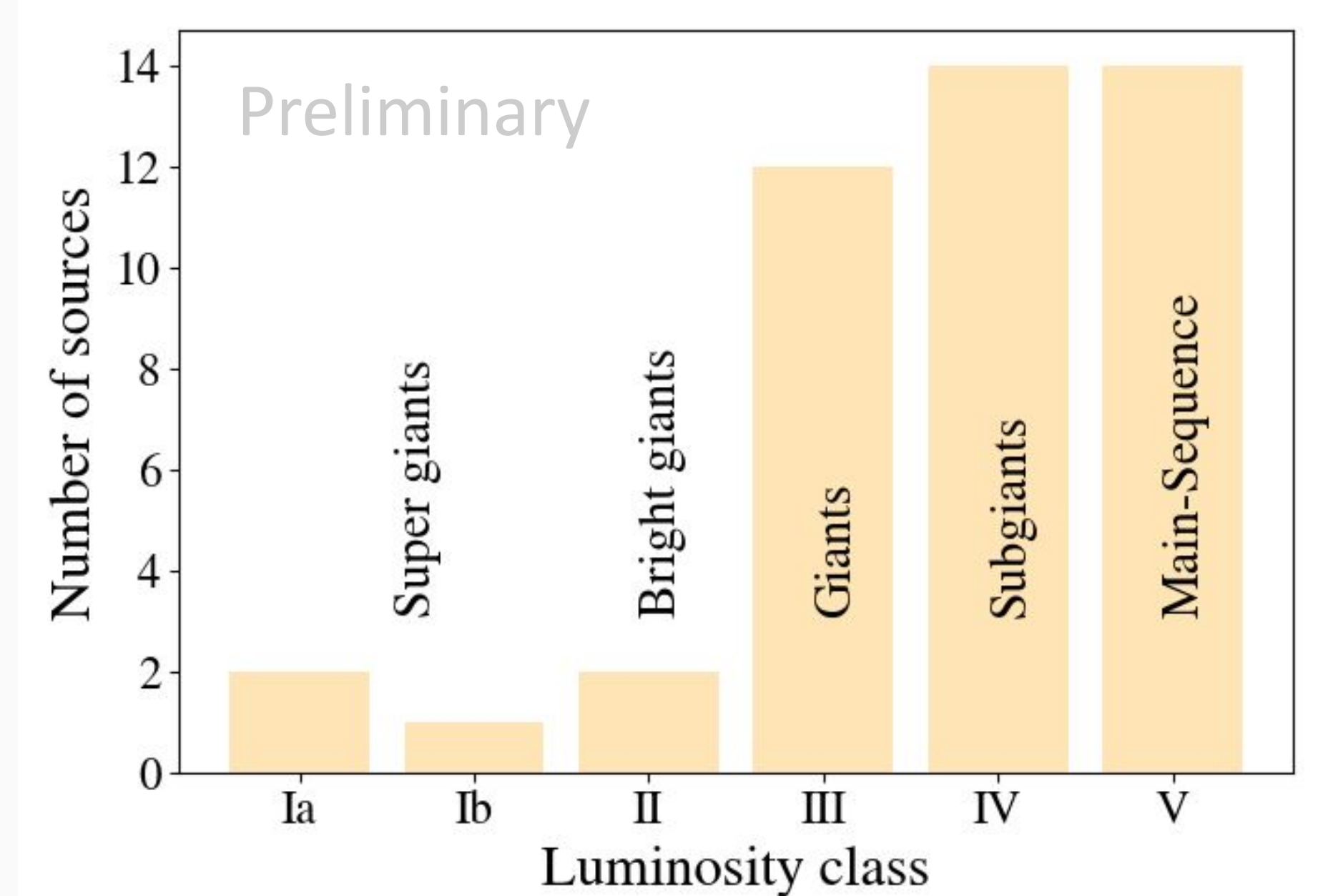
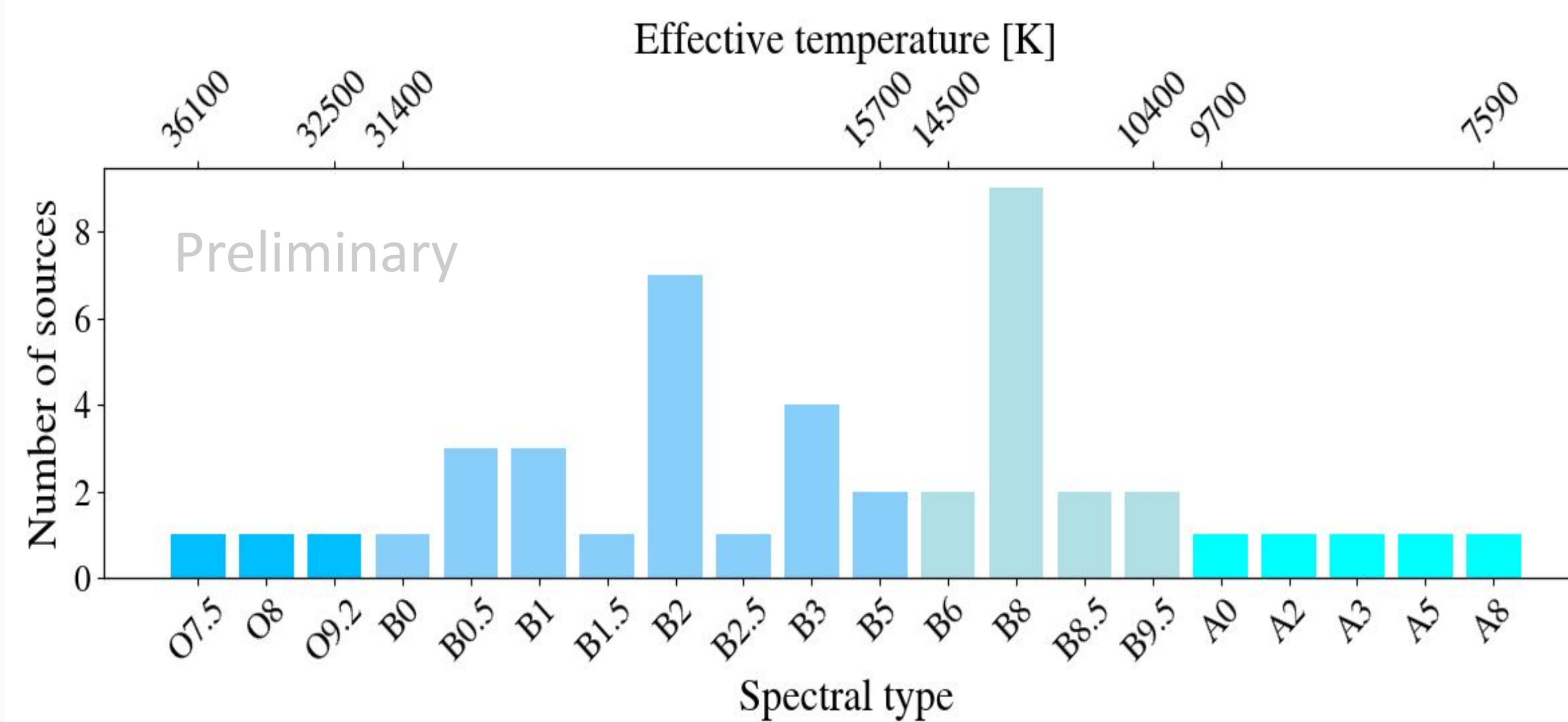


Credit: Alejo Cifuentes Santos



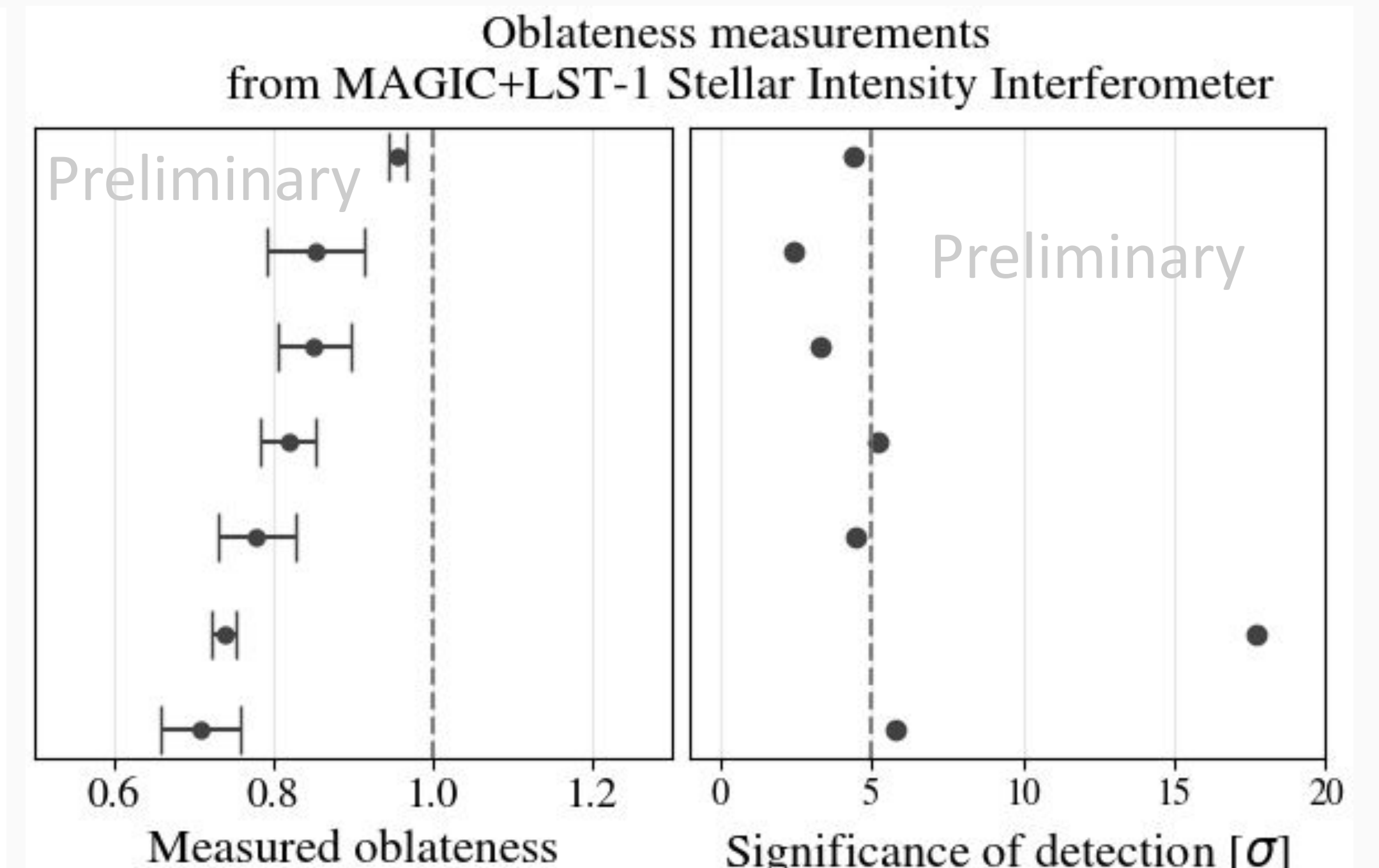
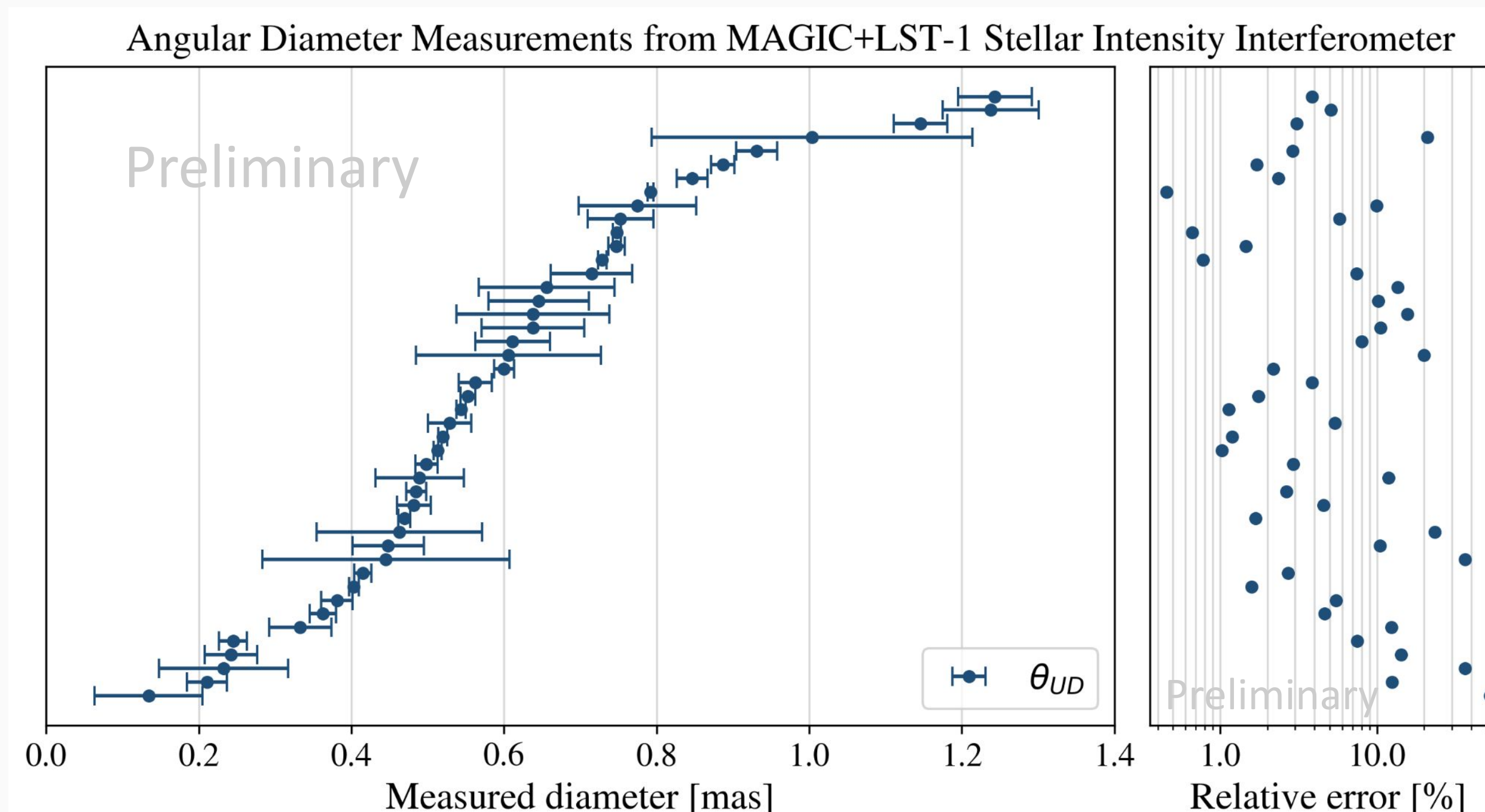
THE OBA STAR POPULATION SAMPLE

- Catalog of 45 OBA stars** with sufficient SII data quality for angular diameter measurements.
- Broad spectral-type coverage**, spanning from **O7.5 to A8** stars.
- Sample dominated by B-type stars**, providing a homogeneous dataset to investigate stellar properties across the upper main sequence.
- Wide range of luminosity classes (Ia–V)**, including supergiants, giants, subgiants and main-sequence stars.



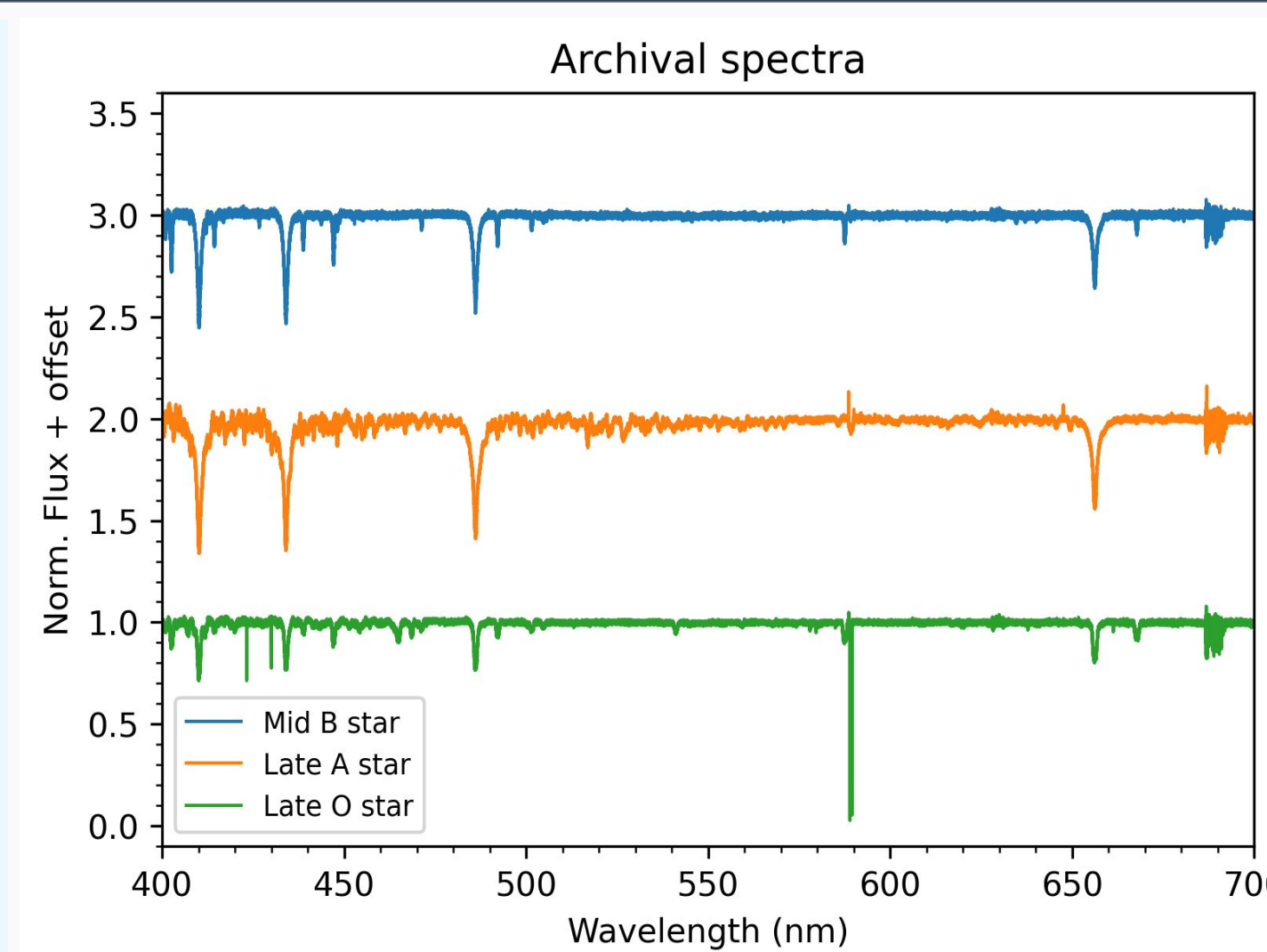
ANGULAR DIAMETERS & DEFORMATIONS

- Angular diameters measured for 45 OBA stars**, including **9 fast rotators**.
- High-precision angular diameter measurements**, with the vast majority of targets showing **relative uncertainties below 10%**.
- Oblateness measurements obtained for 7 rapidly rotating stars**, enabling direct constraints on rotational deformation.
- Several oblateness detections exceed 5 σ significance**, while the remaining targets show promising hints of deformation ($>3\sigma$).



OPTICAL SPECTRA

- High-resolution optical spectra** collected from dedicated observing campaigns and public archives [4] as presented in the right figure.
- Stellar atmosphere models** used to derive **effective temperatures**, **surface gravities**, and **metallicities**, enabling a comprehensive characterization of the physical properties of each star.



CONCLUSIONS & REFERENCES

- MAGIC+LST-1 Stellar Intensity Interferometer enables high-precision angular diameter measurements**, achieving relative uncertainties below **10% for most targets**.
- A sample of 45 OBA stars has been assembled**, providing a large dataset of stellar diameters obtained with SII.
- The combination of interferometric and spectroscopic observations** will deliver fundamental stellar parameters which are key to strengthening constraints on stellar atmosphere models.

- [1] MAGIC Collaboration "Performance and first measurements of the MAGIC stellar intensity interferometer", MNRAS 529, 4387–4404 (2024)
[2] Alejo Cifuentes Santos, PhD Thesis, UCM 2026, Unpublished.
[3] V. A. Acciari, et al., "Optical intensity interferometry observations using the MAGIC imaging atmospheric Cherenkov telescopes", MNRAS 000, 1–9 (2019)
[4] P. Royer, et al., "MELCHORS: The Mercator Library of High Resolution Stellar Spectroscopy" A&A, 681, A107 (2024)

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