

# Pathfinder

---

A Bayesian-inferred simple climate model.

## How-to

---

Download a release. *Read The Fine Manual*.

Pathfinder has been developed in Python 3.7 and run preferentially through IPython. Currently, packages required to run it are `numpy` (v1.19.2), `scipy` (v1.5.2) and `xarray` (v0.16.0), and it has hard-coded dependencies on `pymc3` (v3.8) and `theano` (v1.0.4) that are in fact used only for calibration. Newer versions of Python or these packages are likely to work, although they were not tested.

## Known issues

---

- The model requires a high number of substeps to remain stable under high CO<sub>2</sub> (because of the ocean carbon cycle). This can be set using the `nt` argument when calling `run_xarray`.
- The temperature-driven mode ( `Tdriven` ) is extremely sensitive to its forcings: it can be very difficult to make it transition smoothly from historical to projections. This is unavoidable because mathematically it requires the second derivative of `T` and the first derivative of `ERFx` as input.
- Unclear whether the `my_AR1` class from `cls_calib` is actually needed.

## Changelog

---

### v1.0.1

Exact same physical equations and numerical values as v1.0.

- Added: best-guess parameters and outputs (in `internal_data/pyMC_calib/` ) for single-configuration runs.
- Improved: README and MANUAL files.

### v1.0

Exact model described by Bossy et al. (subm).

First release!

## References

---

**v1.0 (full)** | Bossy, T., T. Gasser & P. Ciais. "Pathfinder v1.0: a Bayesian-inferred simple carbon-climate model to explore climate change scenarios." *Geoscientific Model Development* (submitted). [doi:10.5194/egusphere-2022-802](https://doi.org/10.5194/egusphere-2022-802).