

Anonymous Referee #1

One point which I forgot in my review so far, but which might also get improved by more details: The efficacy of GHG @ LGM was 0.9 here. I am wondering if the full impact of CH<sub>4</sub> on radiative forcing includes indirect effects of CH<sub>4</sub> on stratospheric H<sub>2</sub>O and tropospheric O<sub>3</sub>. They have been proposed in Hansen et al., (2005) and they led to an additional change of 40% in radiative forcing of CH<sub>4</sub> (Hansen et al., 2008).

**Reply:** Thanks for the interesting point and references. Our simulations used the Community Atmosphere Model version 5, which is a low-top model with prescribed stratospheric chemical tracers, such as CH<sub>4</sub>, H<sub>2</sub>O, and O<sub>3</sub>.

We will add the following discussion in the revised manuscript: “We note that the LGM GHG forcing and efficacy in this study is calculated using a “low-top” atmosphere model with prescribed stratospheric chemical tracers and excludes indirect effects from stratosphere chemistry (Hansen et al., 2005).”

Hansen, J., Sato, M., Ruedy, R., Nazarenko, L., Lacis, A., Schmidt, G.A., Russell, G., Aleinov, I., Bauer, M., Bauer, S., Bell, N., Cairns, B., Canuto, V., Chandler, M., Cheng, Y., Genio, A.D., Faluvegi, G., Fleming, E., Friend, A., Hall, T., Jackman, C., Kelley, M., Kiang, N., Koch, D., Lean, J., Lerner, J., Lo, K., Menon, S., Miller, R., Minnis, P., Novakov, T., Oinas, V., Perlwitz, J., Perlwitz, J., Rind, D., Romanou, A., Shindell, D., Stone, P., Sun, S., Tausnev, N., Thresher, D., Wielicki, B., Wong, T., Yao, M., Zhang, S., 2005. Efficacy of climate forcings. *Journal of Geophysical Research* 110, D18104. doi:10.1029/2005JD005776.

Hansen, J., Sato, M., Kharecha, P., Beerling, D., Berner, R., Masson-Delmotte, V., Pagani, M., Raymo, M., Royer, D.L., Zachos, J.C., 2008. Target atmospheric CO<sub>2</sub>: where should humanity aim? *The Open Atmospheric Science Journal* 2, 217–231. doi:10.2174/1874282300802010217.