

**Direct determination of the radius of
giant star: HD 175541**



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Motivation

- ✓ Object: HD175541 – distant evolved star with recently discovered giant planet
- ✓ Problems: stellar mass and radius obtained only from spectroscopic models
- ✓ Goal: direct determination of the stellar radius

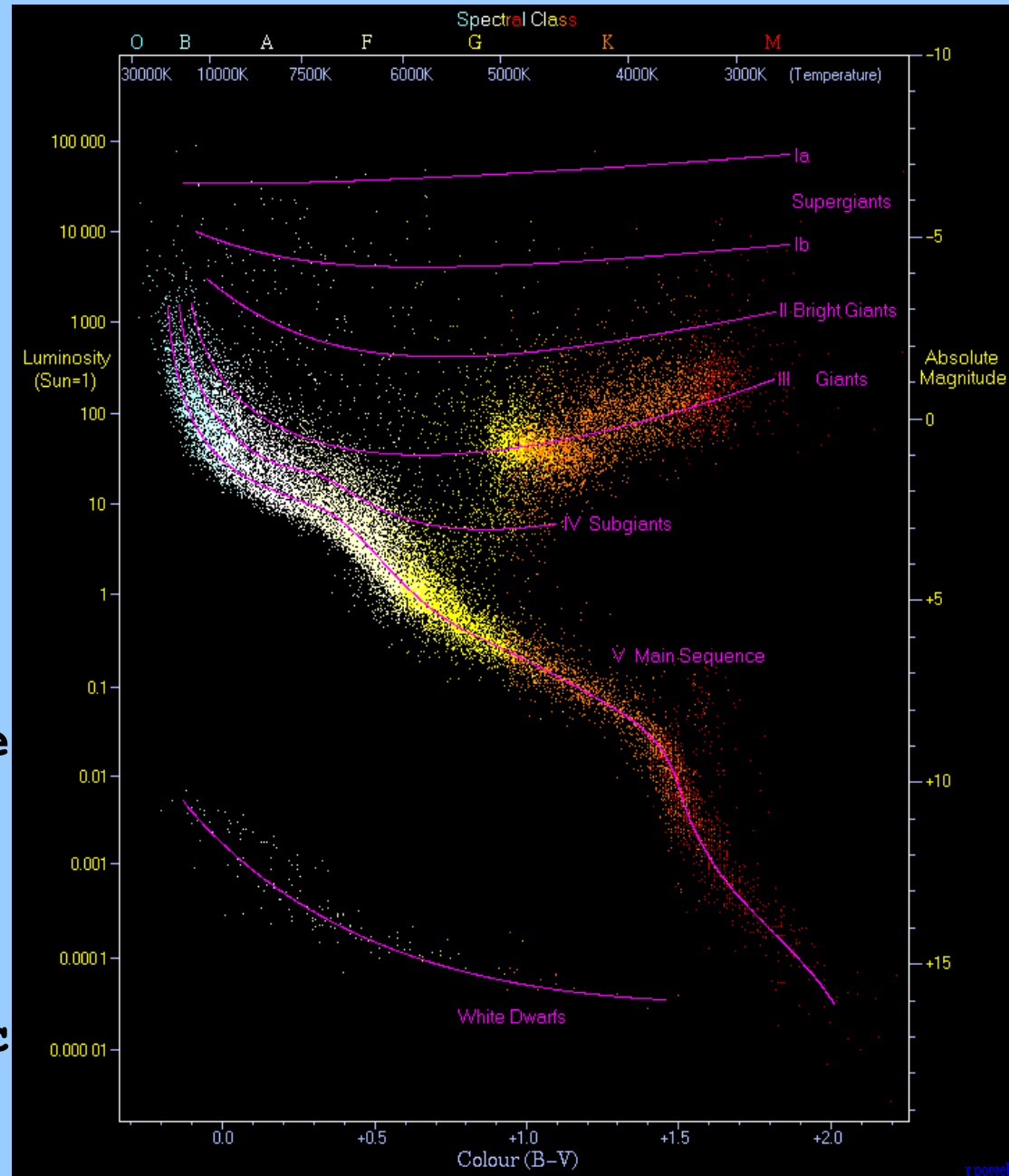
Johnson, J.A. et al., arXiv:0704.2455v2 (2007)

Alonso, A. et al., A&A 355, 1060 (2000)

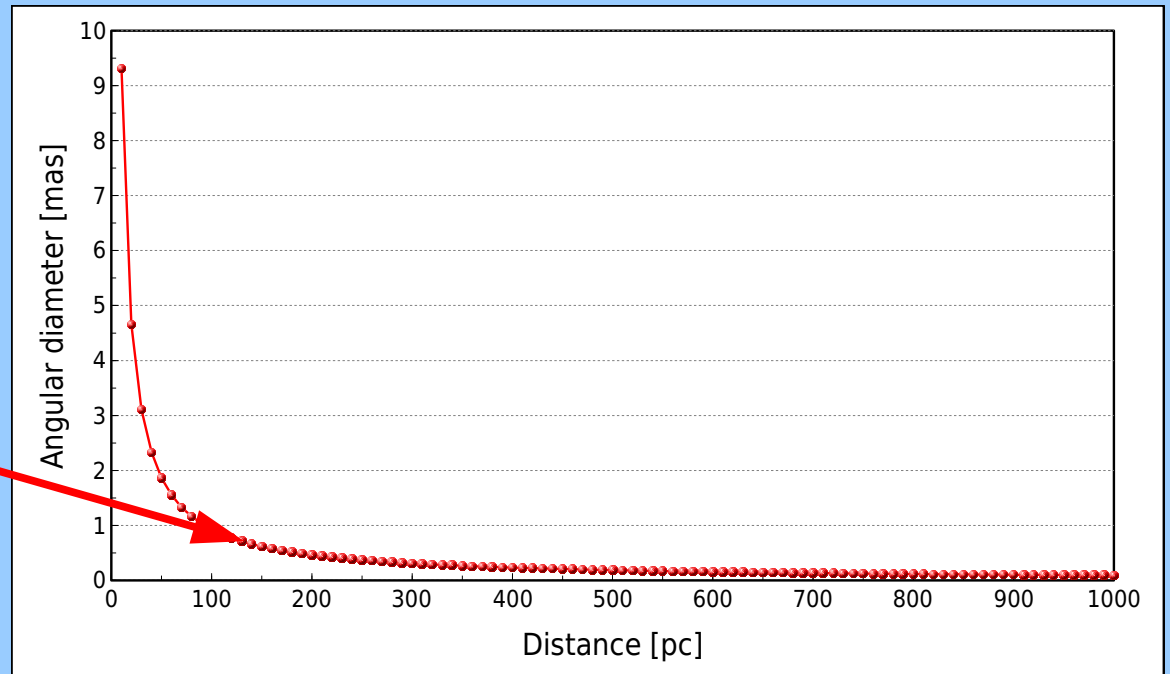
HD 175541	
Distance	128 pc
Spectral Type	G8 IV
Magnitude	V = 8.03
	H = 5.952
	K = 5.829
Mass	1.65 (\pm 0.1) Msun
Age	1.9 (\pm 1) Gyr
Effective Temperature	5060 (\pm 44) K
Radius (authors)	3.85 (\pm 0.2) Rsun
Radius (Alonso)	8.6 (\pm 4.7) Rsun
Metallicity [Fe/H]	-0.07 (\pm 0.04)
Log g	3.52 (\pm 0.3)

HD 175541 b	
M.sin i	0.61 MJ
Semi major axis	1.03 AU
Orbital period	297.3 (\pm 6) days
Eccentricity	0.33 (\pm 0.2)

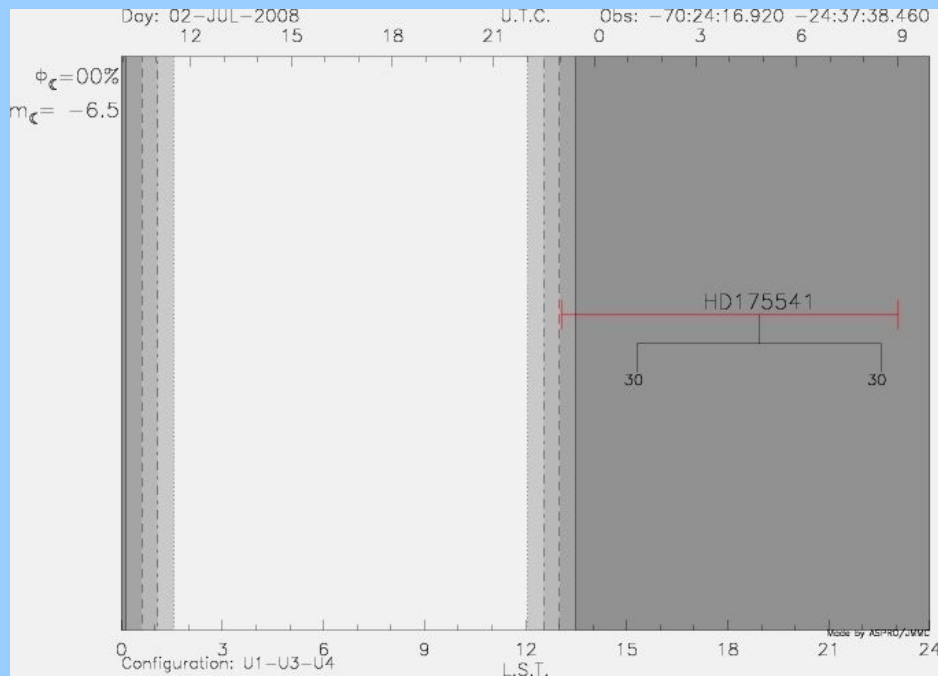
- ✓ We cannot search for planets around massive stars (not enough absorption lines and too fast rotation), however, we can search for planets around massive evolved stars
- ✓ But it is difficult to obtain stellar parameters (mass and radius) because we can use only spectroscopic calibrations
- ✓ We can determine stellar radii from interferometric measurements of their angular diameters



- ✓ Expected angular diameter for HD 175541 is only 0.7 mas
- ✓ Most of the known giants with planets are distant stars

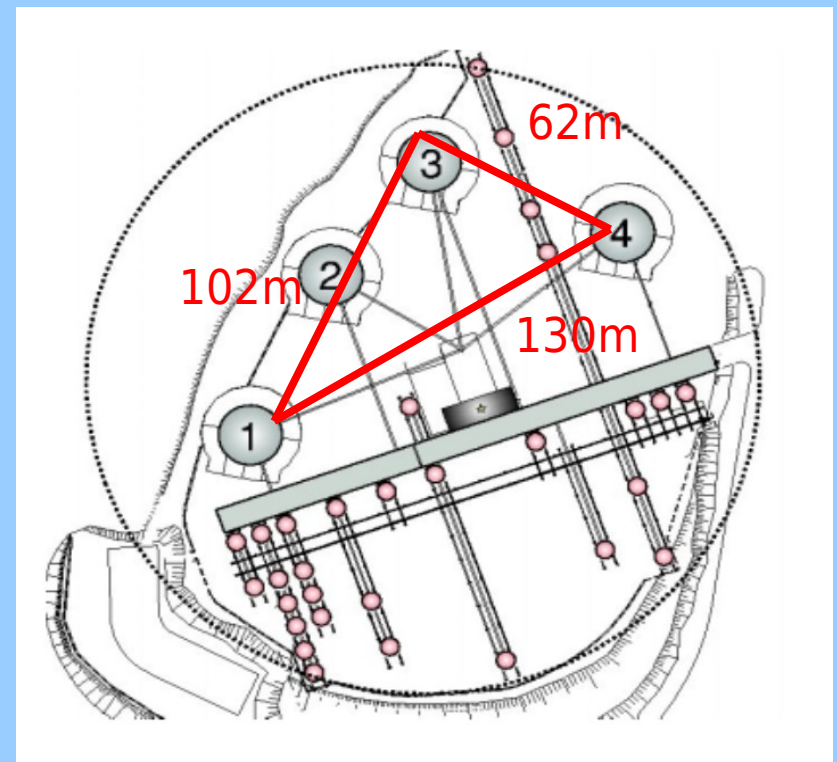


Method of observation

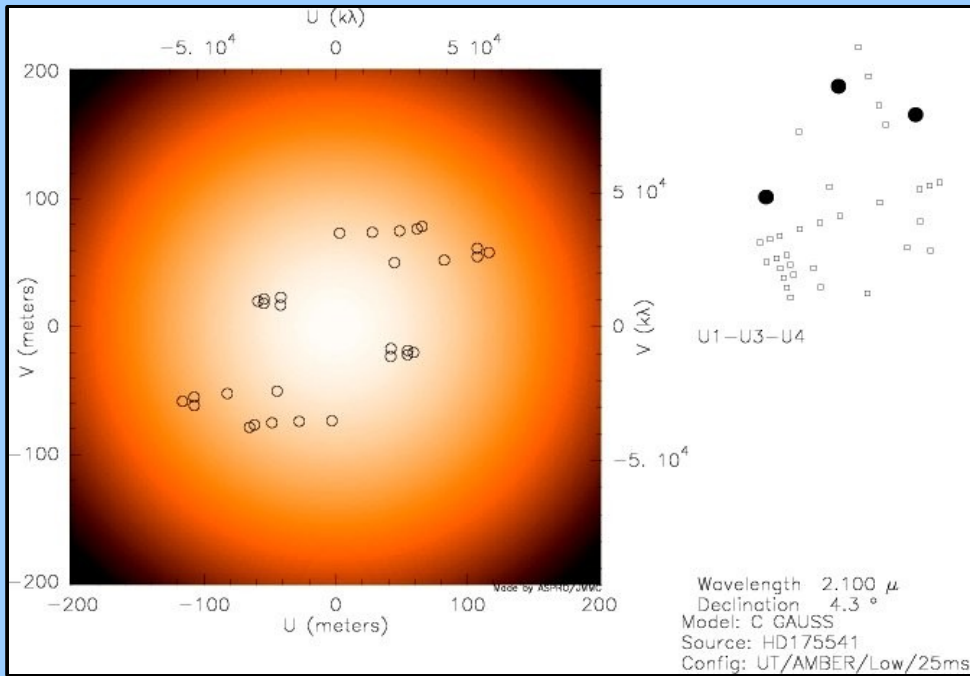


- ✓ date: July 2, 2008
- ✓ time: from 1 to 9 UT
- ✓ 8 hours above of minimum elevation

- ✓ the most precise radius determination can be obtained using the baseline triangle U1-U3-U4
- ✓ instrument: AMBER with the UTs in low resolution mode

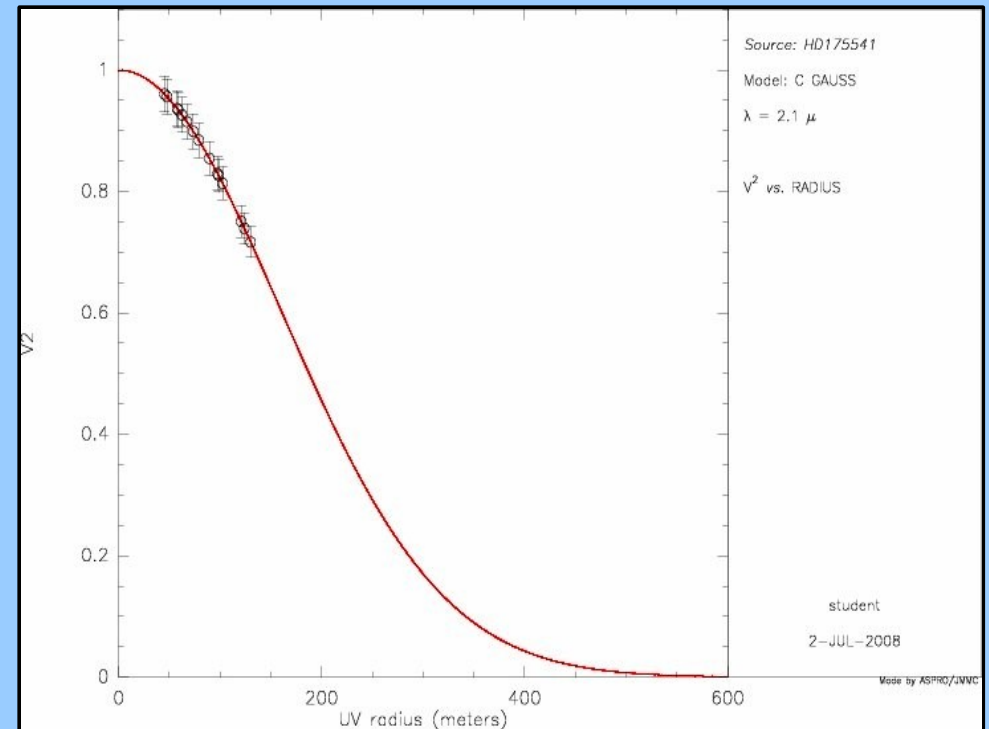


Predicted model

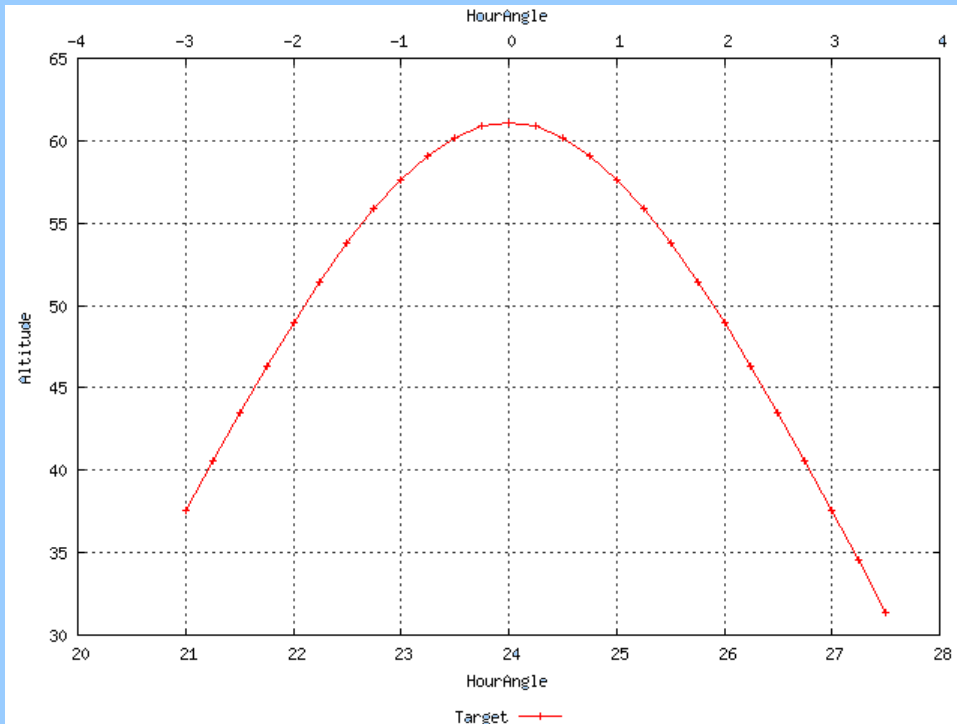


- ✓ baseline is too short for obtaining measurement points at minimum of square visibility but accuracy of the model is about 6%

- ✓ Circular Gauss with expected angular diameter 0.7 mas



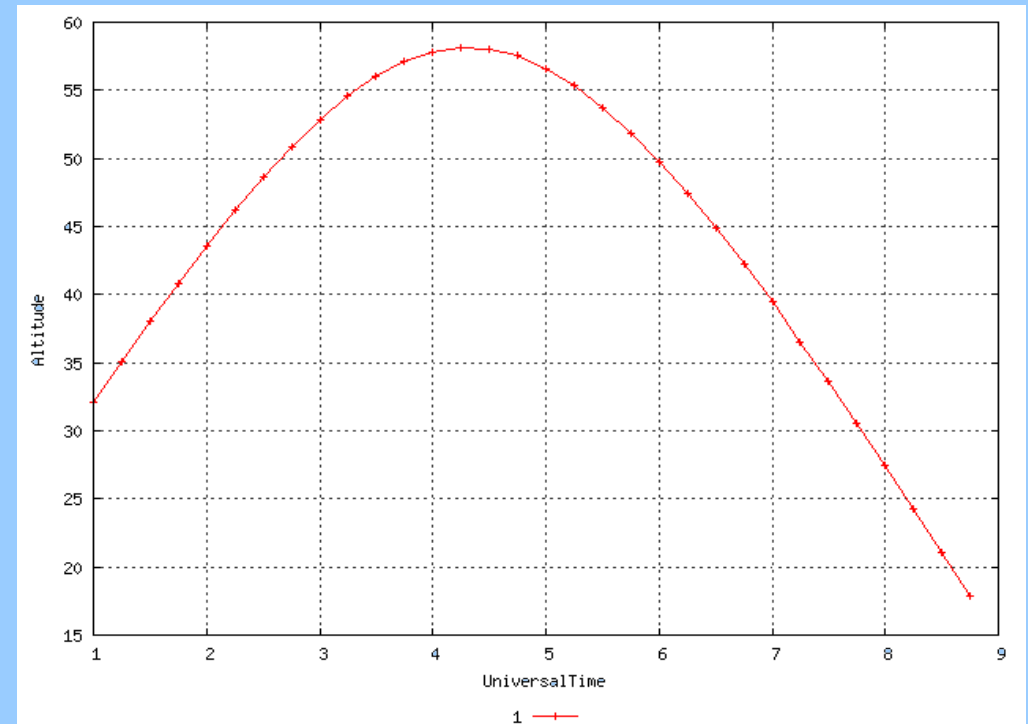
Calibrator



HD 175541

HD 169113

HD 169113	
RA	18 22 49.07
Dec	7 12 24.29
Angular Distance	8.7 deg
Magnitude	K = 3.92
Spectral Type	K1 III



Data analysis

- ✓ It would be the first interferometric measurement of the angular diameter such distant planet host giant star
- ✓ Through this direct measurement with 6% precision we can determine the radius of HD175541 with 10% accuracy
- ✓ It follows us to estimate the stellar (and planetary) mass more precisely than before
- ✓ In our search for planet around evolved stars there are only distant red giants ...
- ✓ Maybe using PRIMA in the future (parallax and radii measurements)?