

## Simulations of the evolution of an earth-like planetary atmosphere

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### Abstract

Our final goal is to simulate the evolution of an earth-like planetary atmosphere considering the effect of biogeochemical cycles for periods before, during and after the rise in oxygen.

We are developing a photochemical column model scheme which includes an array of photochemical reactions (e.g. Kasting et al. 1984, Segura et al. 2003, Grenfell et al. 2007). Instead of fixing the long-lived species  $O_2$ ,  $N_2$ , and  $CO_2$  to constant isoprofile values - a common approach for modern Earth models, we calculate these species interactively. This includes the proper treatment of their photochemical sources and sinks, and the setting of boundary fluxes at the surface (e.g. for  $O_2$ , due to life on Earth, for  $N_2$ , due to the nitrogen cycle, and for  $CO_2$  due to the carbon cycle).

We present preliminary results reproducing modern Earth with a variable  $O_2$ ,  $CO_2$  and  $N_2$  photochemistry coupled with a radiative-convective climate model.

### References

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