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the main climatic

components

Multiple climate

steady state

exploration

**Bifurcation diagram** 

construction

## Introduction

**Biogeodynamical**: surface processes, biology adaptation and climate dynamics  $\rightarrow$ computationally expensive

Our tool is **in between** Earth System Models and an intermediate complexity models, thus requiring a reasonable amount of CPU time to reach a **stationary state** Good description of



Figure 1: example of a bifurcation diagram for an aquaplanet configuration [3]

#### Present-day validation

run1 : biogeodynIS-MITgcm **280 ppm** against CMIP6 1850 – 1880 (detailed) run2 : biogeodynIS-MITgcm **360 ppm** against ERA5/Obs 1979-2009

## Conclusion

Our **biogeodynamic** tool can describe the present-day climate in an efficient and **complete way** for the atmosphere, the ocean, the vegetation and the cryosphere **Close to CMIP6** class models and **verified** against reanalysis



Multistability investigation of deep time and present Earth's climate.

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# Development of a new biogeodynamical tool for exploratory climate modelling Laure Moinat<sup>1,2,3</sup>, Florian Franziskakis<sup>2</sup>, Christian Vérard<sup>3,4</sup>, Daniel Goldberg<sup>5</sup>, Maura Brunetti<sup>1,2,3</sup> laure.moinat@unige.ch

1. Group of Applied Physics, University of Geneva, Geneva, Switzerland; 3. Centre pour la Vie dans l'University of Geneva, Switzerland; 3. Centre pour la Vie dans l'University of Geneva, Switzerland; 3. Centre pour la Vie dans l'University of Geneva, Geneva, Switzerland; 5. School of Geneva, Switzerland; 3. Centre pour la Vie dans l'University of Geneva, Geneva, Geneva, Switzerland; 5. School of Geneva, Switzerland; 3. Centre pour la Vie dans l'University of Geneva, Geneva, Geneva, Switzerland; 5. School of Geneva, Switzerland; 3. Centre pour la Vie dans l'University of Geneva, Switzerland; 5. School of Geneva, Switzerland; 5. School of Geneva, Switzerland; 5. School of Geneva, Switzerland; 4. Section of



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	E - P ( 10 <sup>-8</sup> kgm <sup>-2</sup> s <sup>-1</sup> )	NH sea ice extent (10 <sup>6</sup> km <sup>2</sup> )	SH sea ice extent (10 <sup>6</sup> km <sup>2</sup> )					
vnl8- MITgcm	-2 <u>+</u> 1	9.7 ± 0.1	16 <u>+</u> 1					
CM6A - LR	-8 ± 9	13 <u>+</u> 7	12 <u>+</u> 3					
SM2 - LM	-3 <u>+</u> 1	11 <u>+</u> 3	6 <u>+</u> 3					
hal avarage water budget and the hemisphere see ice extent								

**Science Foundation**