

Interactive comment on “Diminished greenhouse warming from Archean methane due to solar absorption lines” by B. Byrne and C. Goldblatt

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Dear Dr. Kasting,

Thank you very much for the helpful review. We have addressed your comment below.

COMMENT: One should note, however, that the earlier study by Haqq-Misra et al. also included greenhouse warming by ethane (C₂H₆), the concentration of which was calculated self-consistently using a photochemical model. The ethane in that study contributed several degrees of greenhouse warming, although its effect was largely masked at high CH₄ concentrations by anti-greenhouse cooling provided by organic haze. Hence, the two studies (Haqq-Misra et al. and the present paper) are not directly comparable. When the effects of ethane are included, however, it seems likely that

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the general story of a methane greenhouse during the Archean remains valid. And that is significant, as the simplest explanation for the Paleoproterozoic glaciations that happened at the end of this eon is that the CH₄ greenhouse was diminished or wiped out by the rise of atmospheric O₂.

RESPONSE: The first part of Haqq-Misra et al. corrected the error in the methane absorption from Pavlov et al. (2001), and gave the surface temperature solely as a function of CO₂, CH₄, and H₂O (Figure 2). This is where we got our values for surface temperature change.

Interactive comment on Clim. Past Discuss., 10, 4229, 2014.

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