Precise Sizes of Exoplanet Hosts Identified by TESS

Russel White (GSU)

the Transiting Exoplanet Survey Satellite

A NASA mission, scheduled for launch in 2017

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How we might obtain

that should be

… an additional motivation for AO

the Transiting Exoplanet Survey Satellite

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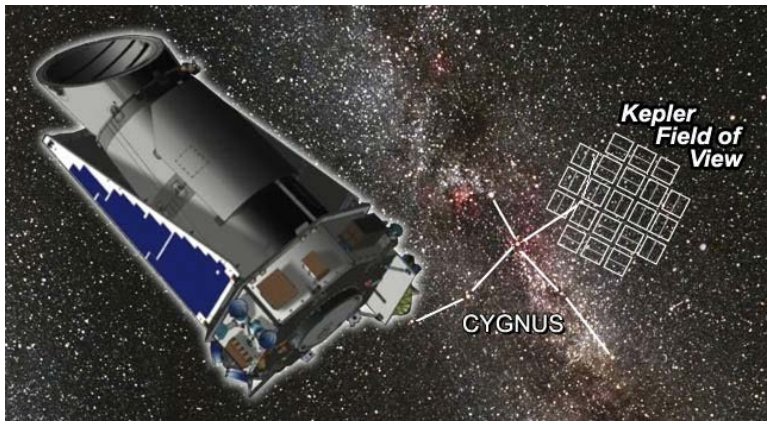
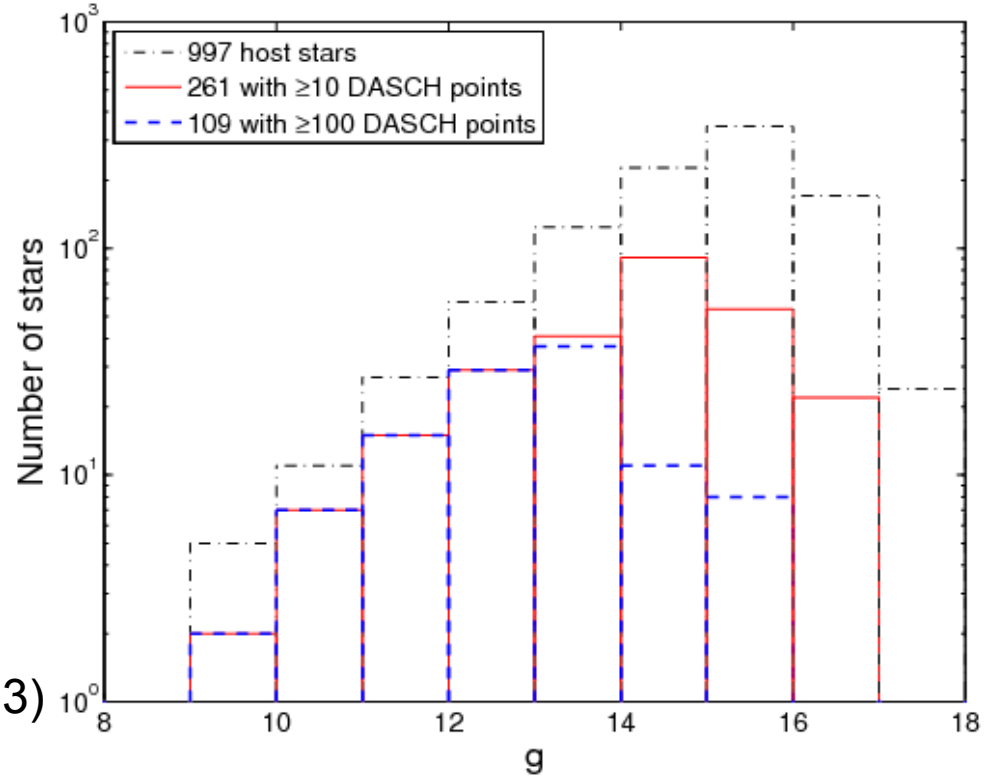
NASA's *Kepler* Spacecraft



Many Seminal Results - One in five has an Earth-size planet in the Habitable zone; multiplanets are common, etc.

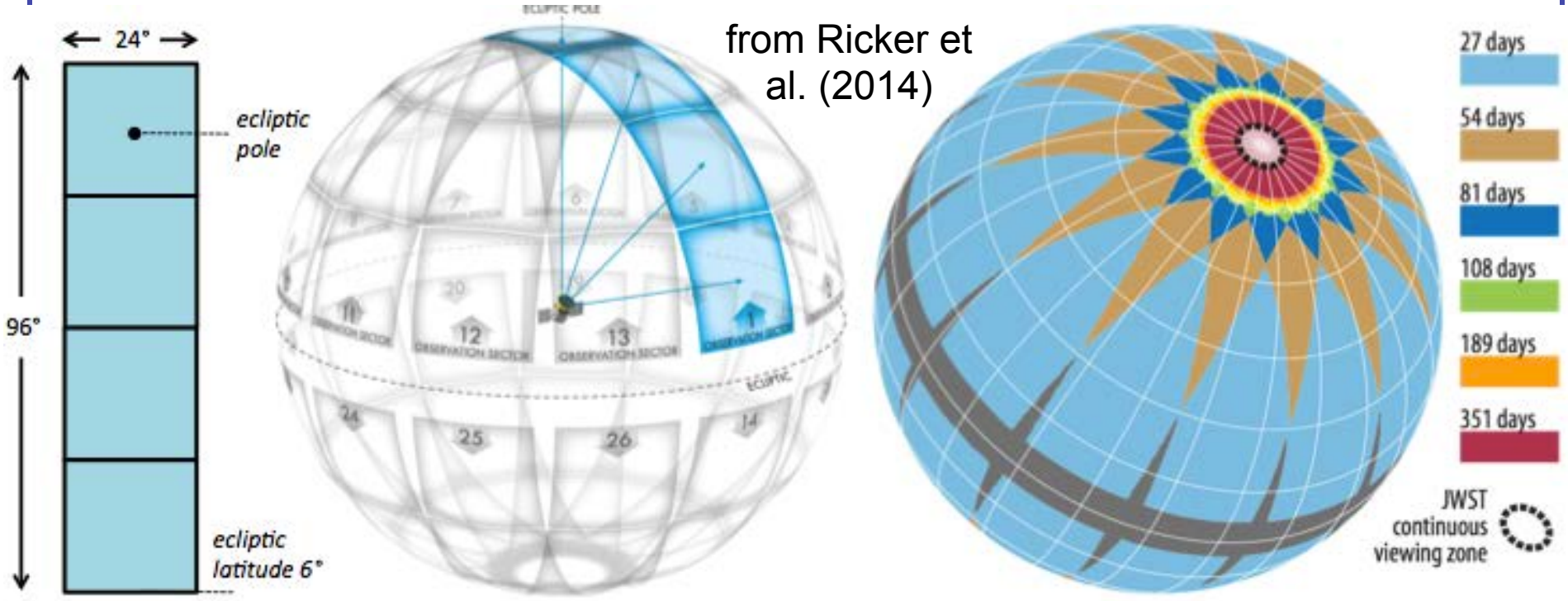
Kepler was successful as a *statistical* mission for exoplanets



Sumin et al. (2013)

The TESS Spacecraft

Will detect transiting planets orbiting the brightest and nearest stars (~1 min cadence of 200,000 stars down to I_C ~13)



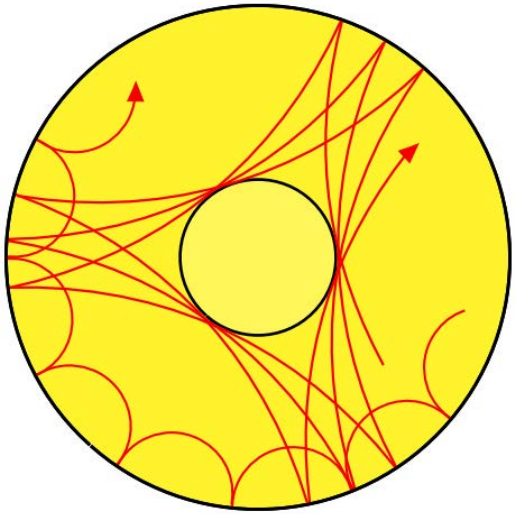
from Ricker et al. (2014)

Will also do asteroseismology of the brightest stars

The Need for Radii

A transiting planet's radius is determined relative to the host star's radius (r^2 / R^2)

(also habitable zone, orbital obliquity… Sam's talk)

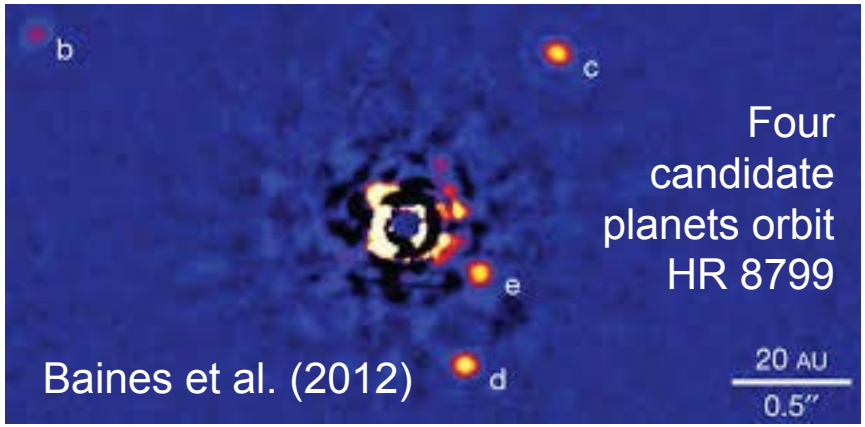


Asteroseismology provides a density, and with a radius, can determine the stellar mass.

CHARA Measures Precise Small Angular Diameters

$\theta_{HR\ 8799} = 0.342 \pm 0.008$ mas

(2% precision! … with PAVO)



CHARA detection limits

		Res.	Mag limit	Mag limit	Mag limit
Mode	**Band**	**λ / 2B**	**Current**	**Tip tilt**	**Full AO**
Classic	H	0.51 mas	7.0	8.5?	9.0
PAVO	~765 nm	0.24 mas	7.0	9.5?	10.0

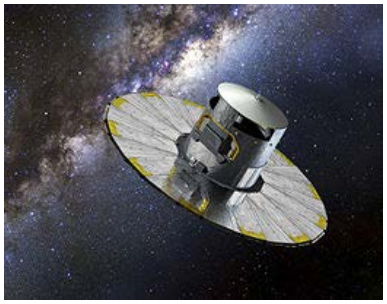
The TESS Dwarf Catalog

The Catalog from which 200,000 dwarfs will be selected for TESS monitoring ($I < 13$, $T_{eff} < F5$)

see Stassun, Pepper, Paegert, De Lee, Sanchis-Ojeda (2014; arXiv:1410.6379)

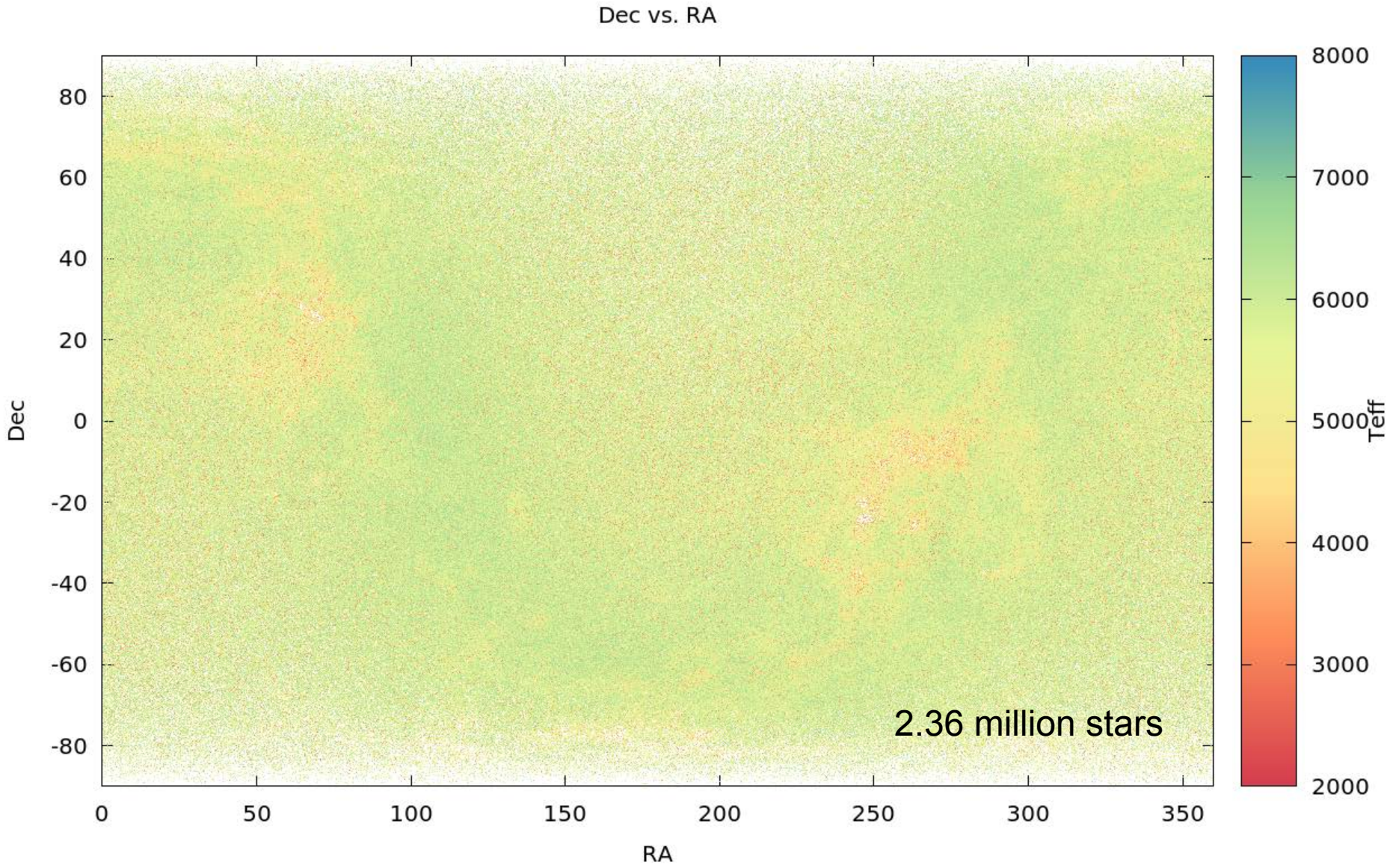
- From a cross-match of 2MASS, NOMAD, Tycho2, Hipparcos, APASS, and UCAC4
- T_{eff} from colors, log g from reduced proper motion

Dwarf sample is still contaminated by subgiants (up to 50%)



For bright stars, GAIA will determine distances to << 1% precision

The Full TESS Dwarf Catalog



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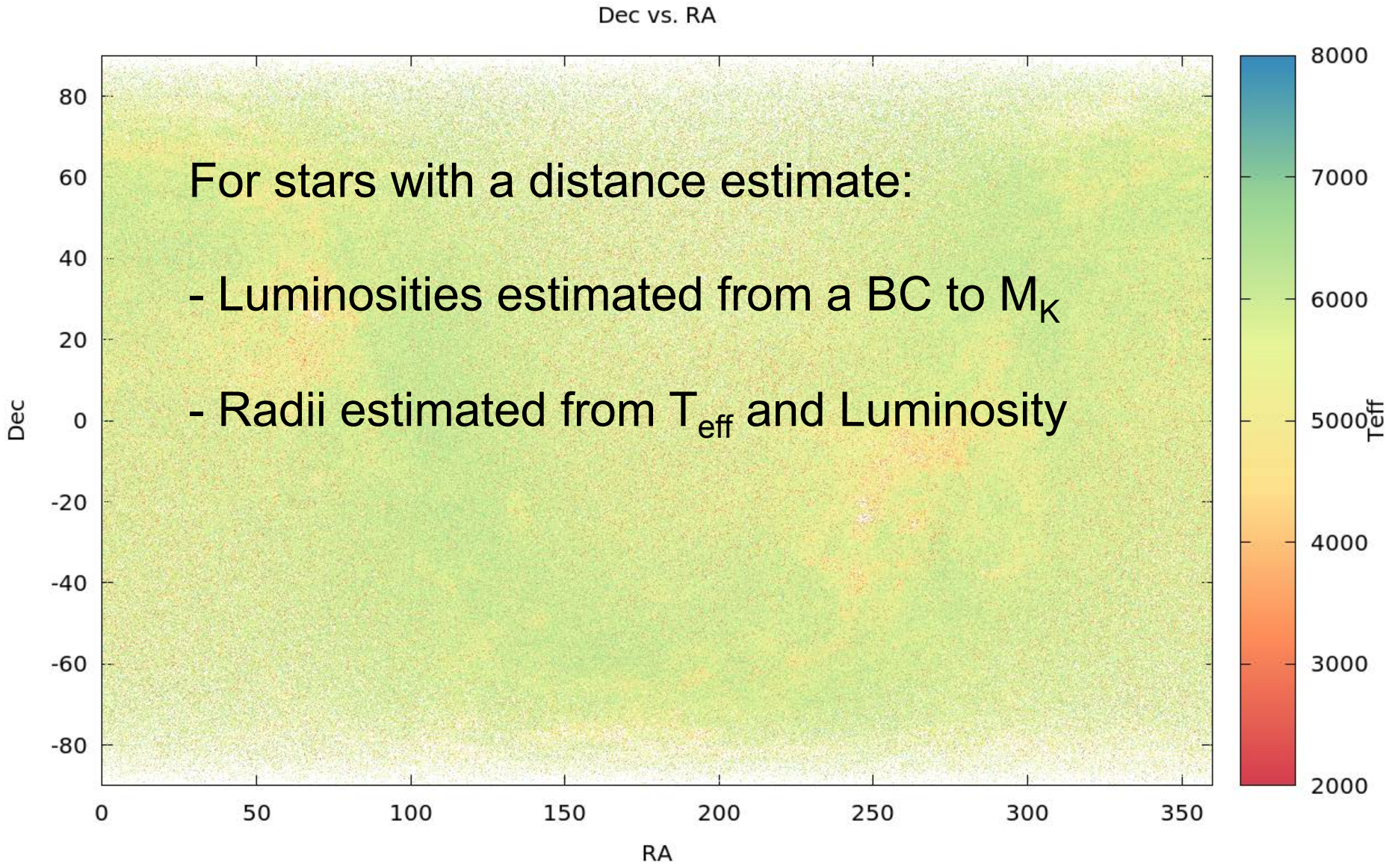
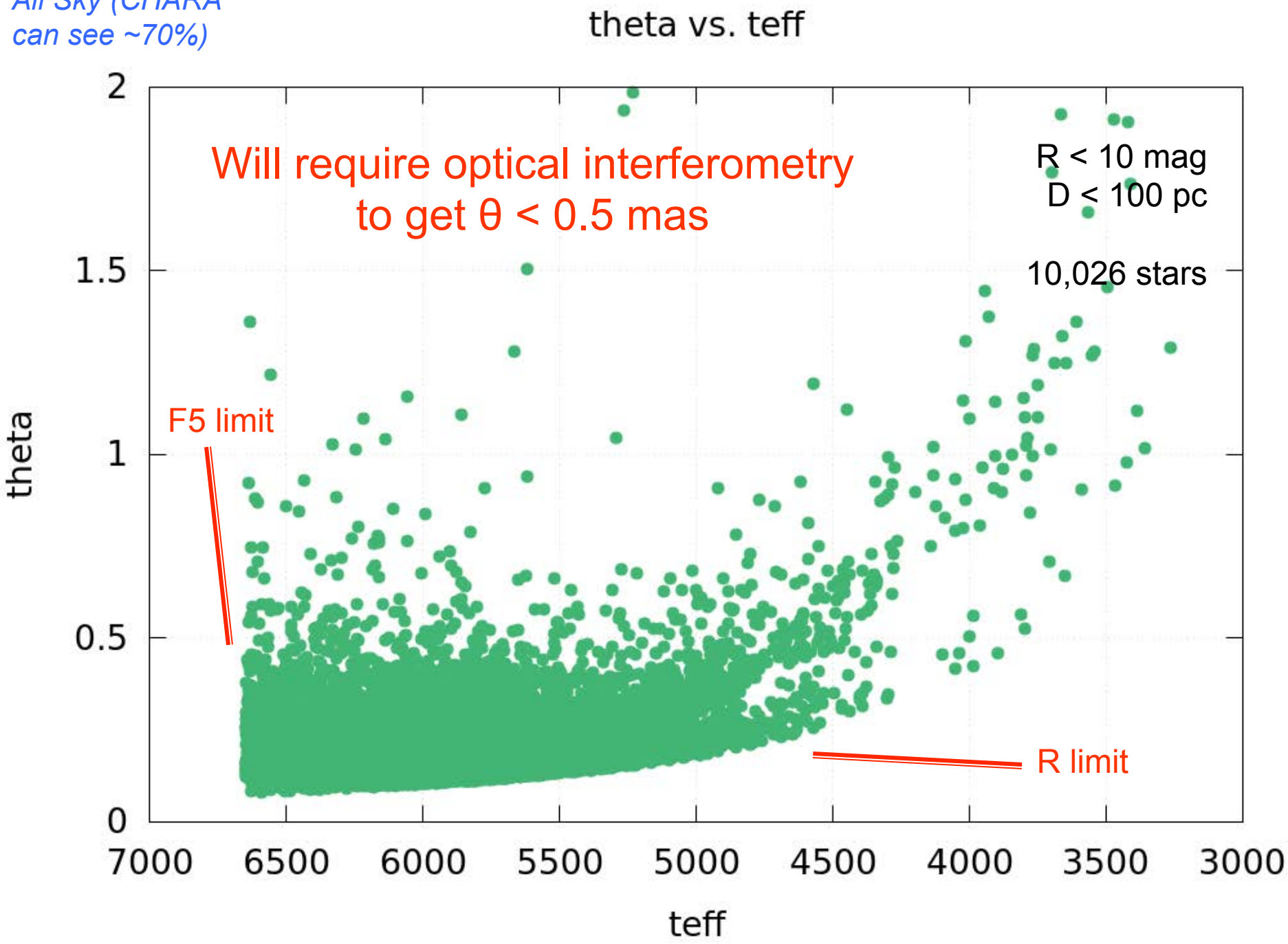


All Sky (CHARA can see ~70%)



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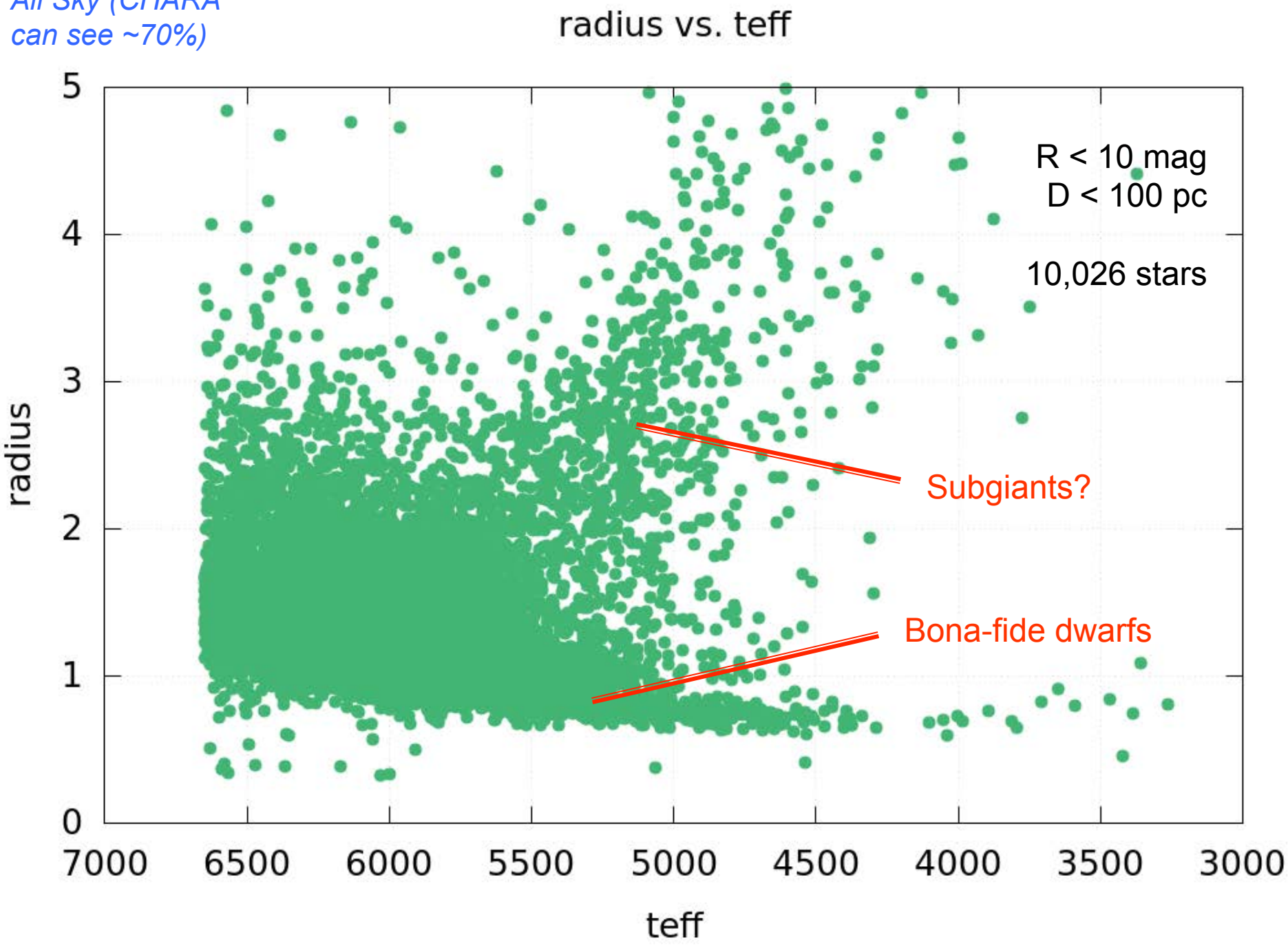

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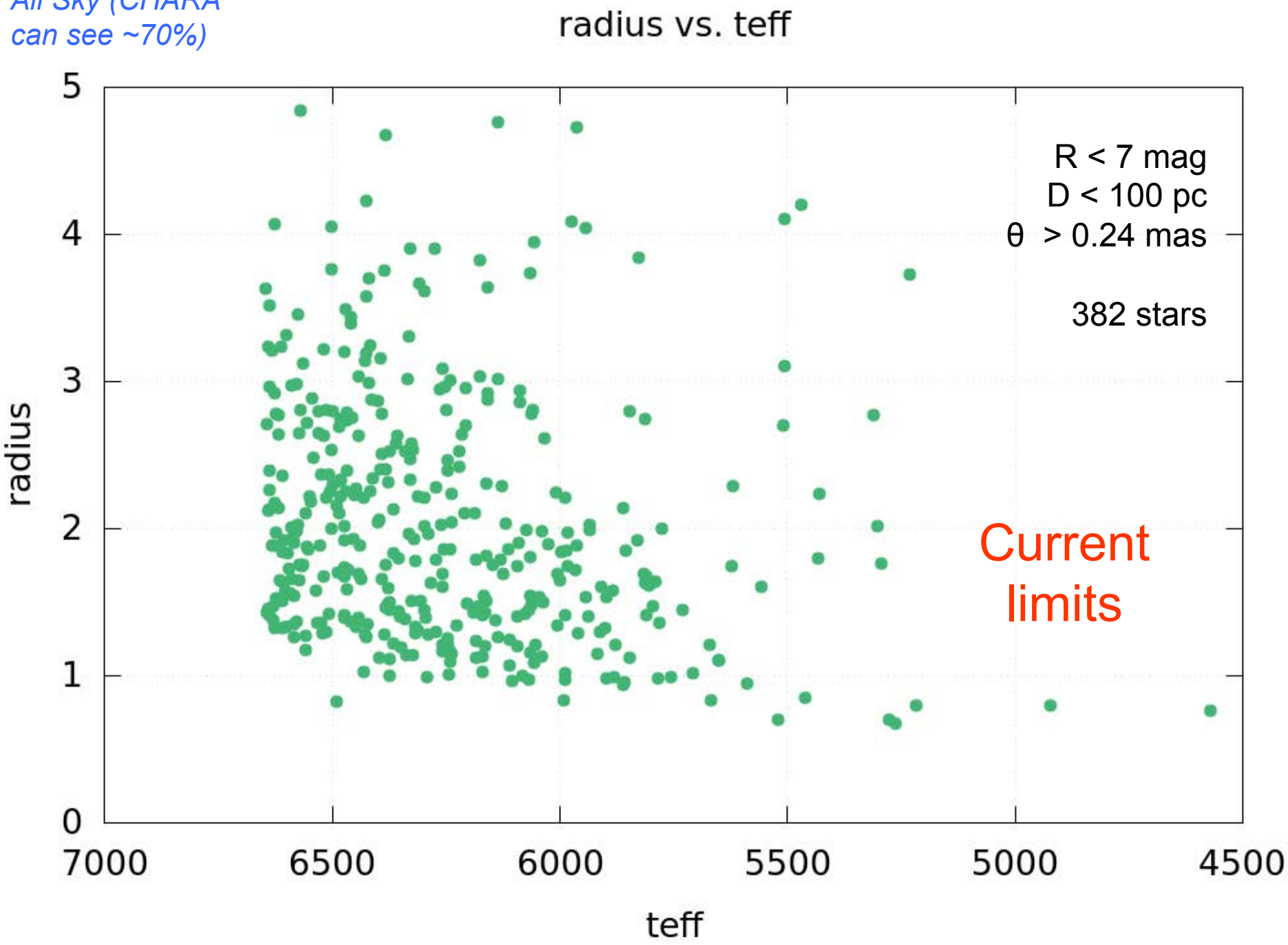

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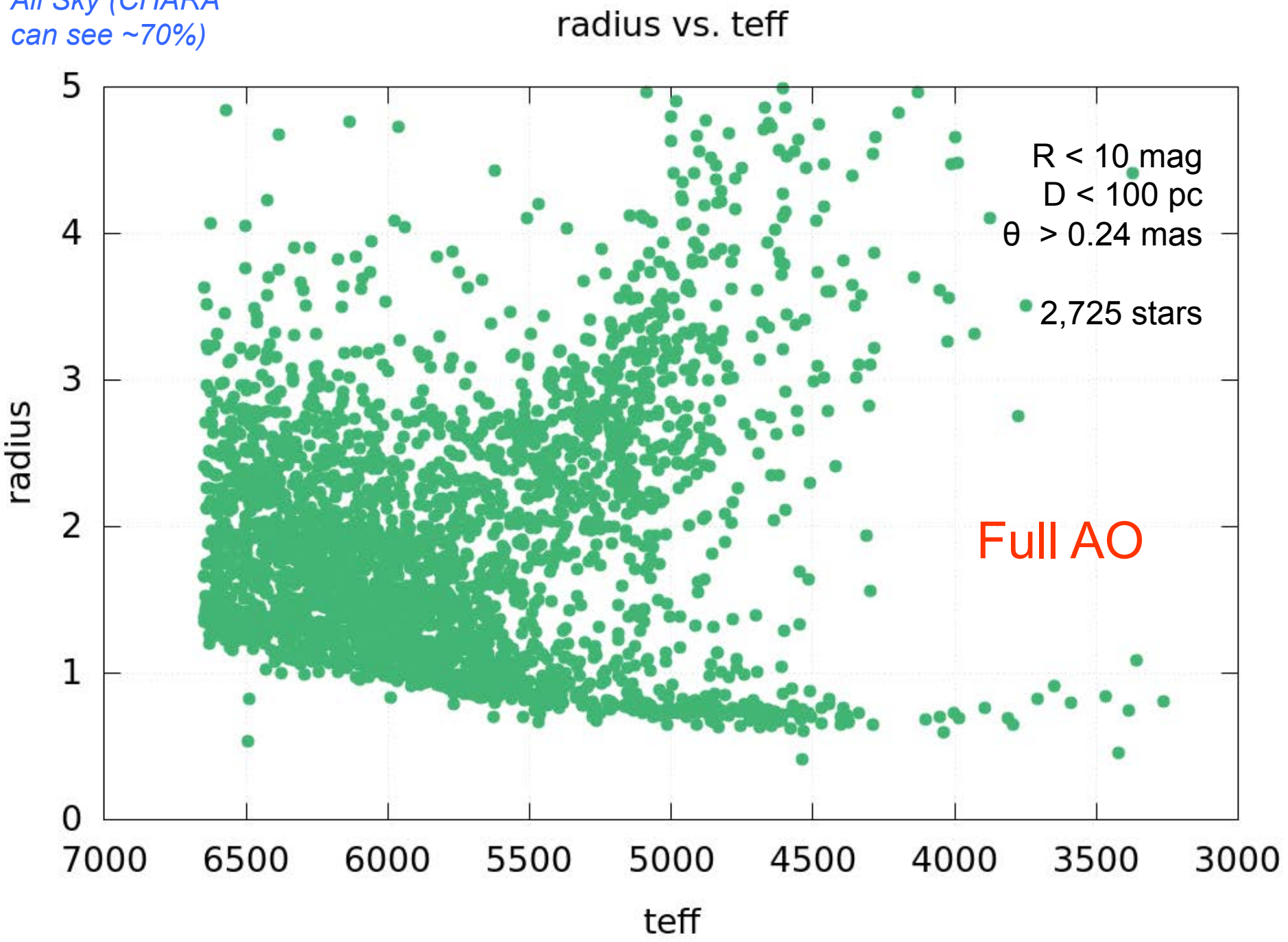

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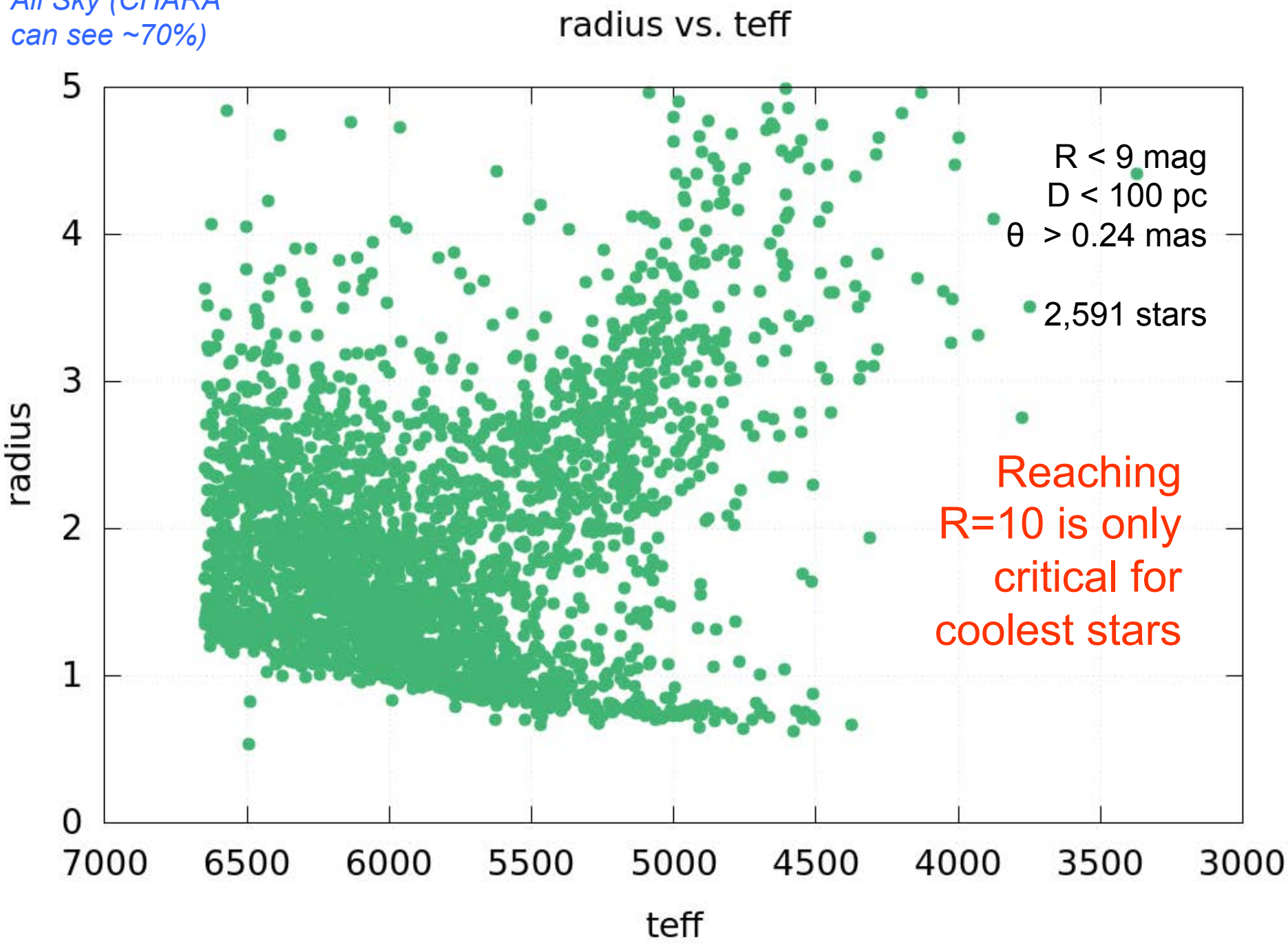

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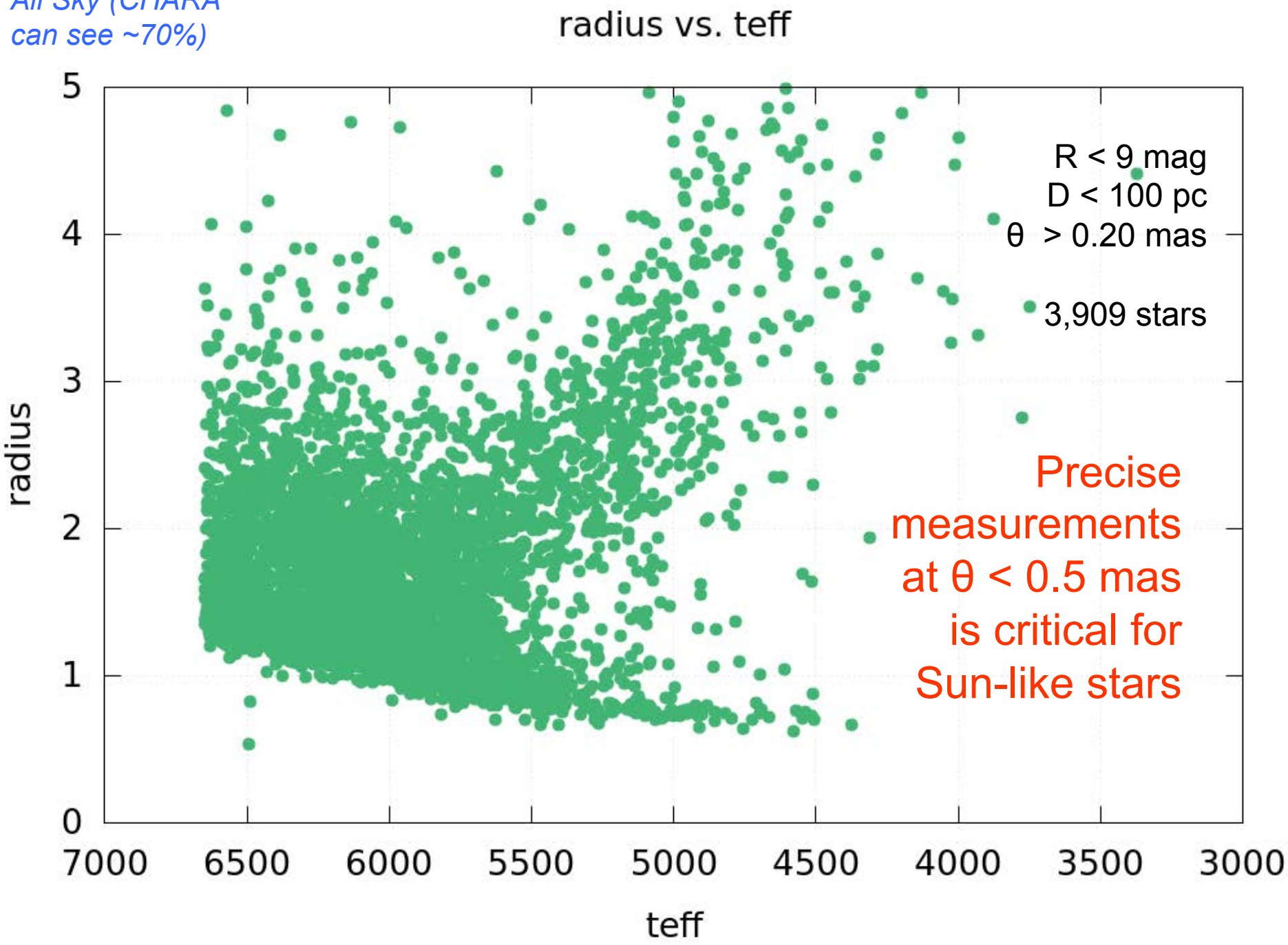

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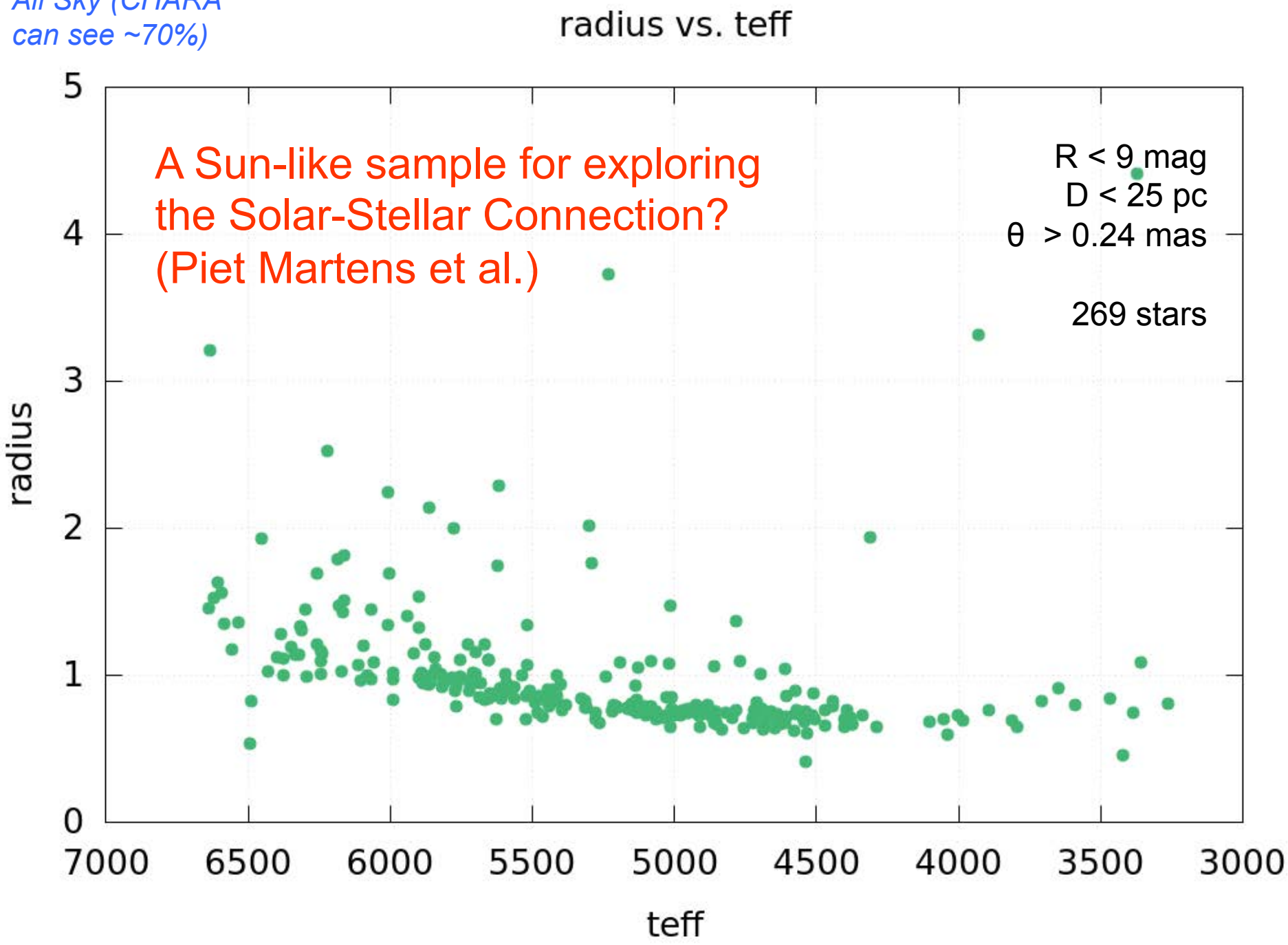

Summary

TESS science (exoplanets, asteroseismology) will be enhanced greatly with precise size measurements

With Full AO, CHARA should be able to resolve at least ~1% of dwarfs surveyed

(sample could grow considerably with GAIA distances)

A potential lucrative funding source for CHARA