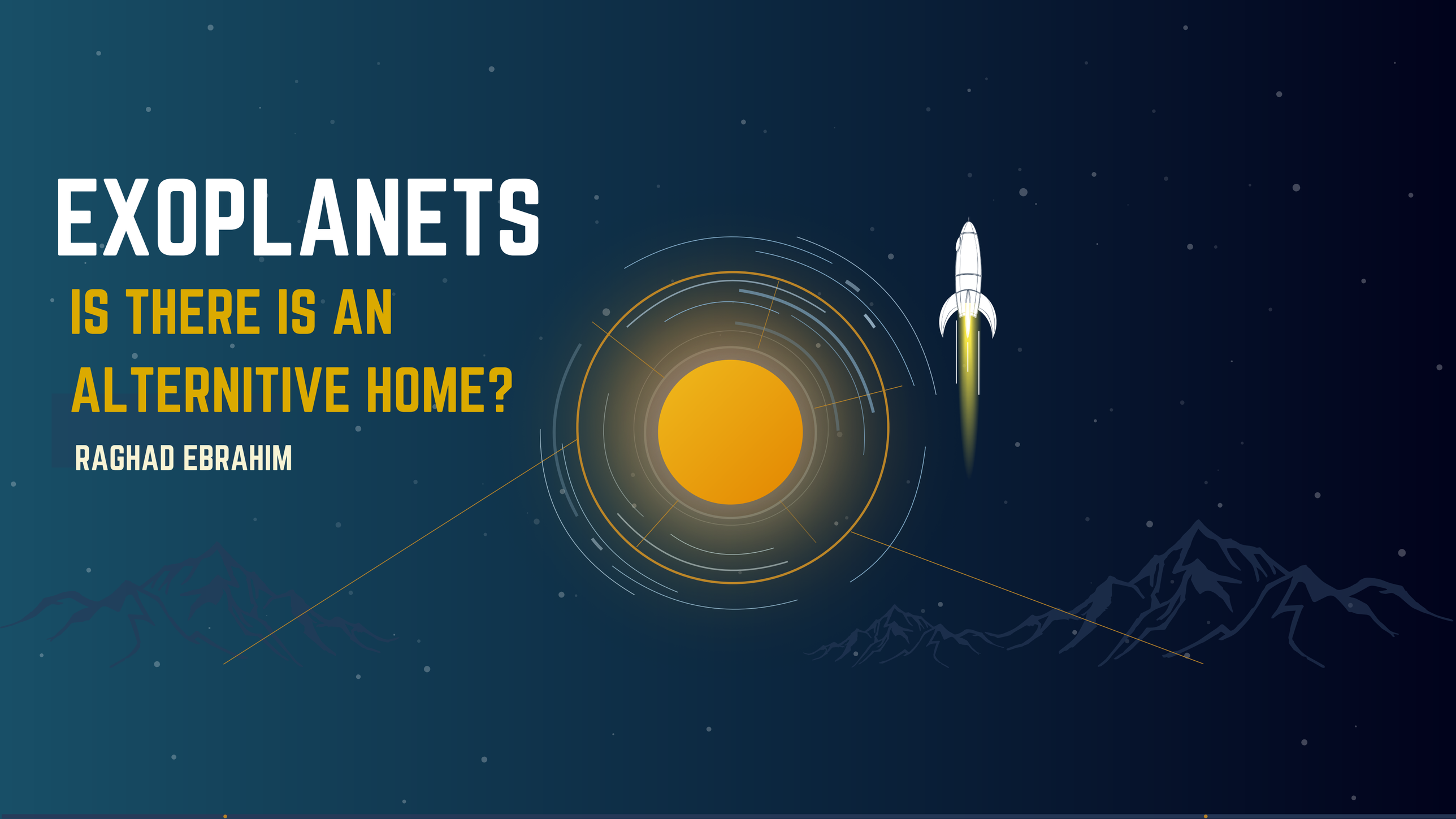
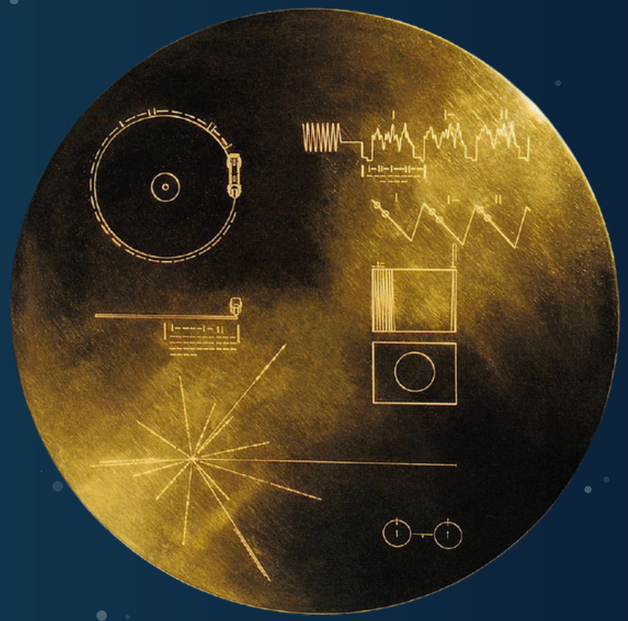
EXOPLANETS

IS THERE IS AN ALTERNITIVE HOME?

RAGHAD EBRAHIM



LOOKING FOR A SIGNAL

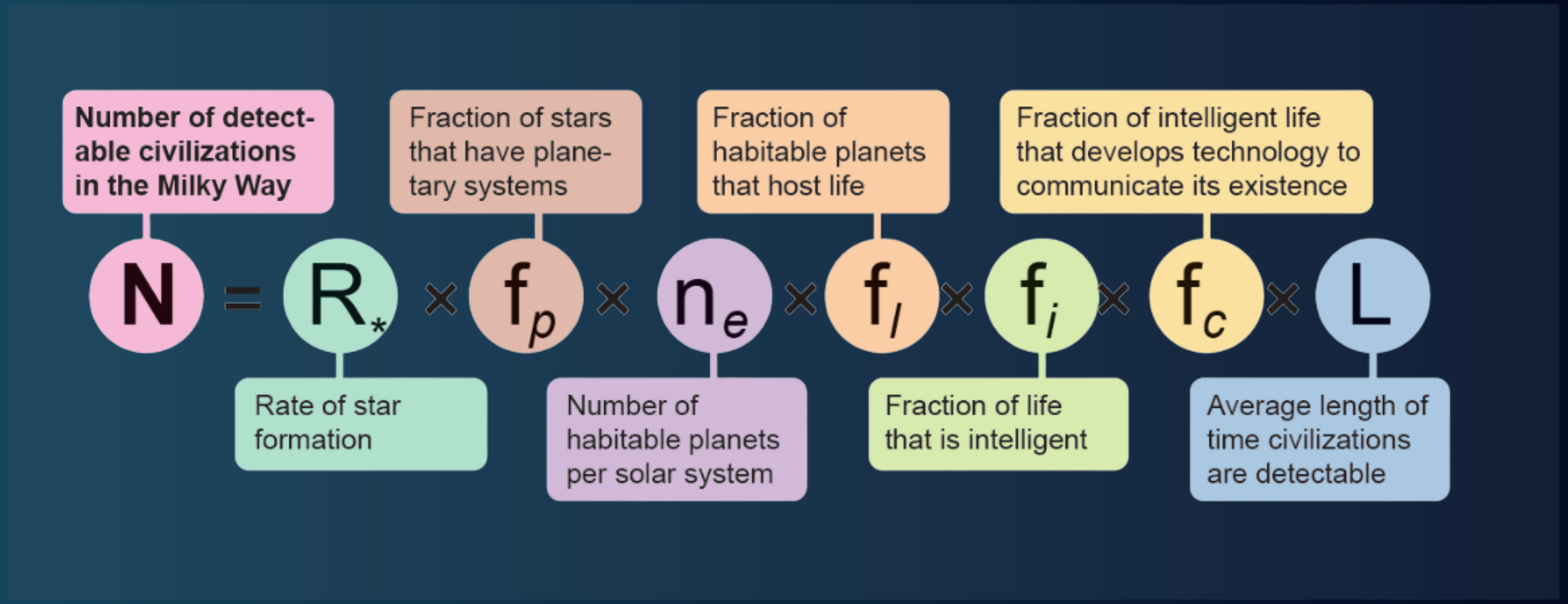


“GREETINGS FROM EARTH”

- In 1977, NASA launched the Voyager 1 and 2 spacecraft.

Carl Sagan proposed including a message from humanity with greeting message of 55 languages, natural sounds from earth and information about human civilization.

FERMI PARADOX



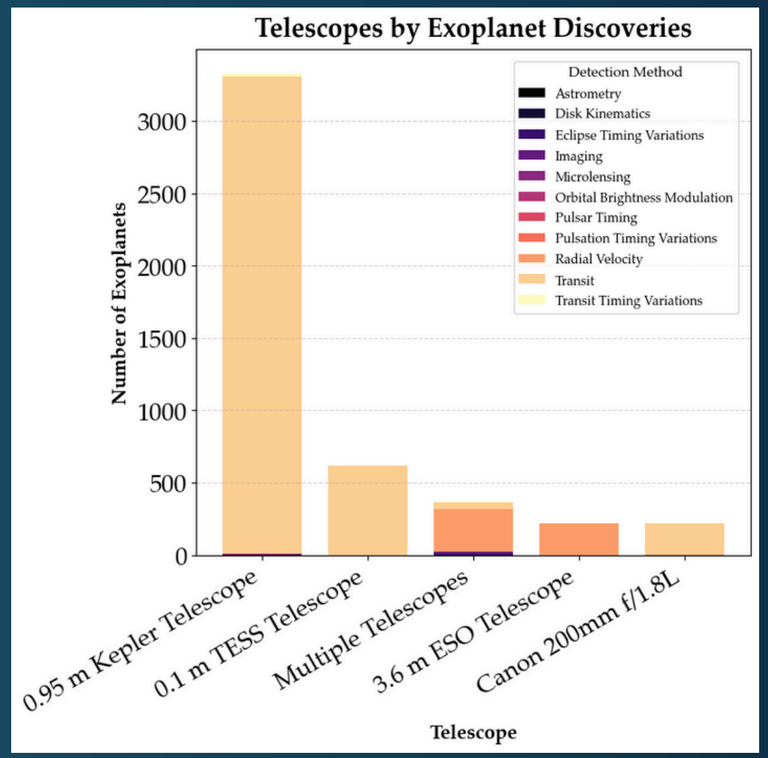
WHAT WE KNOW ABOUT THE EXOPLANETS?

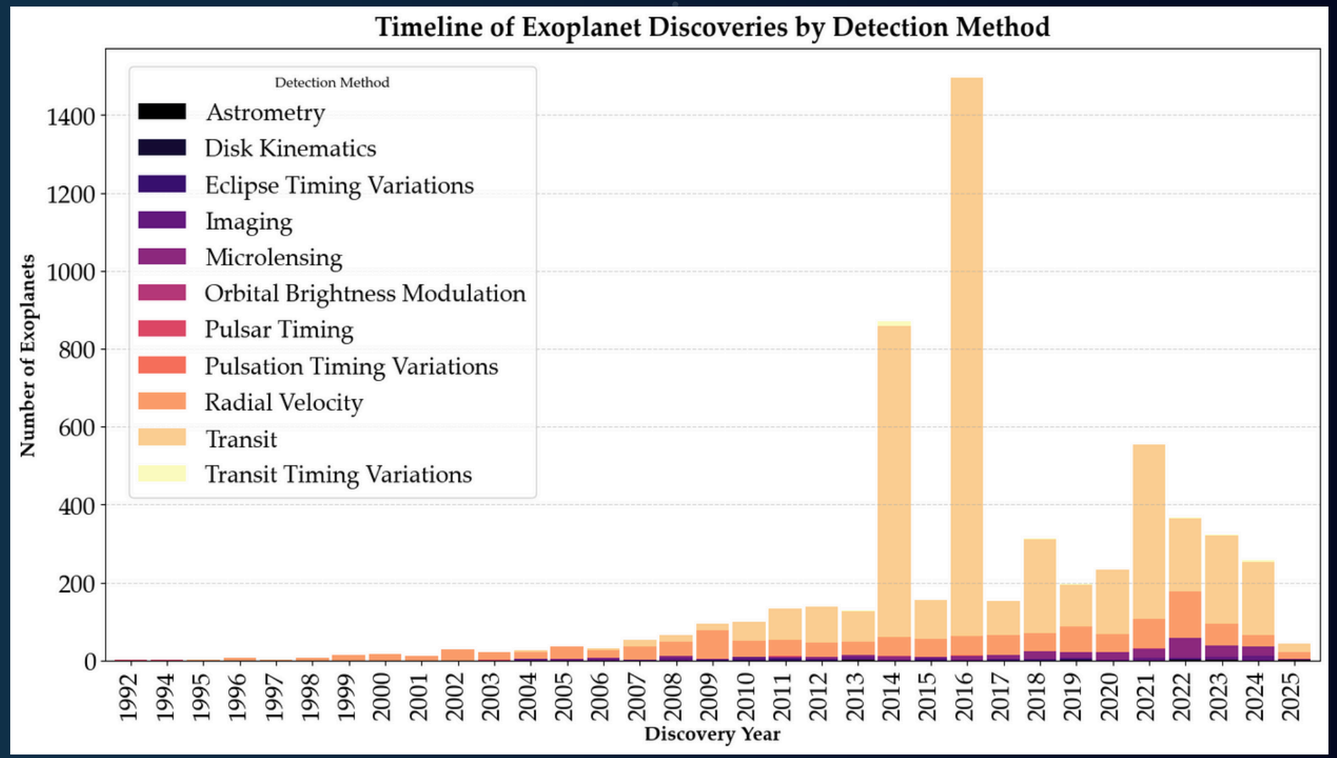
1992
First exoplanets discovery

44
Detections since 2025

5869
Confirmed exoplanets detections

6491
Host Stars

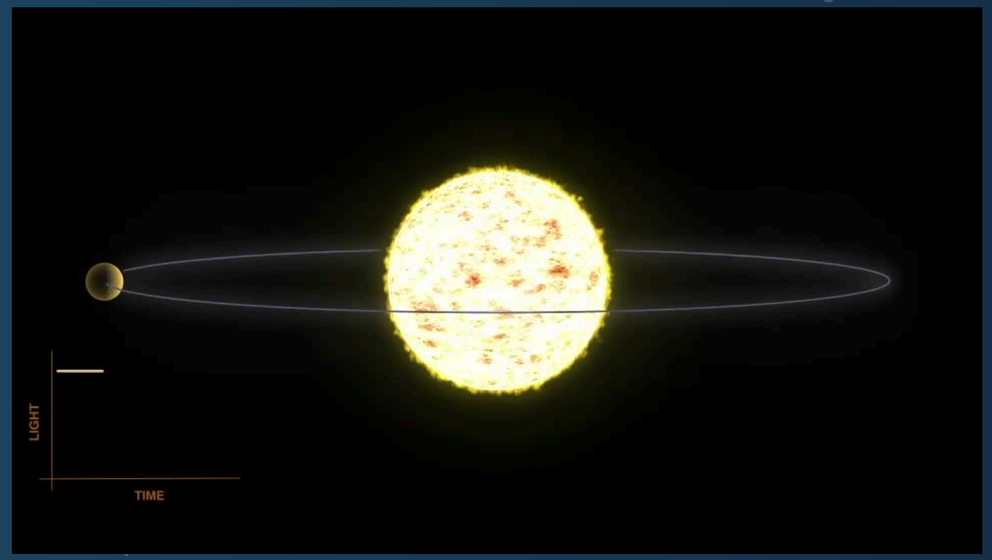




OUR EXOPLANETS CANDIDATES

DETECTION METHOD

TRANSIT METHOD



RADIAL VELOCITY

WHAT MAKES A PLANET HABITIBLE ANYWAY?

THE PLANET MUST BE IN THE HABITIBLE ZONE

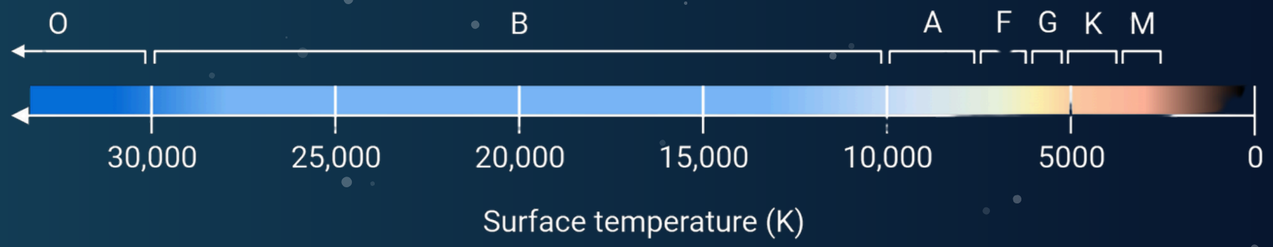
IT SHOULD HAVE STABLE ATMOSPHERE

STABLE GRAVITY

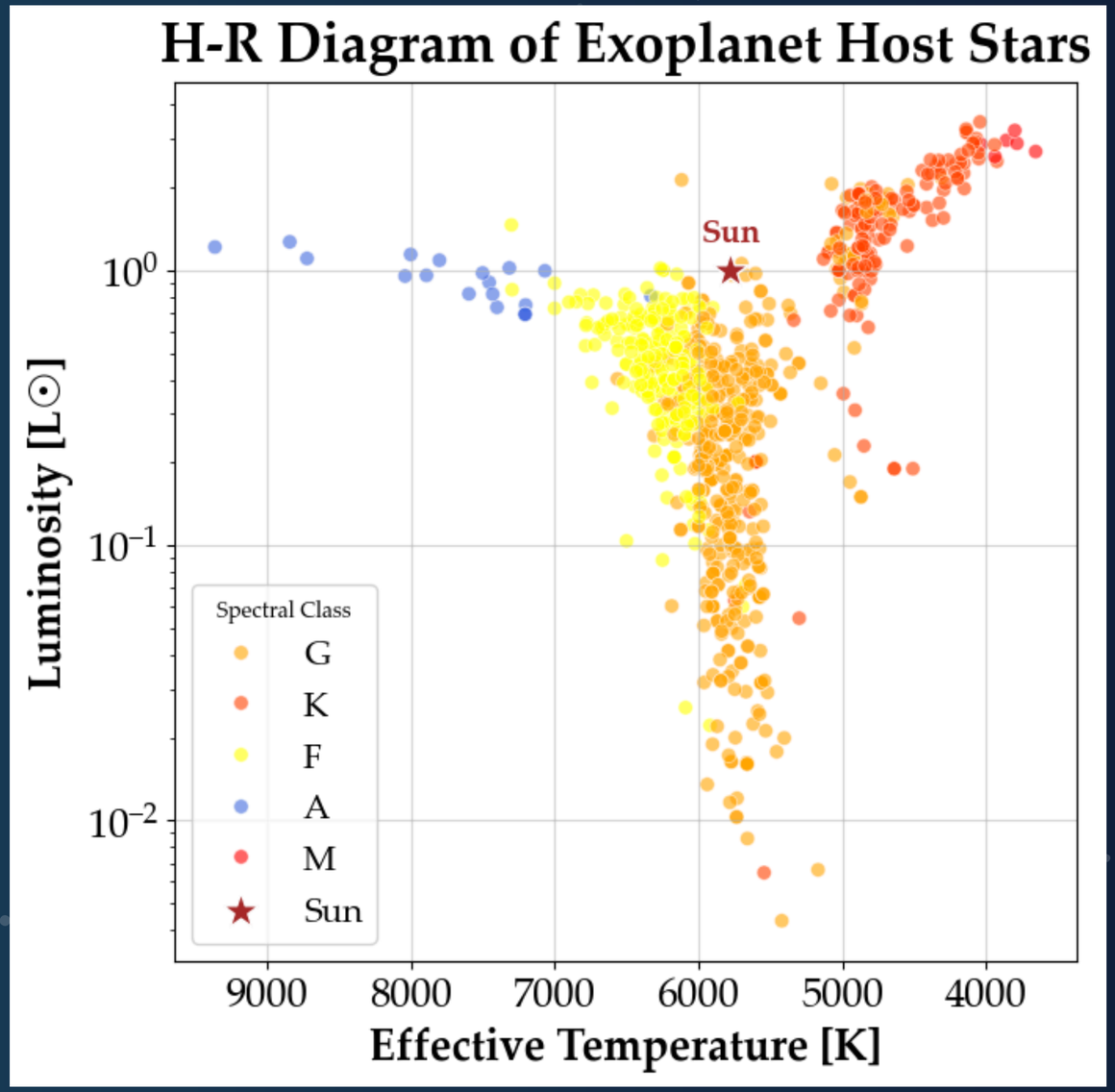
MODERATE SIZE

HOST STARS

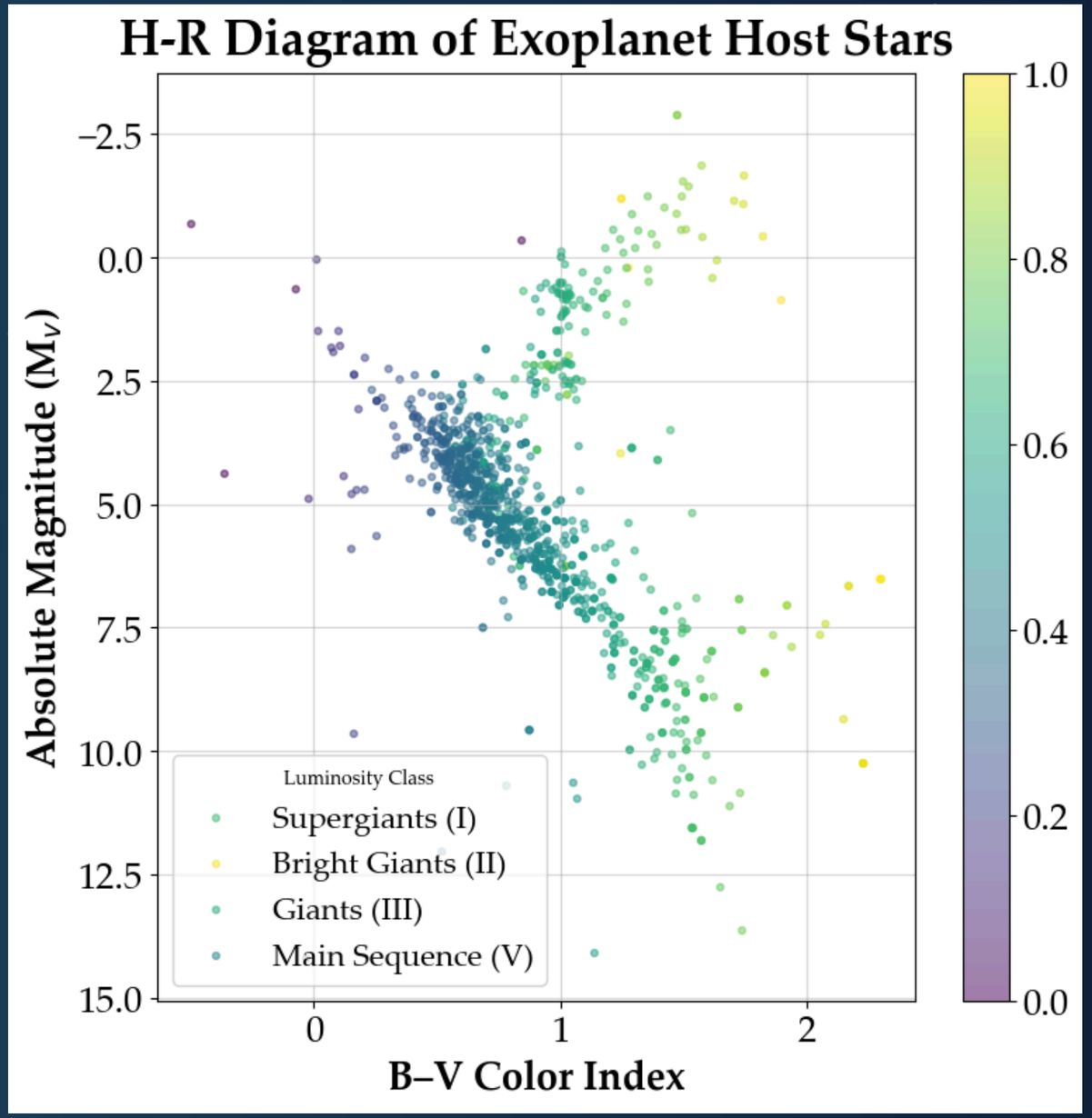

O
B
A
F
G
K
M


O
B
A
F
G
K
M
30,000
25,000
20,000
15,000
10,000
5000
0
Surface temperature (K)

HOST STARS


H-R Diagram of Exoplanet Host Stars
Sun
10^0
10^{-1}
10^{-2}
Luminosity [L⊙]
Spectral Class
G
K
F
A
M
Sun
9000
8000
7000
6000
5000
4000
Effective Temperature [K]

HOST STARS


H-R Diagram of Exoplanet Host Stars
Absolute Magnitude (M_V)
B–V Color Index
−2.5
0.0
2.5
5.0
7.5
10.0
12.5
15.0
0
1
2
1.0
0.8
0.6
0.4
0.2
0.0
Luminosity Class
Supergiants (I)
Bright Giants (II)
Giants (III)
Main Sequence (V)

WHAT MAKES A PLANET HABITABLE?

(F, G, K, OR COOL M STARS)

→ Long-lived and stable, allowing time for life to evolve

MAIN SEQUENCE (LUMINOSITY CLASS V)

Stars in this class are stable, hydrogen-burning stars — like our Sun

TEMPERATURE: 2600–6300 K

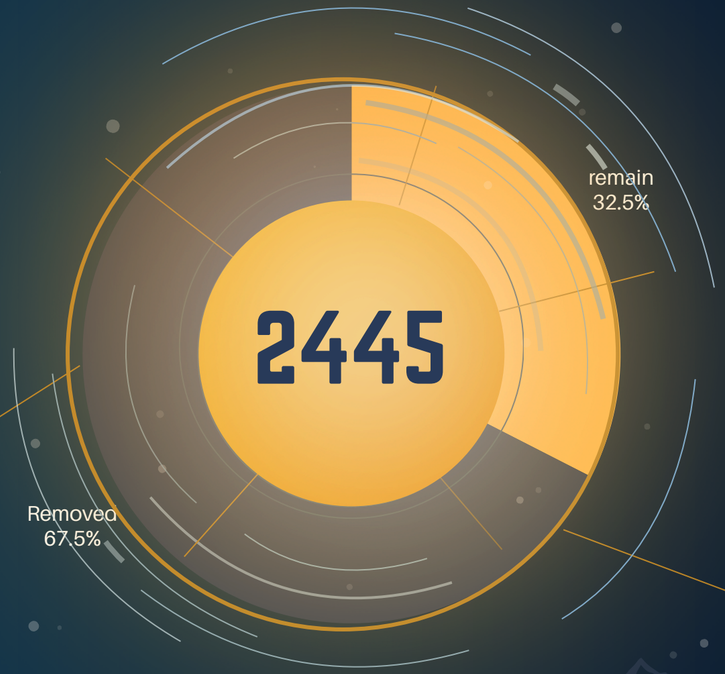
→ Sets the habitable zone range appropriately

OUR EXOPLANETS CANDIDATES

OUR EXOPLANETS CANDIDATES

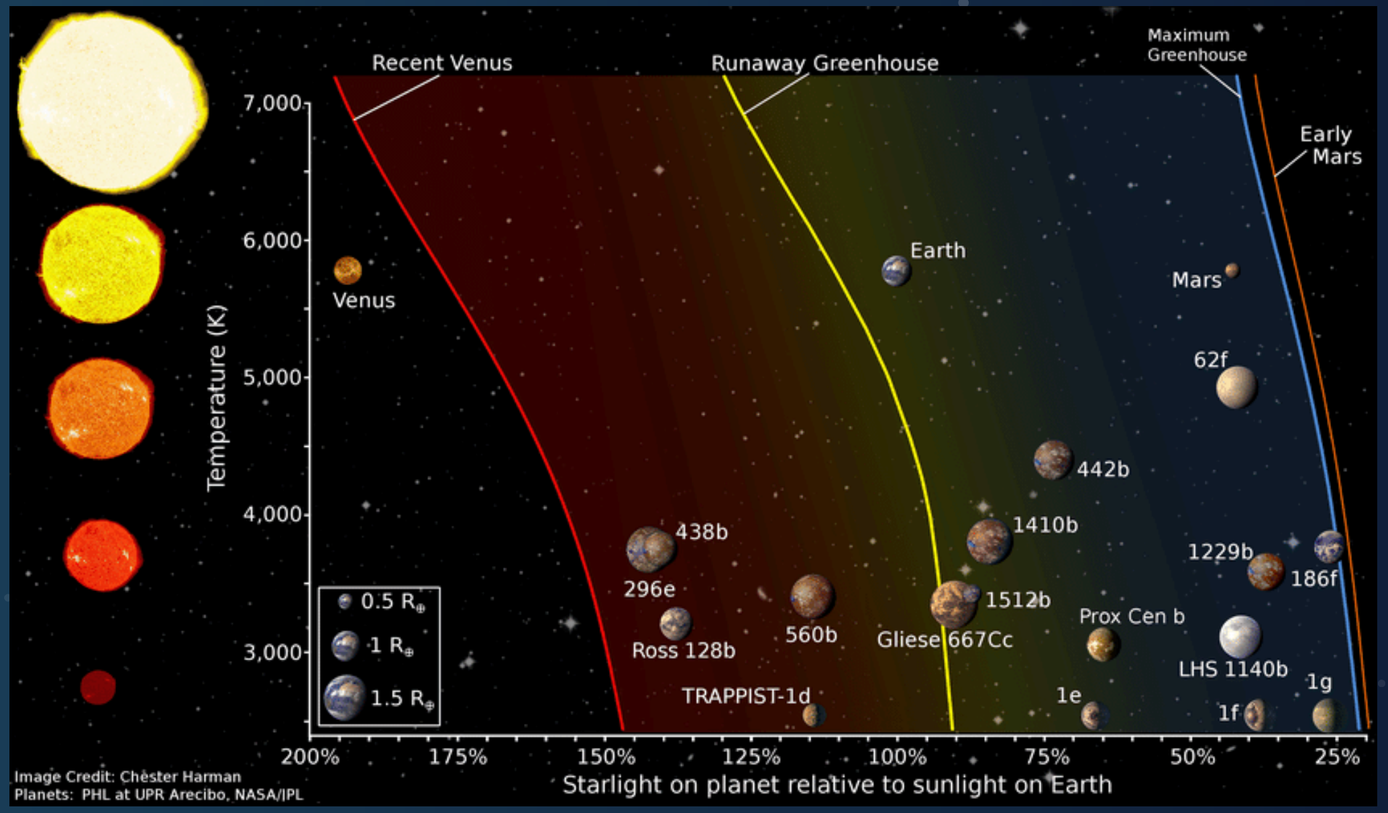
1 STELLAR CHARACTRISTIC

- G , K, M Type stars
- Main Sequence stars
- Surface Temperature 2300-6300 K



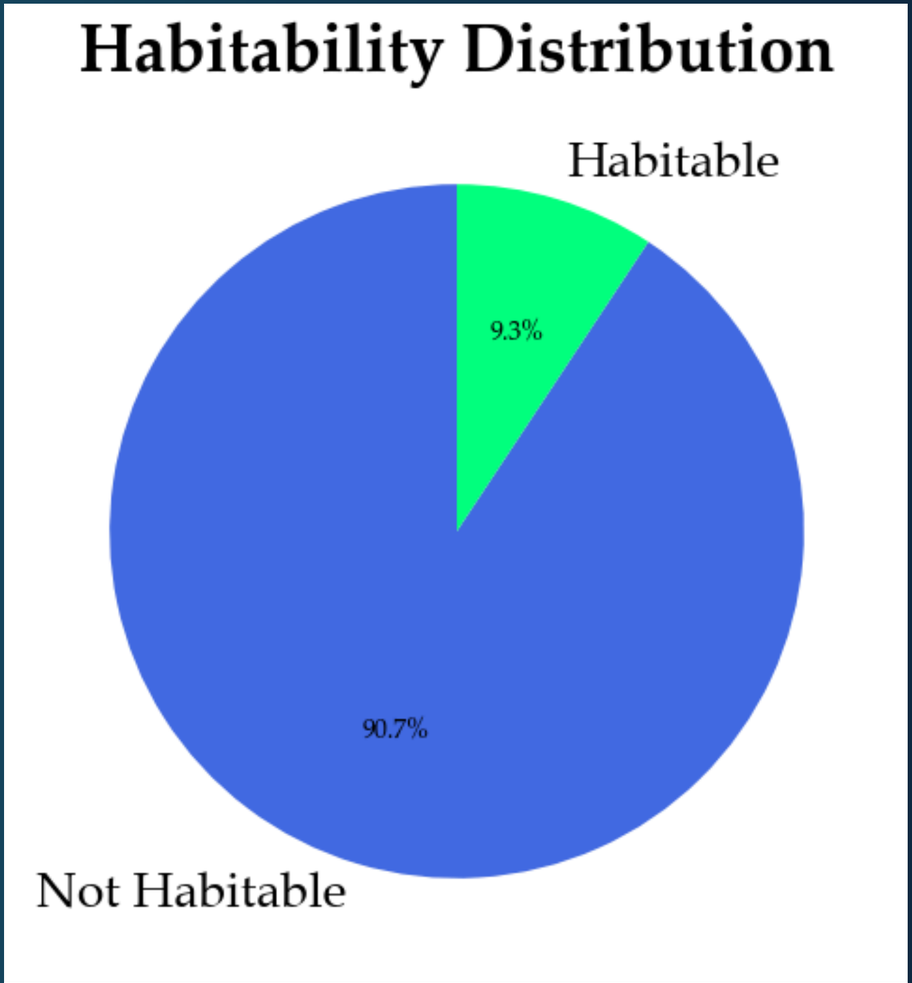
OPTIMISTIC HZ LIMIT

KOPPARAPU ,2014



If the planet’s semi-major axis lies within the optimistic HZ bounds, it's labeled "Habitable"

PLANET RADIUS CLASSIFICATION

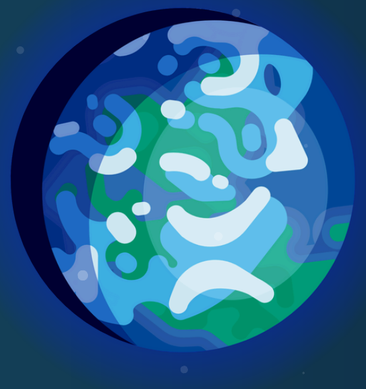


"Just because the planet is in the habitable zone, that does not mean that the planet itself is habitable!"

PLANET RADIUS CLASSIFICATION

TERRESTRIAL

$< 1.25\ R_\oplus$



SUPER EARTH

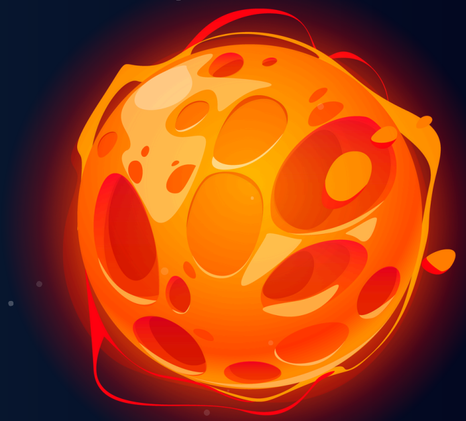
$1.25 - 2.5\ R_\oplus$

SUB-NEPTUNE

$2.5 - 4.0\ R_\oplus$

NEPTUNE-LIKE

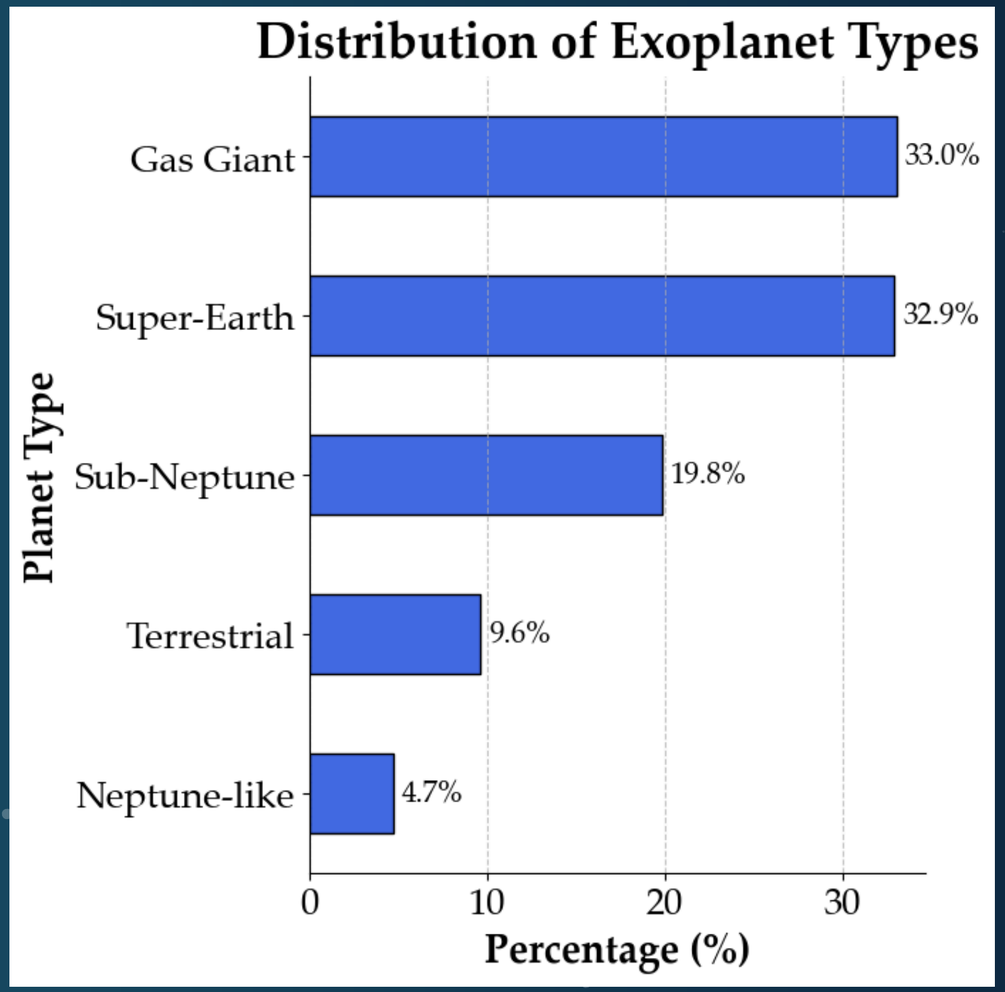
$4.0 - 6.0\ R_\oplus$

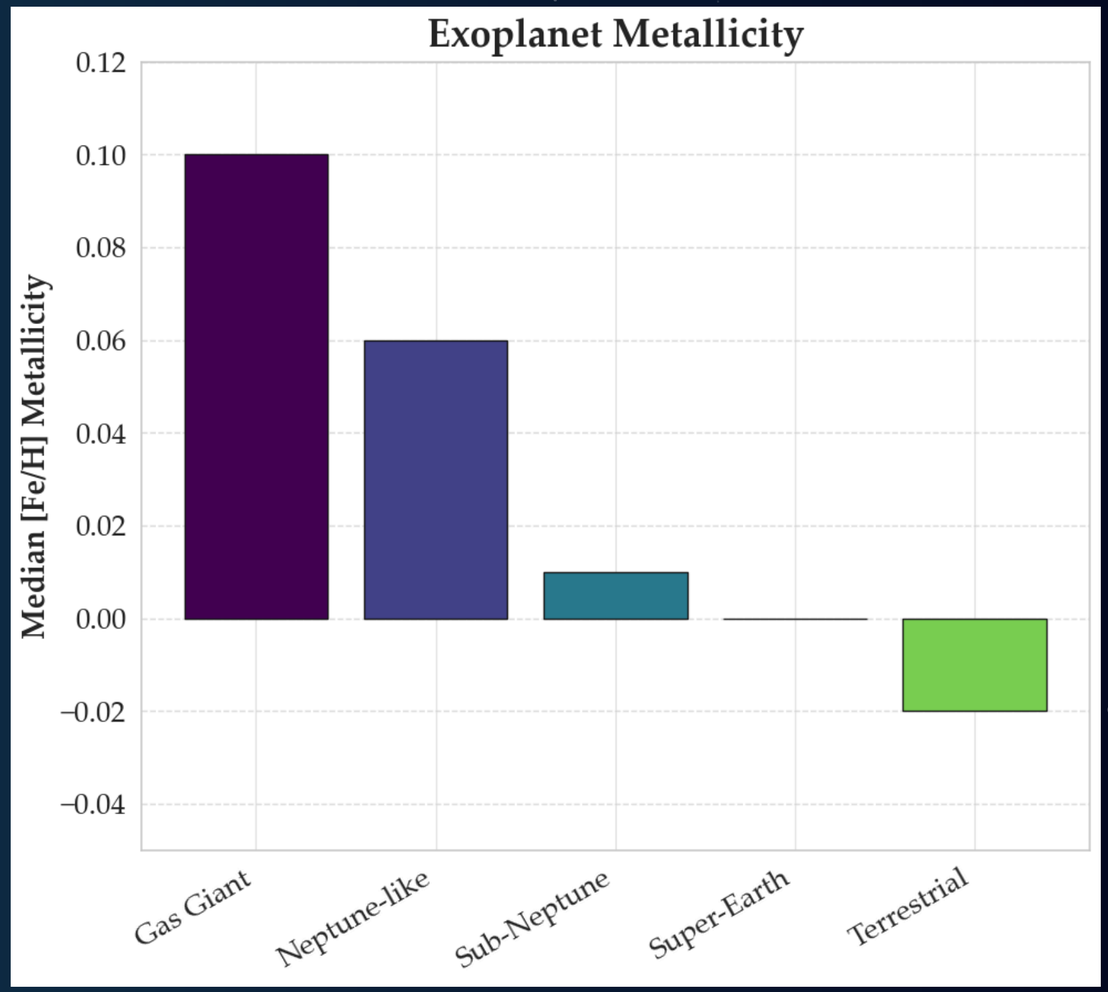


GAS GIANT

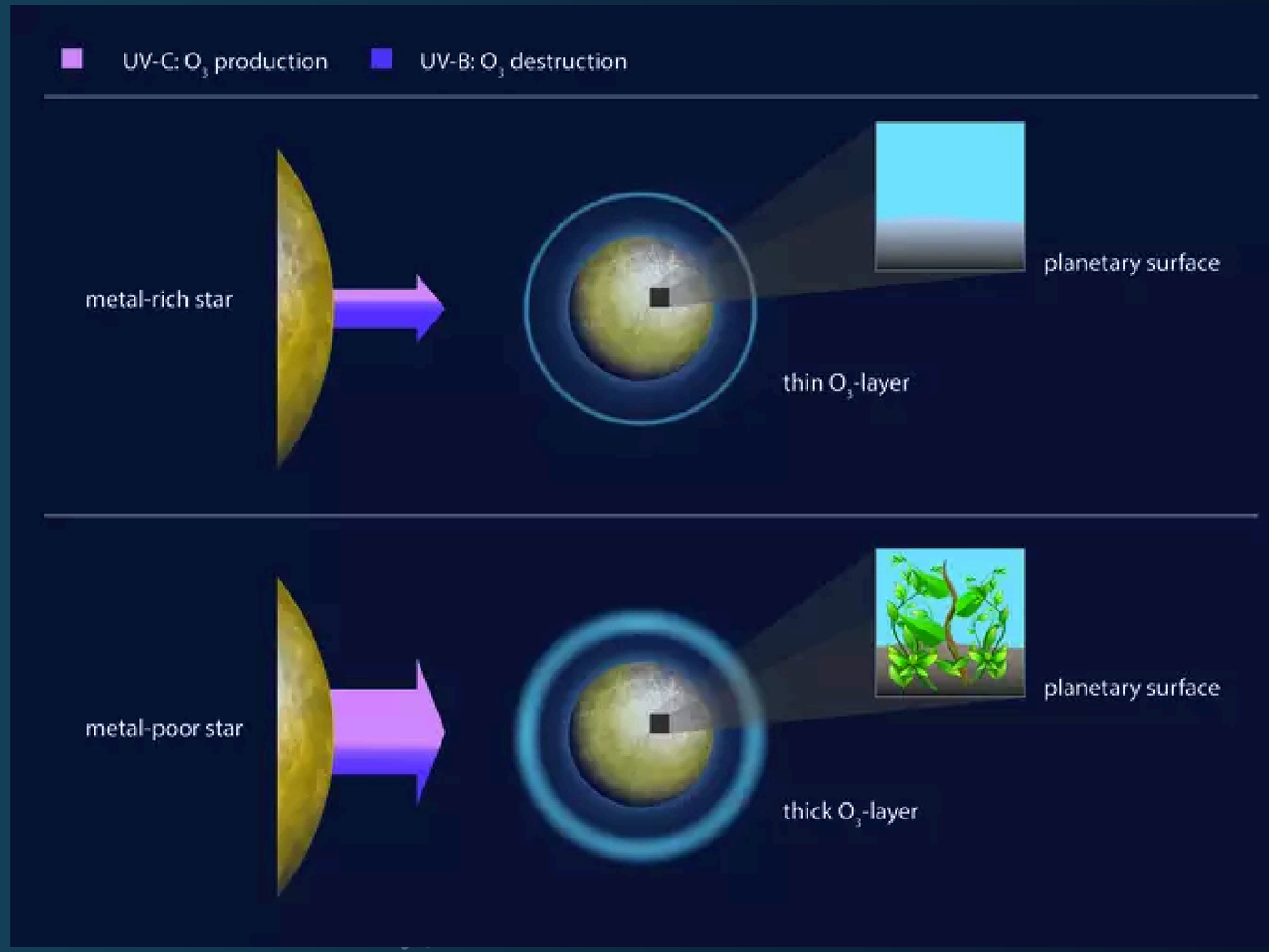
$> 6.0\ R_\oplus$

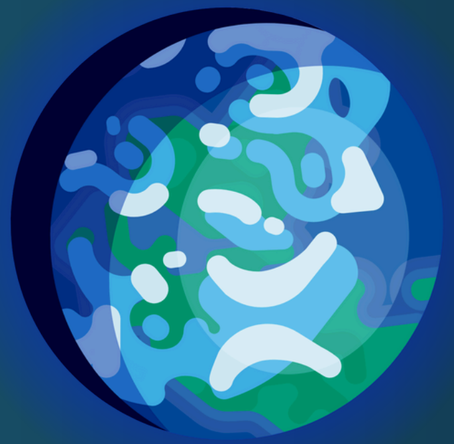
PLANET RADIUS CLASSIFICATION





TERRESTRIAL PLANET, SUPER EARTH





EARTH SIMILARITY INDEX

CARDENAS, R. & HEARNSHAW, J. (2013)

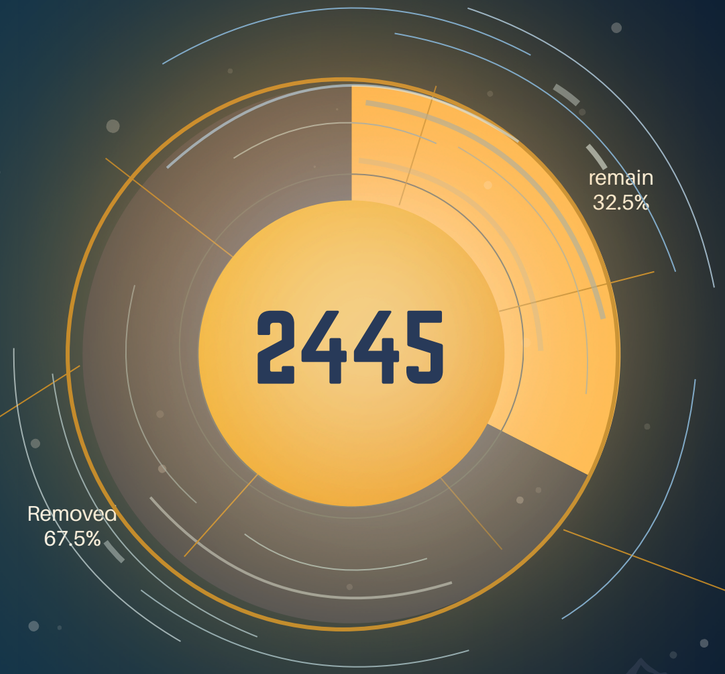
- A way to measure how Earth-like a planet is
- Score ranges from 0 to 1

Size (radius & mass)	Surface temperature
Density	Escape velocity

OUR EXOPLANETS CANDIDATES

1 STELLAR CHARACTRISTIC

- G , K, M Type stars
- Main Sequence stars
- Surface Temperature 2300-6300 K



OUR EXOPLANETS CANDIDATES

1 STELLAR CHARACTRISTIC

- G , K, M Type stars
- Main Sequence stars
- Surface Temperature 2300-6300 K

2 HABITABLE ZOON

- planets that are orbiting their stars in the optimized HZ

OUR EXOPLANETS CANDIDATES

1 STELLAR CHARACTRISTIC

- G , K, M Type stars
- Main Sequence stars
- Surface Temperature 2300-6300 K

2 HABITABLE ZOON

- planets that are orbiting their stars in the optimized HZ

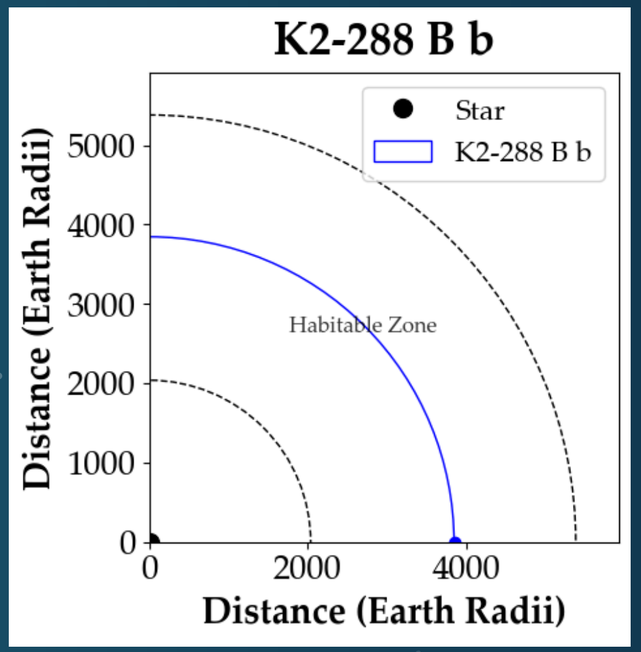
3 ROCKY PLANETS

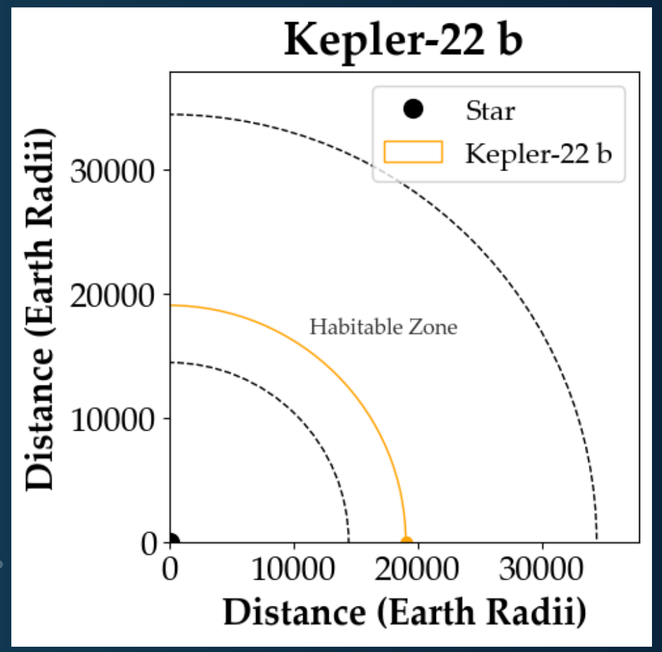
- plants with more metallic stars

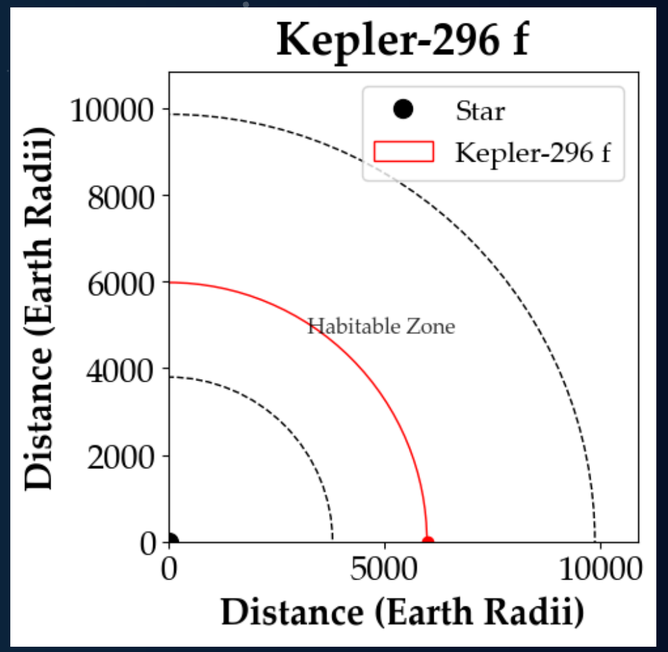
3 EARTH SIMILARITY INDEX

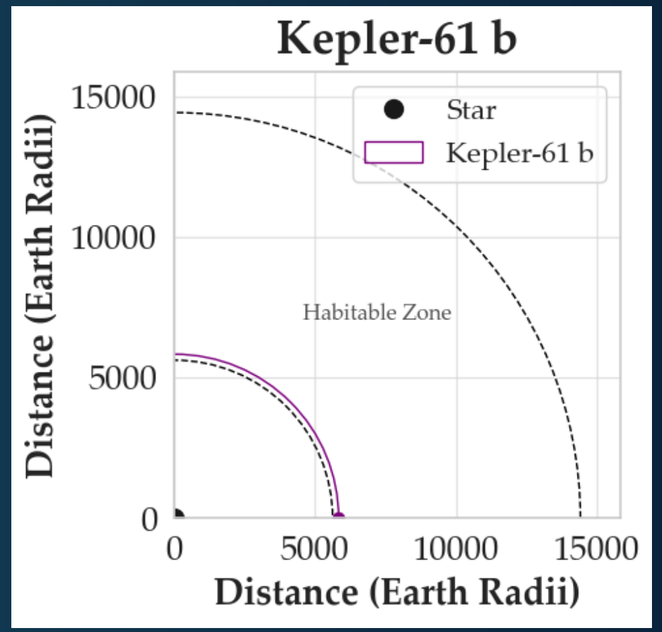
- planets with ESI more than 0.8

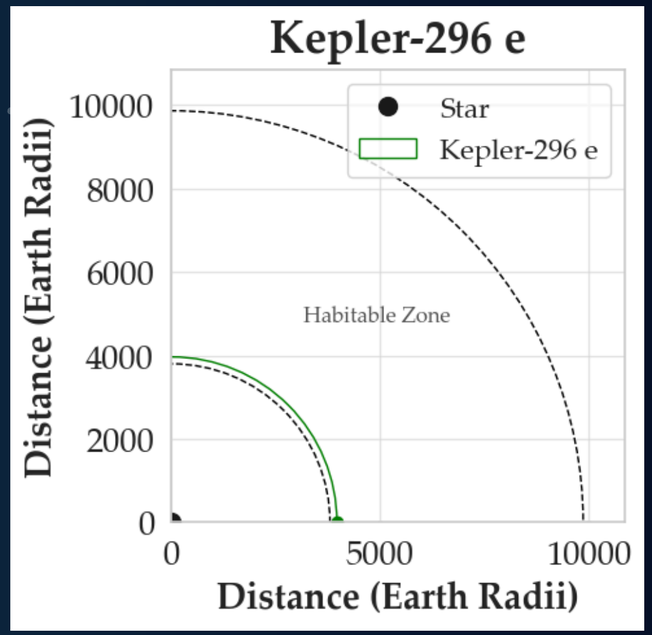
HABITABLE EXOPLANETS



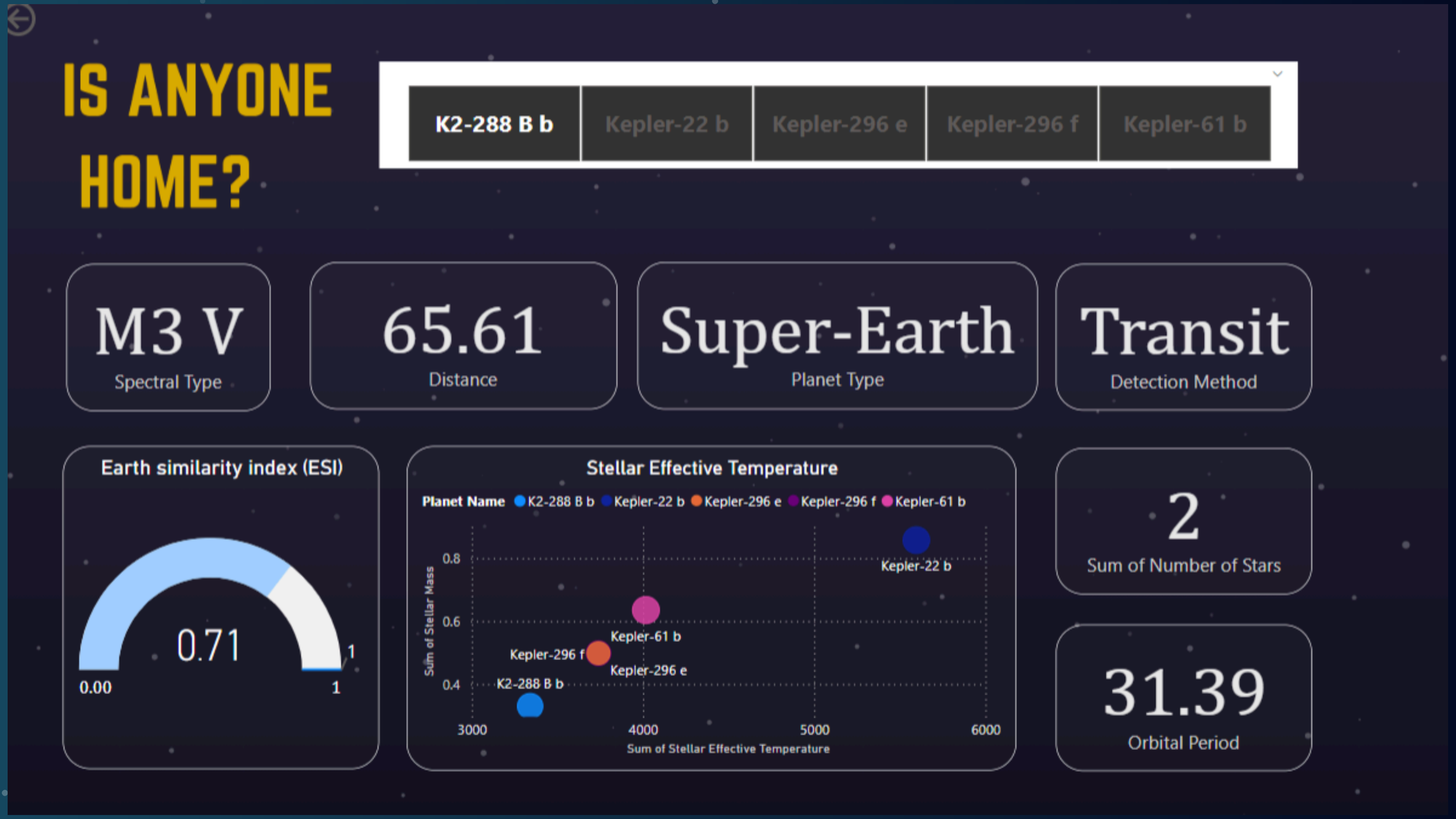




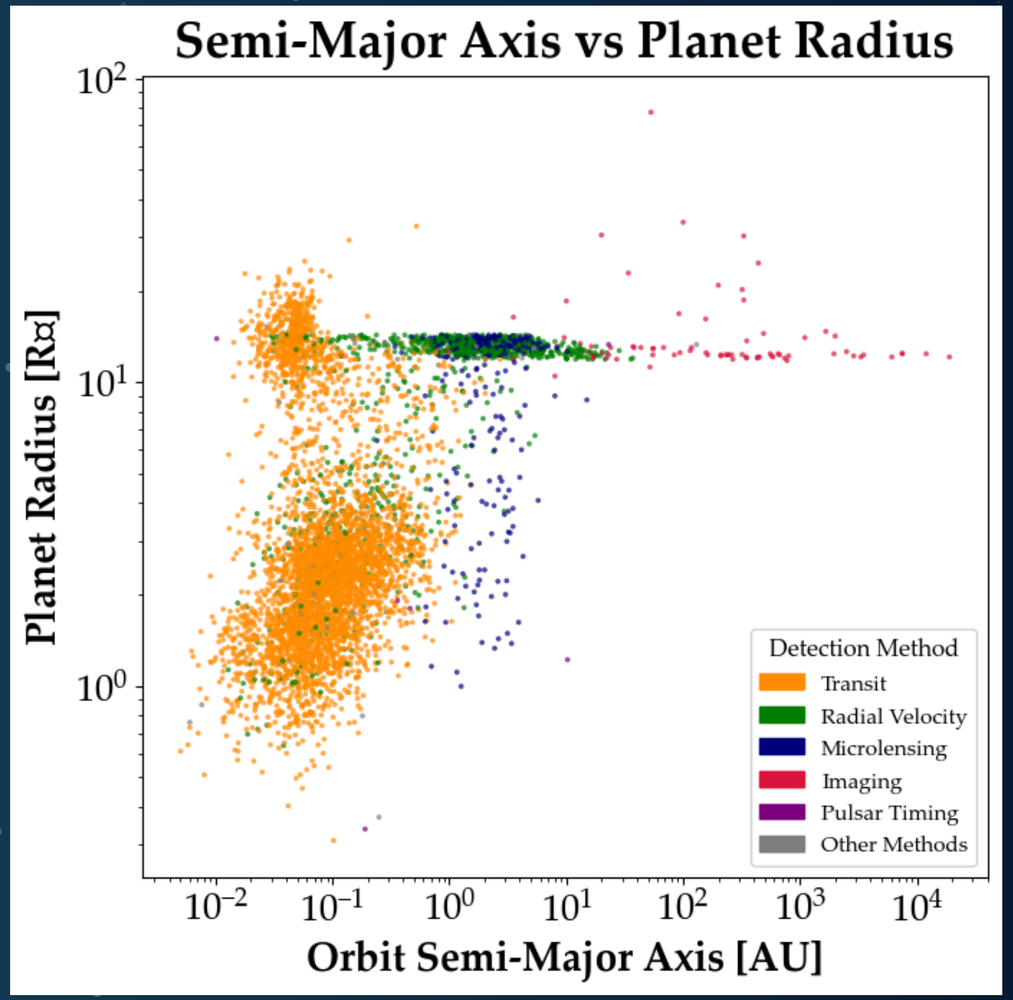




SUMMARY:


IS ANYONE HOME?
K2-288 B b
Kepler-22 b
Kepler-296 e
Kepler-296 f
Kepler-61 b
M3 V
Spectral Type
65.61
Distance
Super-Earth
Planet Type
Transit
Detection Method
Earth similarity index (ESI)
0.71
0.00
1
1
Stellar Effective Temperature
Planet Name
K2-288 B b
Kepler-22 b
Kepler-296 e
Kepler-296 f
Kepler-61 b
Sum of Stellar Mass
0.8
0.6
0.4
Kepler-22 b
Kepler-61 b
Kepler-296 f
Kepler-296 e
K2-288 B b
3000
4000
5000
6000
Sum of Stellar Effective Temperature
2
Sum of Number of Stars
31.39
Orbital Period

AN OBSERVATIONAL BAIS !



the Doppler technique is most sensitive to
massive exoplanets and/or low-mass stars on short-period orbits.

THE QUESTION IS

HABITIBLE PLANET ≠ EXTRATERRESTIAL LIFE

HABITIBLE PLANET ≠ **EXTRATERRESTIAL LIFE**

Astronomers Detect a Possible Signature of Life on a Distant Planet

Further studies are needed to determine whether K2-18b, which orbits a star 120 light-years away, is inhabited, or even habitable.

Listen to this article · 6:39 min Learn more

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