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Earth-Life Science Institute  
Tokyo Institute of Technology  
Meguro, Tokyo, Japan  
Email: irene.bonati@elsi.jp

Editorial office  
Monthly Notices of the Royal Astronomical Society

**Submission of a new article to the MNRAS journal**

Dear Sir or Madam,

We wish to submit the enclosed manuscript, titled "The influence of surface  $CO_2$  condensation on the evolution of warm and cold rocky planets orbiting Sun-like stars", by Irene Bonati and Ramses Ramirez to the *Monthly Notices of the Royal Astronomical Society*. This work is topical because our calculations help improve our understanding of the habitable zone, one of the key metrics used for finding potentially habitable planets. Whereas most previous calculations have used 1-D radiative-convective climate models, we employ an advanced energy balance model that better approximates the realism of actual planets.

Our work presents new calculations investigating the role of  $CO_2$  surface ice condensation on the climatic evolution and habitability of planets orbiting Sun-like (FGK) stars. The permanent collapse of atmospheric  $CO_2$  on planetary surfaces occurs on distant worlds with very high atmospheric  $CO_2$  pressures. We also assess how such  $CO_2$  condensation impacts the width of the habitable zone. Previous work had only assessed this process for young planets orbiting the Sun that had started their evolution cold and icy (cold start planets). In addition to assessing a larger stellar range (F to K stars), we explore the effects of  $CO_2$  surface ice condensation for warm start (ice-free) planets as well.

Our main finding is that  $CO_2$  surface ice condensation is a bigger detriment to the habitability of cold start planets than for warm start planets. Once warm start planets are included, the effective habitable zone is considerably wider than what had been previously suggested for cold start planets.

We are available to answer any questions about this submission. Please let us know if anything else may be needed.

There were no competing financial interests in the production of this manuscript.

Thank you very much and we cordially invite you to read our manuscript.

Kindest regards,

Irene Bonati (corresponding author)  
Ramses Ramirez

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