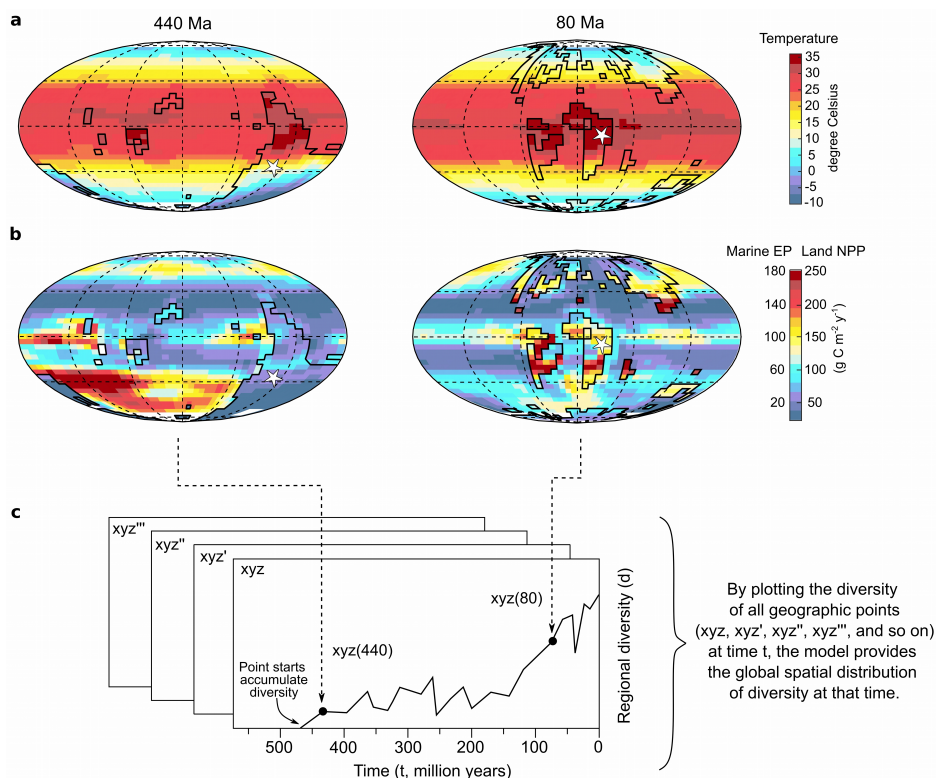


## FPI grant: Fully-funded PhD thesis opportunity in evolutionary modelling

Do you dream of reconstructing the history of life on Earth and understanding the forces that shaped the biodiversity we see today? If so, the INDICiOS project team invites you to embark on an exciting journey through deep time.

### Summary of the research project

INDICiOS will revolutionize our understanding of marine biodiversity by building upon our previous INDITEK model [1], a groundbreaking spatially explicit eco-evolutionary model. We will use state-of-the-art reconstructions of Earth's paleogeography [2], along with simulations of ocean environmental conditions using the Earth system model cGENIE [3] to track the evolution of marine invertebrate diversity through hundreds of millions of years of Earth's history.



Conceptual diagram showing how the INDICiOS project will reconstruct the history of biodiversity from simulations of Earth's paleogeographic and environmental evolution, and the INDITEK eco-evolutionary model.

The potential of the INDITEK model is enormous. It provides an excellent framework for investigating paradigmatic questions in evolutionary ecology [4]. For example, it opens the possibility of investigating the interplay between evolutionary rates and Earth's paleogeographic evolution in shaping the latitudinal biodiversity gradient (LBG), i.e., the increase in diversity from the poles to the equator [5,6]. It also paves the way to understanding the origins of modern biodiversity hotspots, i.e., regions with outstanding diversity levels but currently threatened by global change.

By integrating high-resolution paleogeographic reconstructions, detailed simulations of ocean environmental conditions, and sophisticated eco-evolutionary modeling, INDICiOS will generate a Phanerozoic history of the marine LBG and biodiversity hotspots. This unprecedented view of the past will reveal how the forces of geology and evolution have shaped the diversity of life in the oceans, providing a deeper understanding of where, when, and how animal life flourished, and crucial insights for conservation efforts.

As a pre-doctoral researcher on the INDICiOS project, you will play a pivotal role in:

- **Refining eco-evolutionary models:** You will refine existing models by incorporating speciation and extinction rates and implementing Bayesian calibration techniques.
- **Reconstructing the past:** You will simulate the diversification of marine invertebrates since their origin, mapping the emergence, evolution, and demise of biodiversity hotspots.
- **Testing hypotheses:** You will investigate the mechanisms underlying the origins and dynamics of the LBG and biodiversity hotspots.
- **Sharing your discoveries:** You will contribute to scientific publications, presentations, and the development of a web application to visualize and share the project's findings.

INDICiOS will have a profound scientific impact, contributing to a new understanding of marine biodiversity, informing conservation priorities by understanding the deep history of biodiversity hotspots, fostering collaboration between geologists, paleobiologists, evolutionary ecologists and Earth system modellers, and developing a versatile modelling tool that will enable addressing the biodiversity history of life, from metazoans to microorganisms.

[1] Cermeno et al. *Nature* 607: 507–511 (2022). [2] Scotese, C. R. & Wright, N. *PALEOMAP Project* (2018). [3] Ridgwell, A. et al. *Biogeosciences* 4, 87–104 (2007). [4] Benton, M. J. *Science* 323, 728–732 (2009). [5] Jablonski, D., et al. *Science* 314, (2006). [6] Mittelbach, G. G. et al. *Ecology Letters* 10 (2007).

## Where?

The INDICiOS project offers a unique opportunity to conduct cutting-edge research at a prestigious Spanish research institution, the **Instituto de Ciencias del Mar (ICM-CSIC)** in Barcelona. The ICM is the largest marine research center in Spain. With over 250 researchers, the ICM fosters a vibrant and collaborative research environment dedicated to understanding and addressing the challenges facing our oceans. You will have access to state-of-the-art facilities, world-class expertise, and a rich network of collaborators in marine science and related fields.

The candidate will conduct this research within the optimal working environment provided by the INDICiOS project (2024-2027), maximizing the thesis project's chances of success. The thesis will be supervised by project PIs Pedro Cermeno and Sergio Vallina, along with Carmen Garcia-Comas, the developer of the INDITEK model.

To further enrich the research experience, the Spanish government's science agency awards grants to support research stays at the labs of the project's external collaborators: Alexandre Pohl (Université de Bourgogne, Dijon), Lewis Jones (University College London) and Michael J. Benton (University of Bristol).

### **Your Profile**

We seek a highly motivated candidate to learn about eco-evo modeling and the fascinating history of animal evolution. The candidate would have basic knowledge of evolutionary ecology, macroecology or related fields (at BSc level). Programming skills (e.g., R, Matlab, Python) and good english level would be an asset.

### **Apply Now!**

Send your CV, a brief cover letter, and contact information for at least one reference to Pedro Cermeno ([pedrocermeno@icm.csic.es](mailto:pedrocermeno@icm.csic.es))

**Deadline for applications:** 20 September 2024