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2. *(+++++)2020-01-03-2. Amir Siraj, Abraham Loeb. *Exporting Terrestrial Life Out of the Solar System with Gravitational Slingshots of Earthgrazing Bodies.* arXiv:1910.06414 [astro-ph.EP]
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3. (+++++)2020-01-03-3. Tomonori Totani. *Emergence of life in an inflationary universe.* arXiv:1911.08092 [q-bio.PE]
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arXiv:1910.06414

International Journal of Astrobiology

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Exporting Terrestrial Life Out of the Solar System with Gravitational Slingshots of Earthgrazing Bodies

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Research Article

Cite this article: Siraj A, Loeb A (2019). Exporting Terrestrial Life Out of the Solar System with Gravitational Slingshots of Earthgrazing Bodies. Submitted to the International Journal of Astrobiology.

Received: xx xxxx xxxx
Revised: xx xxxx xxxx
Accepted: xx xxxx xxxx

Key words:
astrobiology; planets; comets; meteors

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Abstract

Exporting terrestrial life out of the Solar System requires a process that both embeds microbes in boulders and ejects those boulders out of the Solar System. We explore the possibility that Earthgrazing long-period comets and interstellar objects could export life from Earth by collecting microbes from the atmosphere and receiving a gravitational slingshot effect from the Earth. We estimate the total number of exportation events over the lifetime of the Earth to be $\sim 1-10$ for long-period comets and $\sim 1-50$ for interstellar objects. If life existed above an altitude of 100 km, then the number is dramatically increased up to $\sim 10^5$ exportation events over Earth's lifetime.

В атмосфере Земли жизнь зафиксирована до высоты 48-77 км

Либо пролетающие кометы, либо долгопериодические кометы, покидающие Солнечную систему из-за возмущений, пролетая вблизи Земли, могут быть заражены спорами бактерий - идеальные переносчики спор жизни между звездами

Результат:

Z = 20-80 км: ~50 событий за историю Солнечной системы

Z > 100 км: 10^3 - 10^5 событий за историю Солнечной системы

Замечание:

Многие или даже большинство малых тел Солнечной системы могут содержать споры бактерий в малом количестве.

Практически любое тело, покидающее Солнечную систему, может быть заражено

Оценка может быть сильно занижена.

arXiv:1911.05068

THE VANISHING & APPEARING SOURCES DURING A CENTURY OF OBSERVATIONS PROJECT: I. USNO OBJECTS MISSING IN MODERN SKY SURVEYS AND FOLLOW-UP OBSERVATIONS OF A "MISSING STAR"

Beatriz Villarroel, Johan Soodla, Sébastien Comerón, Lars Mattsson,
Kristiaan Pelckmans, Martín López-Corredoira, Kevin Krisciunas,
Eduardo Guerras, Oleg Kochukhov, Josefine Bergstedt, Bart Buelens,
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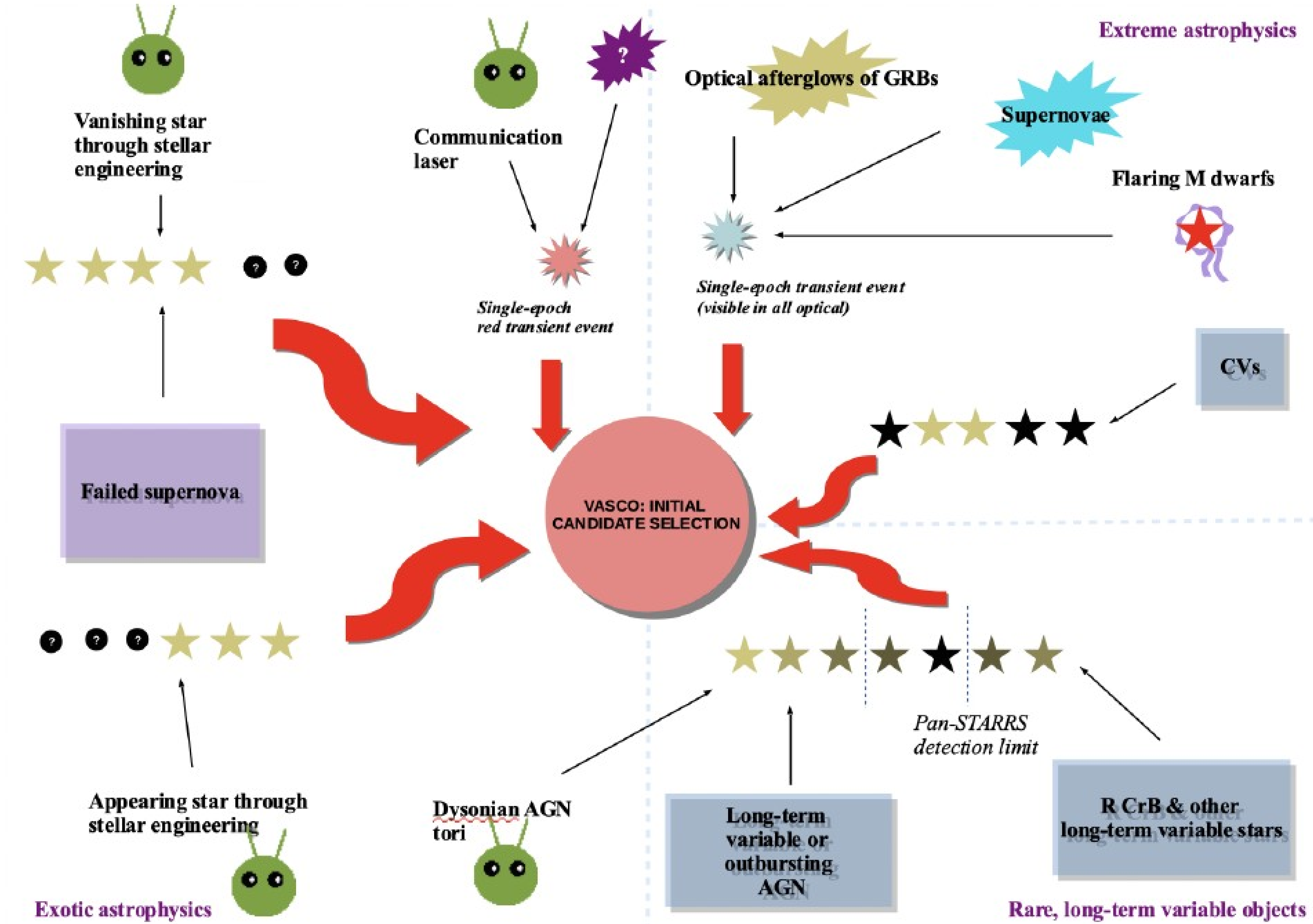
Torgny Karlsson, M. Almudena Prieto, Aleksey A. Shlyapnikov,
Rafael S. de Souza, Irina B. Vavilova, Martin J. Ward.

ABSTRACT

In this paper we report the current status of a new research program. The primary goal of the "Vanishing & Appearing Sources during a Century of Observations" (VASCO) project is to search for vanishing and appearing sources using existing survey data to find examples of exceptional astrophysical transients. The implications of finding such objects extend from traditional astrophysics fields to the more exotic searches for evidence of technologically advanced civilizations. In this first paper we present new, deeper observations of the tentative candidate discovered by Villarroel et al. (2016). We then perform the first searches for vanishing objects throughout the sky by comparing 600 million objects from the US Naval Observatory Catalogue (USNO) B1.0 down to a limiting magnitude of $\sim 20 - 21$ with the recent Pan-STARRS Data Release-1 (DR1) with a limiting magnitude of ~ 23.4. We find about 150,000 preliminary candidates that do not have any Pan-STARRS counterpart within a 30 arcsec radius. We show that these objects are redder and have larger proper motions than typical USNO objects. We visually examine the images for a subset of about 24,000 candidates, superseding the 2016 study with a sample ten times larger. We find about ~ 100 point sources visible in only one epoch in the red band of the USNO which may be of interest in searches for strong M dwarf flares, high-redshift supernovae or other catagories of unidentified red transients.

Subject headings: transient — extraterrestrial intelligence — surveys


Extreme astrophysics
Vanishing star through stellar engineering
Communication laser
?
Optical afterglows of GRBs
Supernovae
Flaring M dwarfs
Single-epoch red transient event
Single-epoch transient event (visible in all optical)
CVs
Failed supernova
VASCO: INITIAL CANDIDATE SELECTION
Pan-STARRS detection limit
Appearing star through stellar engineering
Dysonian AGN tori
Long-term variable or outbursting AGN
R CrB & other long-term variable stars
Exotic astrophysics
Rare, long-term variable objects

arXiv:1910.09871

Stellar Proton Event-induced surface radiation dose as a constraint on the habitability of terrestrial exoplanets

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Accepted XXX. Received YYY; in original form ZZZ

ABSTRACT
The discovery of terrestrial exoplanets orbiting in habitable zones around nearby stars has been one of the significant developments in modern astronomy. More than a dozen such planets, like Proxima Centauri b and TRAPPIST-1 e, are in close-in configurations and their proximity to the host star makes them highly sensitive to stellar activity. Episodic events such as flares have the potential to cause severe damage to close-in planets, adversely impacting their habitability. Flares on fast rotating young M stars occur up to 100 times more frequently than on G-type stars which makes their planets even more susceptible to stellar activity. Stellar Energetic Particles (SEPs) emanating from Stellar Proton Events (SPEs) cause atmospheric damage (erosion and photochemical changes), and produce secondary particles, which in turn results in enhanced radiation dosage on planetary surfaces. We explore the role of SPEs and planetary factors in determining planetary surface radiation doses. These factors include SPE fluence and spectra, and planetary column density and magnetic field strength. Taking particle spectra from 70 major solar events (observed between 1956 and 2012) as proxy, we use the GEANT4 Monte Carlo model to simulate SPE interactions with exoplanetary atmospheres, and we compute surface radiation dose. We demonstrate that in addition to fluence, SPE spectrum is also a crucial factor in determining the surface radiation dose. We discuss the implications of these findings in constraining the habitability of terrestrial exoplanets.

Table 5. Radiation dose (Gy) on potentially habitable planets for a hard spectrum event (24 August 1998) with 10^{11} protons cm^{-2} fluence and no magnetic field. Atmospheric depth varies between 30 and 1000 g cm^{-2}.

	d (AU)	30	100	300	1000
TRAPPIST-1 e	0.028	2.22E+01	1.47E+01	3.67E+00	1.15E-02
TRAPPIST-1 f	0.037	1.28E+01	8.47E+00	2.12E+00	6.66E-03
TRAPPIST-1 g	0.045	8.67E+00	5.73E+00	1.43E+00	4.50E-03
Proxima Cen b	0.049	7.50E+00	4.96E+00	1.24E+00	3.89E-03
GJ 667 C f	0.156	7.25E-01	4.79E-01	1.20E-01	3.76E-04
GJ 667 C e	0.213	3.89E-01	2.57E-01	6.42E-02	2.02E-04
Kepler-1229 b	0.301	1.95E-01	1.29E-01	3.22E-02	1.01E-04
Kepler-442 b	0.409	1.05E-01	6.97E-02	1.74E-02	5.48E-05
Kepler-186 f	0.432	9.45E-02	6.25E-02	1.56E-02	4.91E-05
Kepler-62 f	0.718	3.42E-02	2.26E-02	5.65E-03	1.78E-05

Доза радиации для атмосфер земного типа мала для вспышек, аналогичных самым сильным известным солнечным вспышкам (при гораздо меньшем расстоянии до планеты)

arXiv:1911.05597

Annual Review of Astronomy and Astrophysics

HOW TO CHARACTERIZE HABITABLE WORLDS AND SIGNS OF LIFE

Lisa Kaltenegger
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Published in Annual Review of Astronomy and Astrophysics 2017. 55:433–85
https://doi.org/10.1146/annurev-astro-082214-122238

KEYWORDS: Earth, exoplanets, habitability, habitable zone, search for life

ABSTRACT

The detection of exoplanets orbiting other stars has revolutionized our view of the cosmos. First results suggest that it is teeming with a fascinating diversity of rocky planets, including those in the habitable zone. Even our closest star, Proxima Centauri, harbors a small planet in its habitable zone, Proxima b. With the next generation of telescopes, we will be able to peer into the atmospheres of rocky planets and get a glimpse into other worlds. Using our own planet and its wide range of biota as a Rosetta stone, we explore how we could detect habitability and signs of life on exoplanets over interstellar distances. Current telescopes are not yet powerful enough to characterize habitable exoplanets, but the next generation of telescopes that is already being built will have the capabilities to characterize close-by habitable worlds. The discussion on what makes a planet a habitat and how to detect signs of life is lively. This review will show the latest results, the challenges of how to identify and characterize such habitable worlds, and how near-future telescopes will revolutionize the field. For the first time in human history, we have developed the technology to detect potential habitable worlds. Finding thousands of exoplanets has taken the field of comparative planetology beyond the Solar System.

Contents

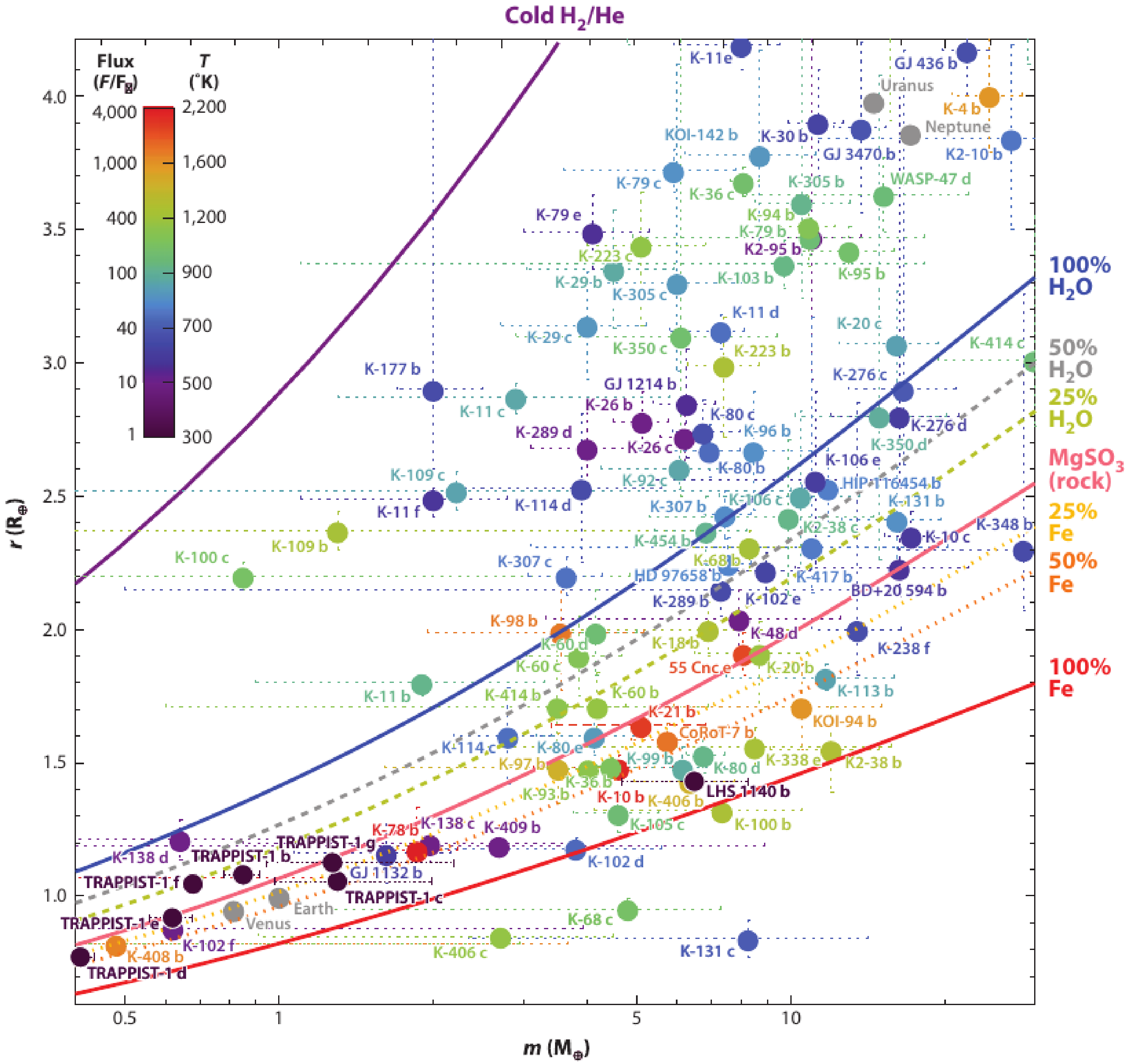
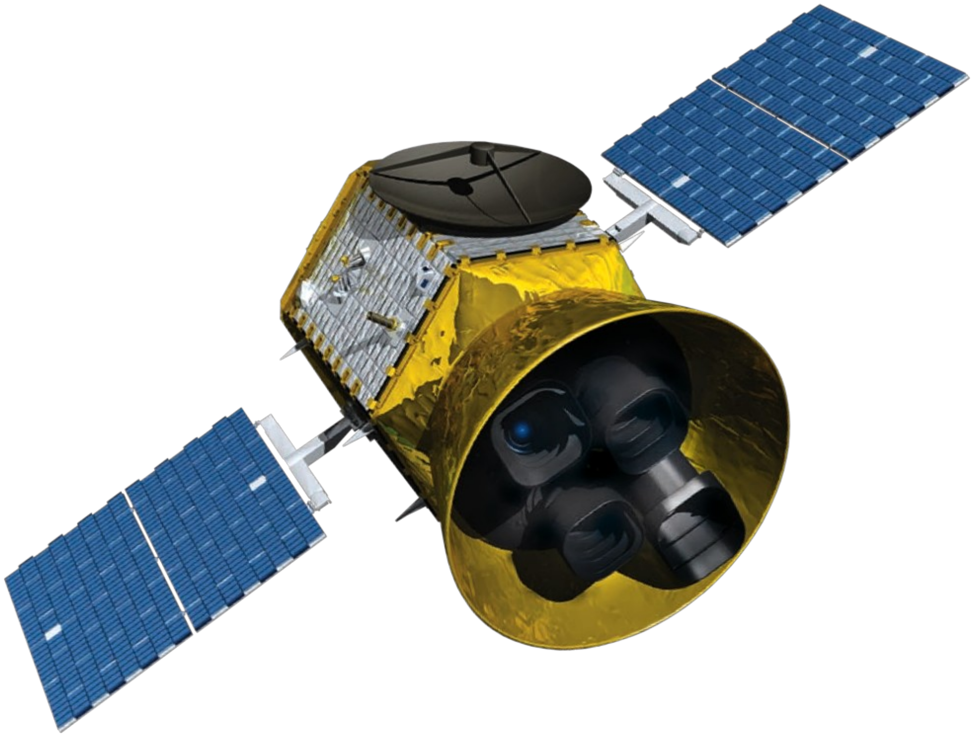


Figure 1 Mass-radius curves of planets with radii below 4 Earth radii and masses below 30 Earth masses. Planets are color-coded by the stellar flux they receive (compared with Earth). Hypothetical temperatures for the planets are included to add a common physical entity to the diagram and are calculated from the stellar flux received by the planets, assuming a bond albedo of 0, perfect heat redistribution, and no greenhouse effect (e.g., this is a fair estimate for Earth's average surface temperature but not for Venus). Data are from http://www.exoplanet.eu (accessed February 2017) and models following Zeng et al. (2016). Figure courtesy of L. Zeng.

TESS



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arXiv:2001.00952, arXiv:2001.00954, arXiv:2001.00955

The First Habitable Zone Earth-sized Planet from TESS. I: Validation of the TOI-700 System

The First Habitable Zone Earth-Sized Planet From *TESS* II: *Spitzer* Confirms TOI-700 d

The First Habitable Zone Earth-sized Planet from TESS. III: Climate States and Characterization Prospects for TOI-700 d

Emily A. Gilbert,[1,2,3,4] Thomas Barclay,[3,5] Joshua E. Schlieder,[3] Elisa V. Quintana,[3] Benjamin J. Hord,[6,3] Veselin B. Kostov,[3] Eric D. Lopez,[3] Jason F. Rowe,[7] Kelsey Hoffman,[8] Lucianne M. Walkowicz,[2] Michele L. Silverstein,[3] Joseph E. Rodriguez,[9] Andrew Vanderburg,[10,*] Gabrielle Suissa,[3,4,11] Vladimir S. Airapetian,[3,4] Matthew S. Clement,[12] Sean N. Raymond,[13] Andrew W. Mann,[14] Ethan Kruse,[3] Jack J. Lissauer,[15] Knicole D. Colón,[3] Ravi kumar Kopparapu,[3,4] Laura Kreidberg,[9] Sebastian Zieba,[16] Karen A. Collins,[9] Samuel N. Quinn,[9] Steve B. Howell,[15] Carl Ziegler,[17] Eliot Halley Vrijmoet,[18,19] Fred C. Adams,[20] Giada N. Arney,[3,21] Patricia T. Boyd,[3] Jonathan Brande,[3,6,4] Christopher J. Burke,[22] Luca Cacciapuoti,[23] Quadry Chance,[24] Jessie L. Christiansen,[25] Giovanni Covone,[23] Tansu Daylan,[26,†] Danielle Dineen,[7] Courtney D. Dressing,[27] Zahra Essack,[28,29] Thomas J. Fauchez,[11,4] Brianna Galgano,[30] Alex R. Howe,[3] Lisa Kaltenegger,[31] Stephen R. Kane,[32] Christopher Lam,[3] Eve J. Lee,[33] Nikole K. Lewis,[31] Sarah E. Logsdon,[34] Avi M. Mandell,[3,4] Teresa Monsue,[3] Fergal Mullally,[8] Susan E. Mullally,[35] Rishi Paudel,[3,5] Daria Pidhorodetska,[3] Peter Plavchan,[36] Naylynn Tañón Reyes,[3,37] Stephen A. Rinehart,[3] Bárbara Rojas-Ayala,[38] Jeffrey C. Smith,[8,15] Keivan G. Stassun,[39,40] Peter Tenenbaum,[8,15] Laura D. Vega,[3,39] Geronimo L. Villanueva,[3,4] Eric T. Wolf,[41,4] Allison Youngblood,[42] George R. Ricker,[26] Roland K. Vanderspek,[43] David W. Latham,[9] Sara Seager,[43,28,44] Joshua N. Winn,[45] Jon M. Jenkins,[15] Gáspár Á. Bakos,[46,47,‡] César Briceño,[48] David R. Ciardi,[49] Ryan Cloutier,[9] Dennis M. Conti,[50] Andrew Couperus,[18,19] Mario Di Sora,[51] Nora L. Eisner,[52] Mark E. Everett,[34] Tianjun Gan,[53] Joel D. Hartman,[46] Todd Henry,[19] Giovanni Isopi,[51] Wei-Chun Jao,[18] Eric L. N. Jensen,[54] Nicholas Law,[14] Franco Mallia,[51] Rachel A. Matson,[15] Benjamin J. Shappee,[55] Mackenna Lee Wood,[14] and Jennifer G. Winters[9]

ABSTRACT

We present the discovery and validation of a three-planet system orbiting the nearby (31.1 pc) M2 dwarf star TOI-700 (TIC 150428135). TOI-700 lies in the TESS continuous viewing zone in the Southern Ecliptic Hemisphere; observations spanning 11 sectors reveal three planets with radii ranging from 1 $R_\oplus$ to 2.6 $R_\oplus$ and orbital periods ranging from 9.98 to 37.43 days. Ground-based follow-up combined with diagnostic vetting and validation tests enable us to rule out common astrophysical false-positive scenarios and validate the system of planets. The outermost planet, TOI-700 d, has a radius of 1.19 ± 0.11 $R_\oplus$ and resides in the conservative habitable zone of its host star, where it receives a flux from its star that is approximately 86% of the Earth's insolation. In contrast to some other low-mass stars that host Earth-sized planets in their habitable zones, TOI-700 exhibits low levels of stellar activity, presenting a valuable opportunity to study potentially-rocky planets over a wide range of conditions affecting atmospheric escape. While atmospheric characterization of TOI-700 d with the James Webb Space Telescope (JWST) will be challenging, the larger sub-Neptune, TOI-700 c (R = 2.63 $R_\oplus$), will be an excellent target for JWST and beyond. TESS is scheduled to return to the Southern Hemisphere and observe TOI-700 for an additional 11 sectors in its extended mission, which should provide further constraints on the known planet parameters and searches for additional planets and transit timing variations in the system.

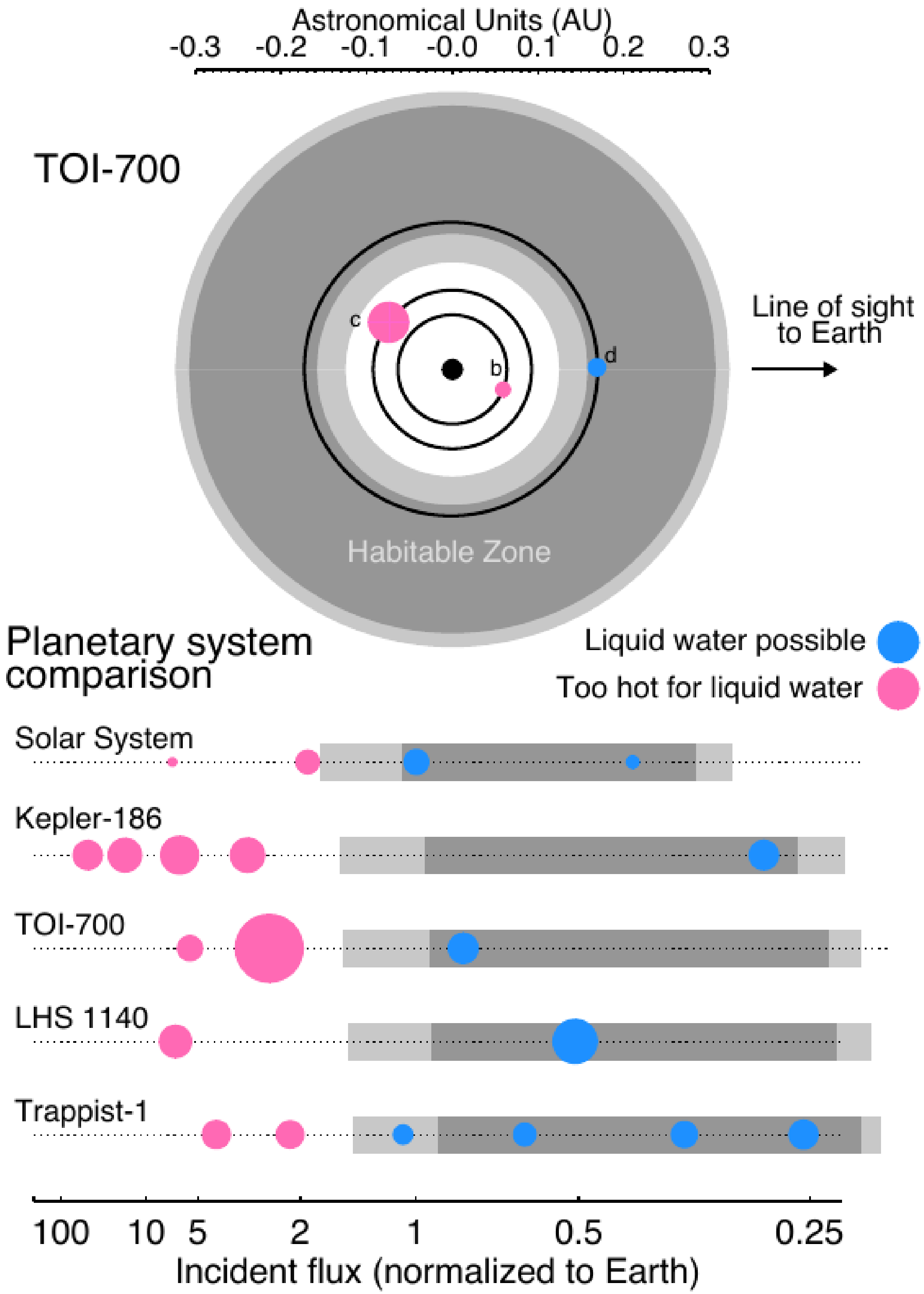

Figure 14. A top-down view of the orbits of the TOI-700 planets (upper panel). The relative sizes of the planets are to scale, but are not on the same scale as the orbits. The conservative habitable zone is shown in dark gray, and the optimistic habitable zone in light gray (Kopparapu et al. 2013). We also compare the TOI-700 system to the Solar System and other benchmark exoplanet systems with small habitable-zone planets (lower panel).

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https://elementy.ru/novosti_nauki/433596

Кристина Уласович

arXiv:2001.04634

Unsupervised Distribution Learning for Lunar Surface Anomaly Detection

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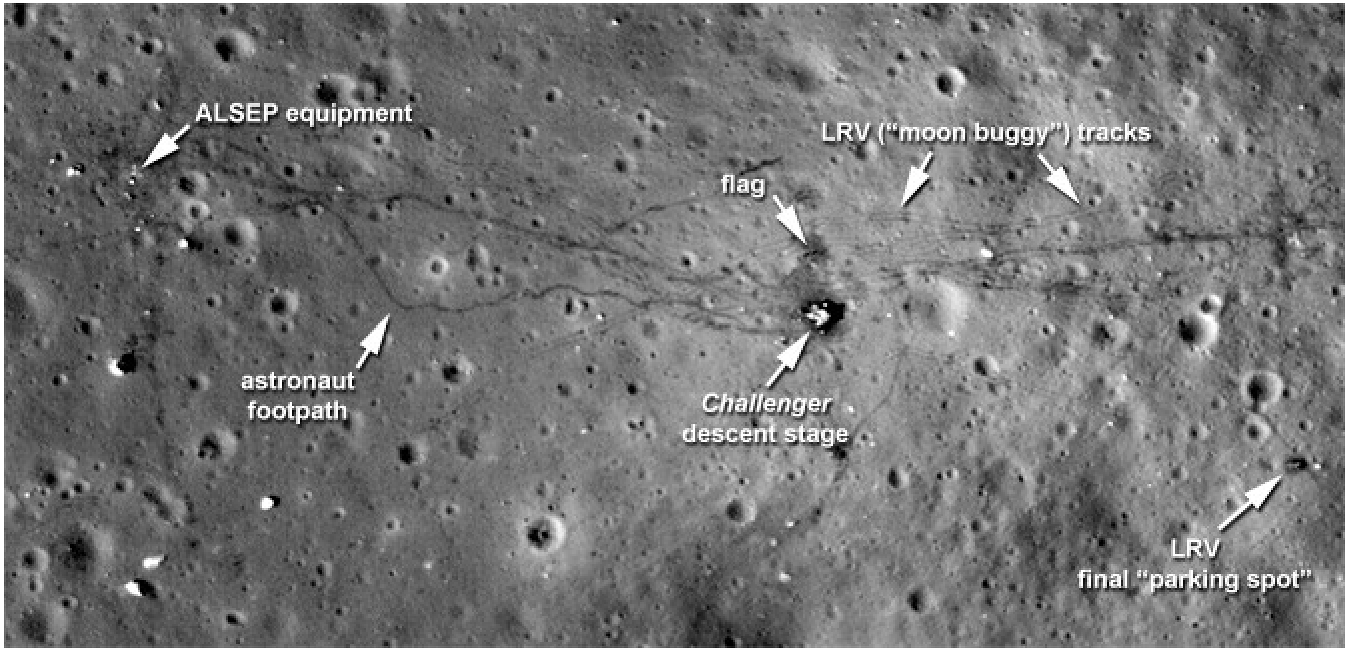

2.4 Software, Hardware

We used PyTorch for training, JupyterLab with Python to coordinate the experiments, and the seaborn statistical visualization python package to view and plot results. We used an NVIDIA GeForce GTX 1070 and Intel Core i7 system with 512 GB SSD for training and validation.

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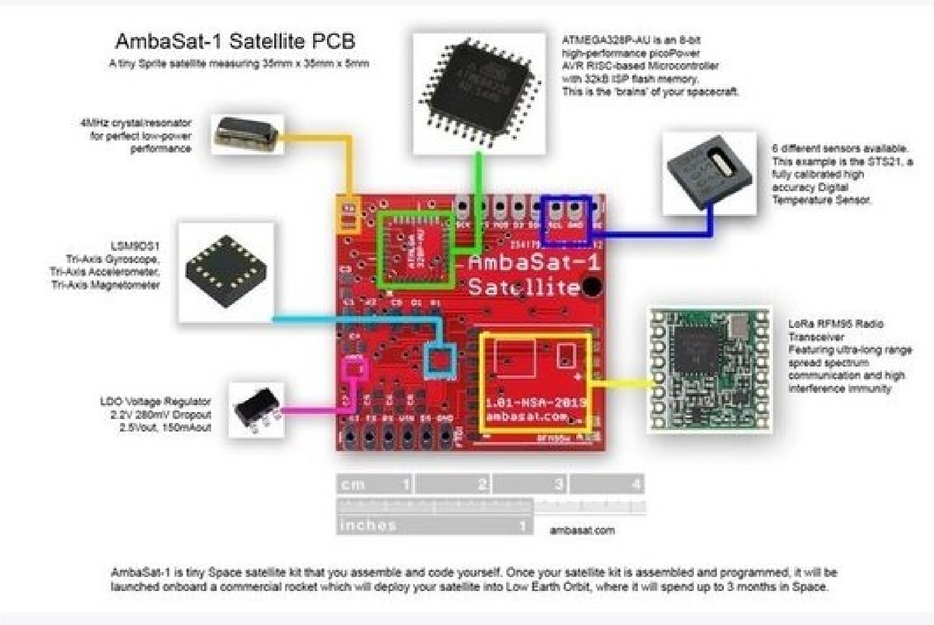

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