

Homework 8

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1 Abstract Exercise

Ongoing and future space missions aim to identify potentially habitable planets in our Solar System and beyond. Planetary habitability is determined not only by a planet's current stellar insolation and atmospheric properties, but also by its climate transition. It has been suggested that icy planets and moons become habitable after their initial ice shield melts as their host stars brighten. Here we show using XX Method that icy world can shift from snowball to moist and runaway greenhouse abruptly. Additionally, we use a theoretical model to explain this transition and get self-consistent results. Specifically, we find that the water content of this icy world is suitable for humans after the transition. These results suggest a new range of habitable planets.

2 Title Analysis

Title 1 Physics of self-rolling viruses[2]

Title 2 Self-Organized Lane Formation in Bidirectional Transport by Molecular Motors[1]

Title 3 Optimality in Self-Organized Molecular Sorting[4]

Title 4 Motility and self-organization of gliding Chlamydomonas populations[3]

Number of title	number of words	acronym	semicolon or colon
1	4	No	No
2	9	No	No
3	5	No	No
4	7	No	No

References

- [1] JOSE, R., AND SANTEN, L. Self-organized lane formation in bidirectional transport by molecular motors. *Physical Review Letters* 124, 19 (2020), 198103.
- [2] RUIZ, P. A. S., ZIEBERT, F., AND KULIĆ, I. M. Physics of self-rolling viruses. *Physical Review E* 105, 5 (2022), 054411.
- [3] TILL, S., EBMEIER, F., FRAGKOPOULOS, A. A., MAZZA, M. G., AND BÄUMCHEN, O. Motility and self-organization of gliding chlamydomonas populations. *Physical Review Research* 4, 4 (2022), L042046.
- [4] ZAMPARO, M., VALDEMBRI, D., SERINI, G., KOLOKOLOV, I. V., LEBEDEV, V. V., DALL’ASTA, L., AND GAMBA, A. Optimality in self-organized molecular sorting. *Physical Review Letters* 126, 8 (2021), 088101.