The VERITAS Stellar Intensity Interferometer (VSII) Survey of Stellar Diameters

- Measure diameters of 32+ northern hemisphere stars
  - Bright O/B/A star survey $+1.0 < m_V < +3.75$
  - Measure diameter ∅ @ 416 nm effective wavelength
  - ∅ < 1.2 milli-arcsec, ~5% resolution or better
- Explore Improvements to VERITAS-SII
  - Electronic Noise reduction, improved optics and sensors
  - Test Dimmer magnitudes m_V ~ 3-5
  - Explore Cooler Stellar Classes (F?)
- Develop survey tools for VERITAS-SII
  - SII Observation planning
  - Observing tools, automated observation sequences
  - Nightly data processing, calibration, archiving
  - Pipelined data analysis tools
- Establish community sandbox of observational data (raw and processed)
  - Secondary analysis
  - Improved reconstruction and science tools
  - Explore Image Reconstruction
  - Resource for design of next generation SII instruments (e.g. CTA-SII)

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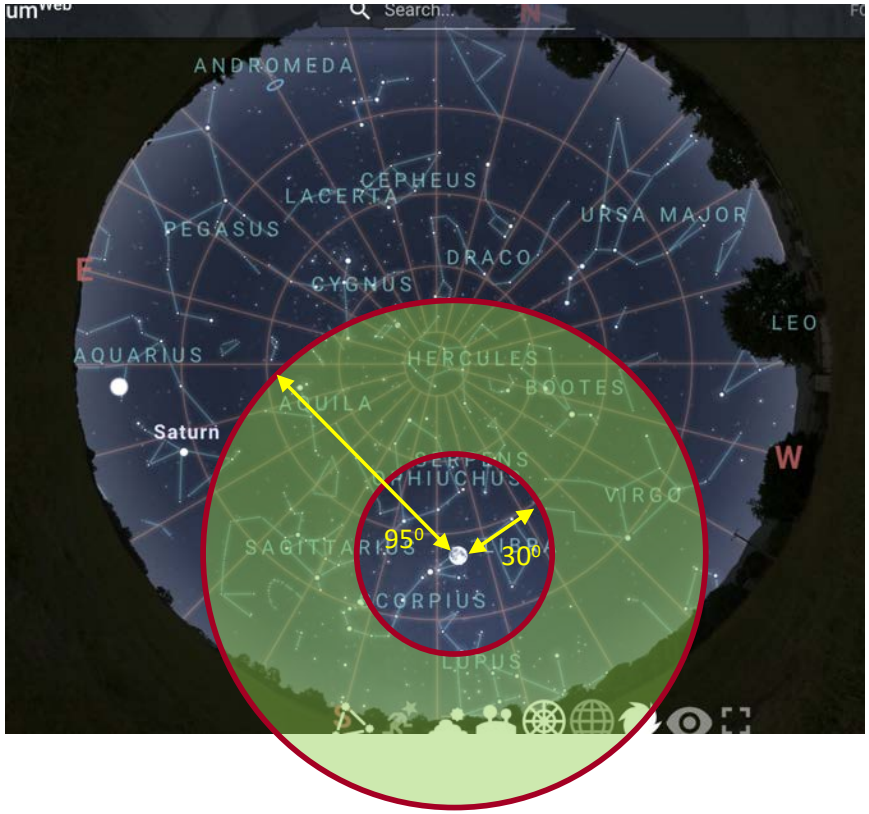
VSII Survey Observing Strategy

- Moonlight observation time is the main constraint
- 30^o < *moon angle* < 95^o
- List of observable targets change every night

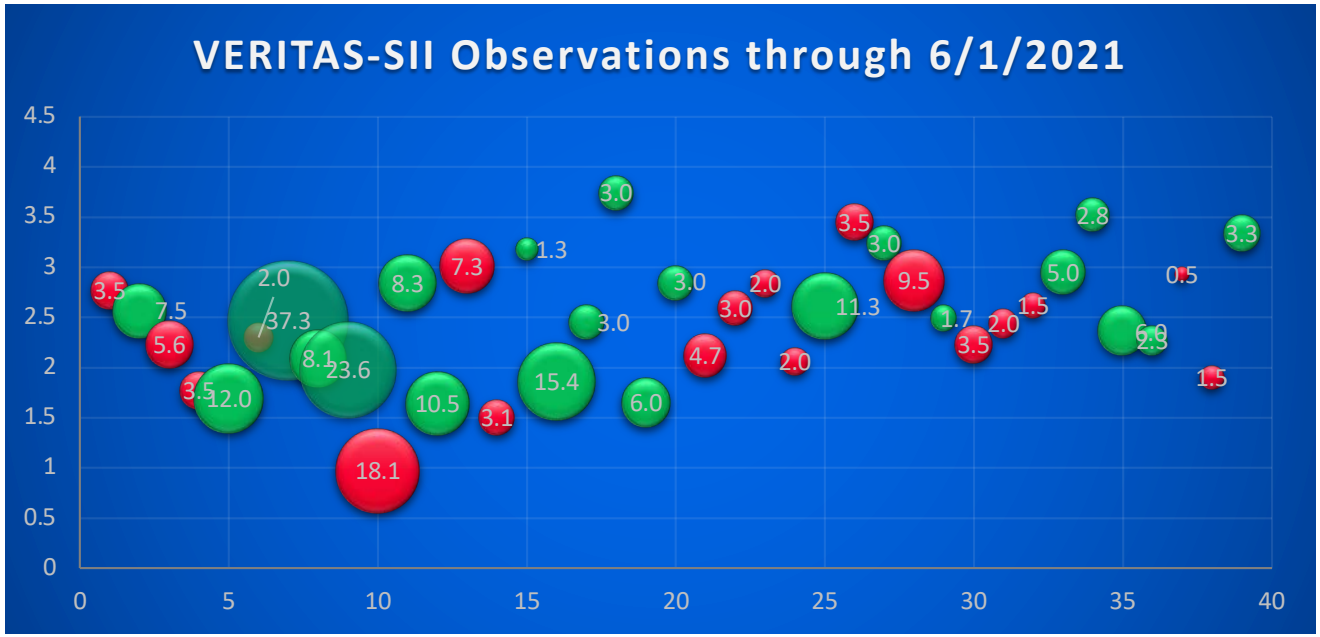
- Need >1 hour of observation
- 0.4 mas < *stellar diameter* < 1.2 mas
- Prefer m_V < +3.0
- Prefer O, B, then A stars
- Single stars and binary/multiple stars
- Unusual stellar characteristics (cepheid, fast rotators, etc.)

*ASIIP planning software recently updated to include moon angle cuts (Thanks to Jonathan Davis!)



*Davis, J., Matthews, N. and Kieda, D., ASIIP: A Stellar Intensity Interferometry Target Planner, *J. Ast. Inst.* 2020 **6**, 037001. https://github.com/astronomaestro/ASIIP

VSII Observations (Dec 2019- June 2021)



Primary star classification: O9 O9.5 B0 B0.5 B1 B2 B3 B7 B8 A0 A1 A2

Single star

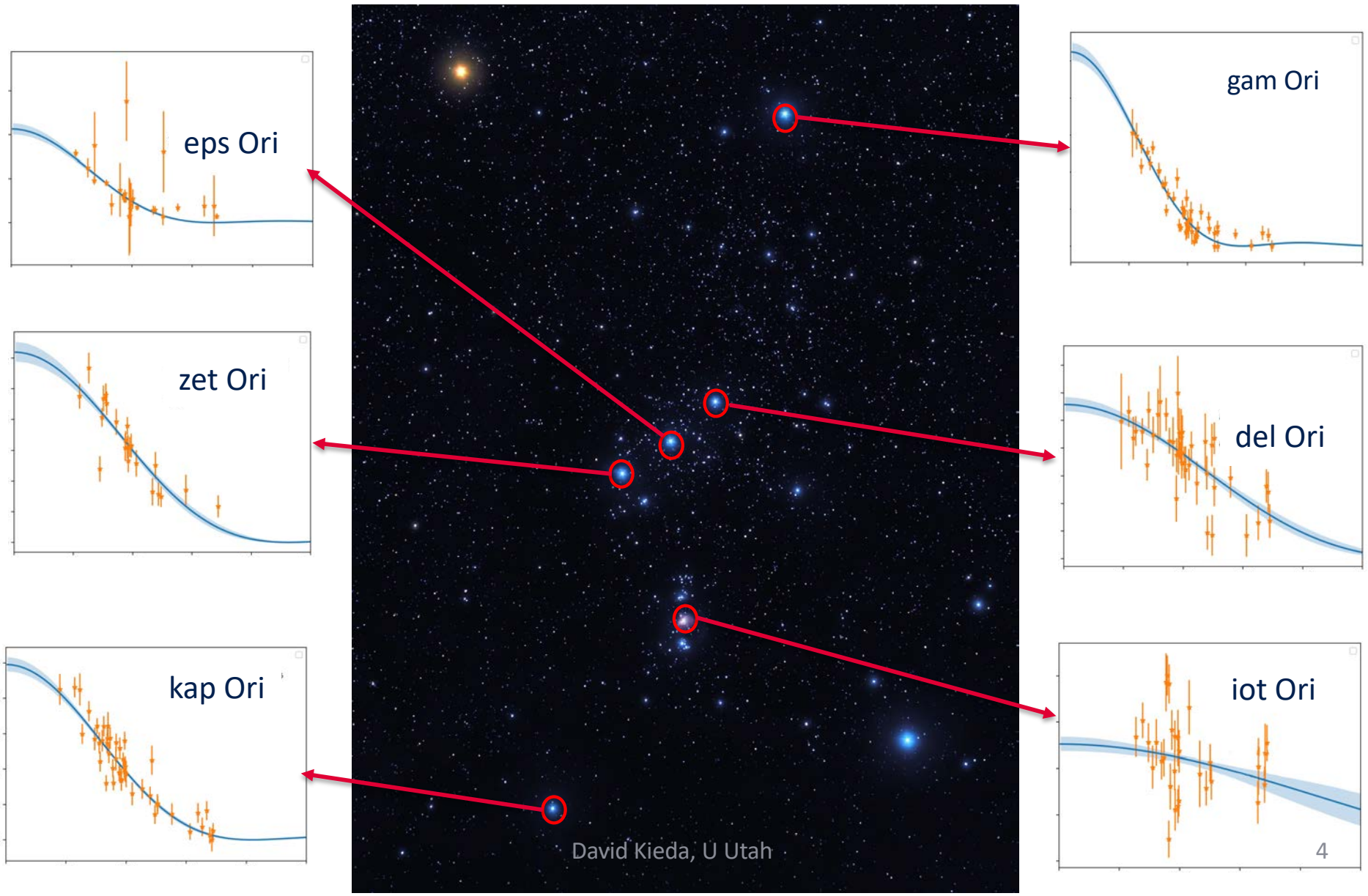
Binary/multiple star

Circle area is the number of each star's exposure (hrs) (12/19 – 6/1)

- 39 different targets
- 21 single
- 18 binary/multiple

- Total 255+ hrs exposure

VSII Orion mini-Survey 2019-2021
(SII Quicklook analysis)



VERITAS SII Survey Status

- Routine VSII observations underway 2019-2021
- <5% stellar diameter resolution for m_V~2 OB stars, 5 hours
- Northern Hemisphere Survey in progress (416 nm)
- 255+ hours of observation on 39 OBA stars +0.97 < m_V < +3.74 (since 12/2019)
- Preliminary analysis of entire survey dataset is underway