(Mostly)
Science Topic: Stellar Diameters

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Motivation

- EMPIRICAL stellar astrophysical parameters.
- Exoplanet characterization via characterization of host stars.
- Stellar physics, particular late-type stars.
- Calibration / constraints for stellar models
- Predictive, semi-empirical relations.

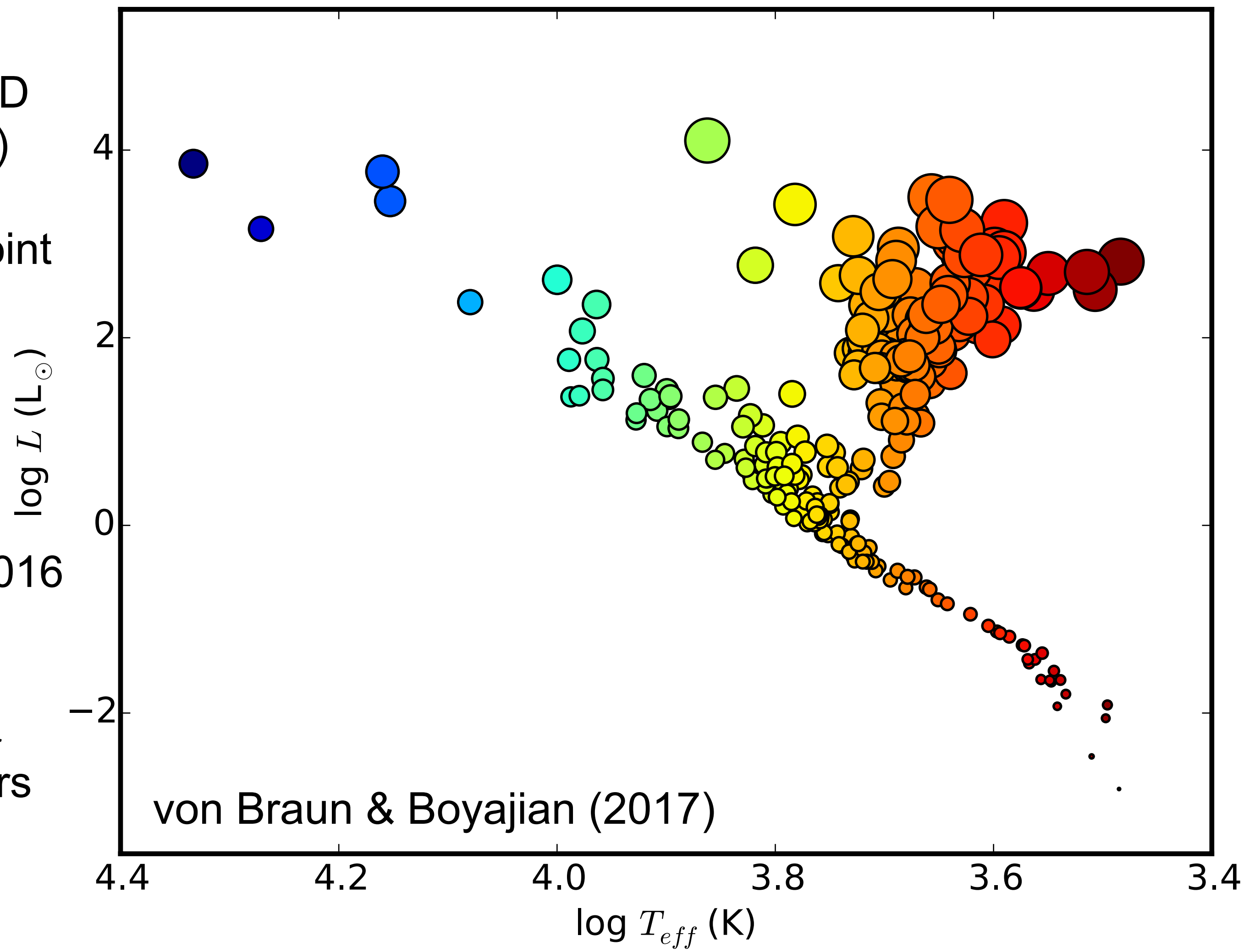
Approach

- IR / optical interferometry and limb darkening corrections: angular stellar diameter.
- Observing: minimize unknown systematics.
- Trigonometric parallax: physical stellar diameter.
- SED fit / spectrophotometry: stellar F_{BOL}.
- From angular diameter and F_{BOL}: T_{EFF} and L.

Status

Empirical HRD
(~ 290 stars)

size of data point
= log R_{star}



- Status Nov 2016
- δθ < 5%
- d < 150 pc
- R < 100 R_{solar}
- no fast rotators
- no pulsators

Why Interferometry for Diameters?

- SB Law: $T_{eff} \sim (L\ R^{-2})^{0.25} \sim (F_{BOL}\ \theta^{-2})^{0.25}$
- Alternative approaches:
  - Full-on stellar models
  - Semi-empirical: determine T_{eff} spectroscopically, SED fitting for F_{BOL}, get θ and R_{star}.
  - Interferometric results calibrate models & relations.
- But:
  - Stellar models tend to underestimate stellar radii (5-10%) and overestimate T_{eff} (3-5%), especially for late types.
  - For semi-empirical models, σT_{eff} of 3-5% result in $\sigma R_{star} \sim$ 6-10%.
  - Accuracy, eccentric objects, …

However...

Interferometry prone to difficulties / systematics.

– Atmospheric conditions; time scales.

– (Un)known calibrator sizes; choice of calibrators.

– Uncertainties very hard to characterize.

– Inherently complicated and challenging method.

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- Proper motion of targets
- Telescopes experience different weather
- Vacuum or lack thereof
- Piston
- etc

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