MNRAS **000**, 1–3 (01-04-2024) Version: 1 April 2024 Compiled using MNRAS LATEX style file v3.0

On Bio-Signatures in Sunspot Activity

Dr. Rayo del Sol,[1] and Dr. Kin G. Helios[1] and Dr. Moe Skeeto[2] and Dr. Stella del Ray[3]
[1]*Department of Science, Canary University, Canary Islands, Spain*
[2]*Tire with some water in it, parkinglot behind the shop, Germany*
[3]*Playa del Mosquito, Costa del Sol, BZZZ, Spain*

Accepted 1 April, 2024. Received 1 April 2024

ABSTRACT

Sunspots, cooler regions on the solar surface, have historically been overlooked in searches for extraterrestrial life, despite speculative assertions regarding their habitability. This study broadens astrobiological exploration by investigating sunspots as potential habitats for complex life forms. Utilizing observations from the Swedish 1-m Solar Telescope of sunspot NOAA 13433, we introduce the detection of "giant space mosquitoes" (GSMs), challenging conventional astrobiological perspectives, while comparing their size and behavior to smaller Earth mosquitoes. We also tie this discovery to the extinction of the dinosaurs, and make several other ad-hoc assumptions. This discovery suggests life may thrive in extreme conditions of stellar environments, necessitating a reevaluation of habitable zone criteria and underscoring the importance of including stellar phenomena in the search for extraterrestrial life.

Key words: Sun – Mosquitoes – Extraterrestrial Life

1 INTRODUCTION

The prospect of extraterrestrial life has captivated humanity for millennia, as evidenced by both ancient literary works (of Samosata 200; Huygens 1698) and modern scientific endeavors (Scott 1979; Sagan 1985; Villeneuve 2016). Numerous space missions and astrophysical studies have been specifically designed to probe for signs of life beyond Earth (e.g. Cocconi & Morrison 1959). However, despite many potential signs of extraterrestrial life being reported, such as the infamous Wow! Signal (Ehman 1977), countless UFO videos, and the conjectures surrounding phosphine gas on Venus (Greaves et al. 2020), conclusive evidence has so far not been found. While many are just disappointed, and others call it a paradox (Webb 2015), there is also the possibility that this lack of biosignatures is caused by something called the 'Great Filter' (Hanson 1998).

However, it must be noted that the majority of these investigations have concentrated on planetary bodies, which in fact are only in very rare instances known to harbor life (Luger et al. 2019). When dividing all planets known to harbor life, with the over 5500 confirmed planets (Barth et al. 2024), we find a 'life fraction' of 0.0002%. This number is comparable with the life fraction of stars (like our Sun), which have so far been completely overlooked as potential habitats for life. This oversight persists even though habitability for mammals was tested and confirmed nearly decades ago (Pursel & Feiss 1997), although simulations of manned missions have shown that this is not an easy task Squad (2015).

While stellar surfaces are a much dryer and hotter environment than that of the Earth, they are not completely devoid of water (Wallace et al. 1995) and shade (Wilson & Maskelyne 1774) as both can be found in the crater-like formations of sunspots. While the Sun has rapidly evolving spots, as well as an activity cycle that could leave solar life without shelter for extended periods of time, we believe that they may seek shelter in the relatively cooler solar interior (Kaiser 1847).

In the present study, we broaden the paradigm of astrobiological exploration by extending the search for extraterrestrial life to include the solar environment. Our investigation is motivated by the hypothesis that sunspots, due to their relatively cooler temperatures and unique physical characteristics, could serve as sanctuaries for life forms radically similar to those on Earth, just bigger. Herein, we introduce the initial high-confidence detection of entities referred to as *giant space mosquitos* (GSMs), posited to inhabit these solar structures.

2 OBSERVATIONS

The observations are of a sunspot designated NOAA 13433 $(x, y) = (684", 384")$, which were taken on the 21st of September, 2023 at 19:04 LHST with the Swedish 1-m Solar Telescope (Scharmer et al. 2003). The observation was taken in Fe I 6173 Å red line wing with a plate scheme of $0.058''$ pixel^{-1}, and circular a field of view (FOV) with a 30" radius. The data were not reduced beyond taking out the flats because this result was too important to wait for such trivial things. However, we did add an image of the Earth for scale, as a banana was too small to resolve on such a figure. Plus a banana could attract terrestrial insect-like creatures as well, compromising our objective measurements.

3 RESULTS

In this section, we present the results of our study based on the observations and existing literature. We focus especially on Fig. 1, which shows a sunspot as well as a transient mosquito-like structure

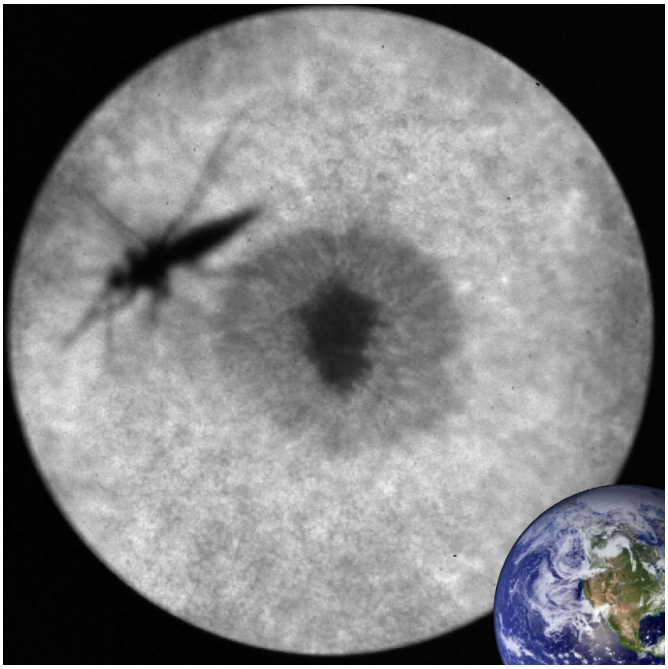

Figure 1. Giant space mosquito flying over NOAA 13433. The Earth has been included as a size comparison to show how big this thing is... damn.

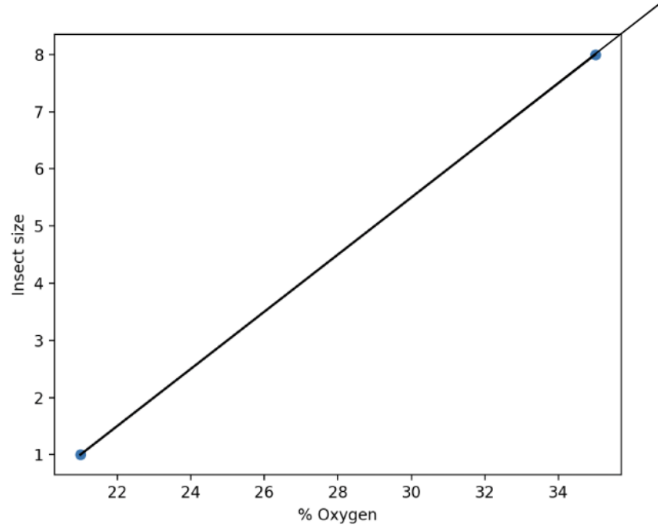

Figure 2. Best fit model of correlation between insect size and oxygen percentage. We extrapolate this relation to solar conditions.

which was visible along 3 frames each taken 70 ms apart. Each aspect of the GSM will be discussed in its own subheading.

Velocity

Given the size of the FOV, and the time during the apparition of this GSM, we can approximate the velocity at which the GSM is moving with math. Doing so with a variation on the methodology described in Tai (1994) suggests that it is moving with an approximate velocity of $1.8 \times 10^5\ km/s$, or 60% of the speed of light. Which is much faster than other solar structures (e.g. Kuridze et al. 2011), as well as typical Earth mosquito velocities (Shishika & Paley 2019).

Composition

Since this observation is taken in the Fe I 6173 Å line, and a strong absorption feature is measured at the location of the creature, we could assume that it has a high iron abundance. However, it is also possible that its density is much larger than that of the solar atmosphere (Fontenla et al. 2009). The latter has been found on Earth, where humans have a density close to that of water (Heymsfield et al. 1989), and a spherical mosquito (in vacuum) is estimated to have a density of 10 g/L. While this is much less than the density of a human, it is still a million times higher than that of the solar atmosphere. Additionally, if it was made out of iron, it would likely melt, as the melting point of iron is far below that of the solar surface, while the melting point of mosquitoes is currently not known. (ERC grant in prep.)

Size

The size of the structure is measured in pixels and then converted to km, which results in a length of about $1.18 \times 10^6\ km$, or 93% of the Earth's diameter. This is roughly 120 billion times larger than a typical Earth mosquito (Attaullah et al. 2023). A possible reason for this is the much lower pressure on the Sun, which helped expand the creatures much like balloons expand when they reach the higher layers of the less dense Earth atmosphere. It is also possible that the much higher amount of oxygen allows mosquitoes to grow to larger sizes.

During the Carboniferous period (358.9 -298.9 million years ago) the percentage of oxygen in the Earth's atmosphere grew to be as high as 35% of the atmospheric composition (Beerling & Berner 2000), versus the 21% that it is now. This mere 14% increase in oxygen allowed insects to be 8 times larger than they are today.

The Sun contains 98% of the oxygen in the solar system (Davis et al. 2008), which is three billion times more than what is currently found on the Earth (Verniani 1966; Pietrow et al. 2023). If we extrapolate the above relation (see Fig. 2, then such an increase in oxygen would equate to an increase in size of around 1.7 billion times. Assuming a typical mosquito size of 1 cm, this means that mosquitos on the Sun can become up to 1.25 times the size of the Earth. This is within 8% of the measured size of our mosquito. Thus, we can safely conclude, based on our measurements, that this specific mosquito was approaching adulthood at the time of observations.

The increased temperature and reduced humidity of the solar atmosphere should not affect mosquito habitability, given that Morales Vargas et al. (2010) found no correlation between mosquito sizes and these two parameters. However, Honěk & Honek (1993) showed a linear relation between mosquito mass and its fertility, while Petersen et al. (2016) found a linear relation between mosquito size and the height at which it can fly, as well as their lifespan. This suggests that perhaps this hyper-fertile ancient mosquito is responsible for the increase in mosquitoes during the summer, which is when the Sun is higher in the sky, and thus the chance for the smaller offspring becomes bigger due to the increased angle from the solar surface towards that of the Earth.

Another, perhaps more worrying conclusion is that this mosquito grew to its current size while on the Earth, and then flew up to the Sun at some point in time. The increased lifespan and maximal altitude that it can reach make it plausible that it was around during the end of the Cretaceous Period (65 million years ago), and perhaps is singularly responsible for the extinction of the dinosaurs. The fact that until now only dinosaur bones have been found, but no blood whatsoever does support this theory.

4 DISCUSSION AND CONCLUSIONS

We report the sighting of a giant space mosquito on the Sun (See Fig. 1) that is roughly the size of our planet and flies around at 60% of the speed of light. While it shows strong absorption in the Fe I 6173 Åline, we believe that this does not mean that it is a spaceship like Oumuamua, but rather a comparatively very dense massive insect. Primarily because of its movement, but also because iron has a melting point far below the average temperature of the photosphere.

This discovery challenges conventional astrobiological perspectives by suggesting that life may not be confined to planetary or lunar surfaces but could also thrive in the extreme conditions of stellar environments. Especially in and around sunspots where lower temperatures, an abundance of water, and the relative safety of the penumbral walls shield its inhabitants from harmful solar radiation. A distinction should be made here with respect to the terrestrial mosquitoes. While the latter are drawn by bright artificial light at summer nights, the giant solar mosquitoes are in fact drawn by the shades of sunspots, demonstrating in action how diverse evolutionary mechanisms can be developed to facilitate their adjustment to adverse habitats.

It not clear if this animal evolved to look suspiciously similar to Earth mosquitoes, or if an especially large specimen simply flew to the Sun and adapted to its new environment there. If the latter case is true, then it is impossible that this giant mosquito is responsible for killing the dinosaurs, similar to the simulation with much smaller GSMs ran by (Jones 1995). We hope that the gravity of the Sun is enough to keep it where it is, but further studies are required to confirm this. Given that mosquitoes are disease vectors in many places, we urge for the development of space borne mosquito nets, or perhaps a new variation on the Dyson sphere, where a mosquito net is wrapped around the Sun.

This revelation not only necessitates a reevaluation of the criteria for habitable zones within the cosmos but also suggests that mosquitoes are in fact invasive aliens on our planet that come from a hyper-fertile and long-lived 'brood mother' that lives on the Sun, and fall down to Earth during the summer months. On the other hand, if we could capture this mosquito and utilize its flying speed to get around the universe, that would be a very cool premise for a sci-fi movie. Think Star Trek, but with mosquitoes that carry around human-made structures on their backs[1].

Acknowledgements

We thank Alex Pietrow, Ioannis Kontogiannis, Nikki Zabel, and Dominique Petit for no particular reason.

We thank Roman Emperor Lucius Aprilis the First for the creation of both the month and the holiday celebrated on its first day. Damn it, now I'm thinking of the Roman empire again.

This work was made possible by us really needing a break, but not being able to actually go on a walk and instead writing about that one weird frame that we got during an observing run.

[1] If you are from Hollywood and would like to steal this idea, please do so!

This paper has been typeset from a TEX/LATEX file prepared by the author.

REFERENCES

Attaullah M., et al., 2023, Brazilian Journal of Biology, 83
Barth P., Stüeken E. E., Helling C., Schwieterman E. W., Telling J., 2024, arXiv e-prints, p. arXiv:2402.13682
Beerling D. J., Berner R. A., 2000, Proceedings of the National Academy of Sciences, 97, 12428–12432
Cocconi G., Morrison P., 1959, Nature, 184, 844
Davis A. M., Hashizume K., Chaussidon M., Ireland T. R., Prieto C. A., Lambert D. L., 2008, Reviews in Mineralogy and Geochemistry, 68, 73–92
Ehman J., 1977, The "WOW!" Signal, Ohio State University's Big Ear Radio Telescope
Fontenla J. M., Curdt W., Haberreiter M., Harder J., Tian H., 2009, ApJ, 707, 482
Greaves J. S., et al., 2020, Nature Astronomy, 5, 655–664
Hanson R., 1998, The Great Filter - Are We Almost Past It?, Some Website
Heymsfield S. B., Wang J., Kehayias J., Heshka S., Lichtman S., Pierson R. N., 1989, The American Journal of Clinical Nutrition, 50, 1282–1289
Honěk A., Honek A., 1993, Oikos, 66, 483
Huygens C., 1698, Cosmotheoros. Adriaan Moetjens, The Hague
Jones G., 1995, Mosquito, Film
Kaiser F., 1847, De sterrenhemel. C.G. Sulpke, https://books.google.de/books?id=FZBy0AEACAAJ
Kuridze D., Mathioudakis M., Jess D. B., Shelyag S., Christian D. J., Keenan F. P., Balasubramaniam K. S., 2011, A&A, 533, A76
Luger R., Bedell M., Vanderspek R., Burke C. J., 2019, arXiv e-prints, p. arXiv:1903.12182
Morales Vargas R. E., Ya-umphan P., Phumala-Morales N., Komalamisra N., Dujardin J.-P., 2010, Infection, Genetics and Evolution, 10, 580–585
Petersen V., Marchi M. J., Natal D., Marrelli M. T., Barbosa A. C., Suesdek L., 2016, Revista da Sociedade Brasileira de Medicina Tropical, 49, 508–511
Pietrow A. G. M., Hoppe R., Bergemann M., Calvo F., 2023, A&A, 672, L6
Pursel R., Feiss D., 1997, I.R. on Sun, Episode 2 in "I Am Weasel"
Sagan C., 1985, Contact. Simon and Schuster, United States
Scharmer G. B., Bjelksjo K., Korhonen T. K., Lindberg B., Petterson B., 2003, in Keil S. L., Avakyan S. V., eds, Proc. SPIE Vol. 4853, Innovative Telescopes and Instrumentation for Solar Astrophysics. pp 341–350, doi:10.1117/12.460377
Scott R., 1979, Alien, https://www.imdb.com/title/tt0078748/
Shishika D., Paley D. A., 2019, Autonomous Robots, 43, 1781–1799
Squad 2015, Kerbal Space Program, Video Game
Tai M. M., 1994, Diabetes Care, 17, 152–154
Verniani F., 1966, J. Geophys. Res., 71, 385
Villeneuve D., 2016, Arrival, https://www.imdb.com/title/tt2543164/
Wallace L., Bernath P., Livingston W., Hinkle K., Busler J., Guo B., Zhang K., 1995, Science, 268, 1155–1158
Webb S., 2015, If the Universe Is Teeming with Aliens ... WHERE IS EVERYBODY?: Seventy-Five Solutions to the Fermi Paradox and the Problem of Extraterrestrial Life. Science and Fiction, Springer International Publishing, https://books.google.de/books?id=Y111CQAAQBAJ
Wilson A., Maskelyne N., 1774, Philosophical Transactions, 64, 1
of Samosata L., 200, A True Story. Unknown, Unknown, https://www.google.co.in/books/edition/Lucian_s_True_History/1HENAAAAYAAJ?hl=en&gbpv=1&printsec=frontcover