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Tropospheric ozone as a UV shield on the early Earth

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Model runs suggest that the troposphere of the Early Earth with 1% present day oxygen was much thicker than for modern day runs and it contributed much more to UV-shielding via ozone produced from the smog mechanism. A similar result was suggested in Grenfell et al. (2006) but the results presented here are for more general, global conditions and apply a more sophisticated model. The troposphere is thicker for the Early Earth runs because the cold trap moves upwards. This occurs because the lowered oxygen leads to supressed ozone which means weaker ozone heating. So, to overcome the effect of adiabatic cooling with increasing altitude the cold trap moves up to higher altitudes where UV fluxes (hence ozone heating) are stronger. We present temperature profiles and ozone column amounts (split into their tropospheric and stratospheric components) for modern day and Early Earth model runs and we discuss variables related to habitability such as surface UV exposure and temperature.