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sDiv working group meeting report

”sTime”

Working group meeting report

The second sTime working group met from 10 to 13 November 2025 at iDiv, Leipzig. The overarching goal of the sTime working groups is to understand ecological dynamics across spatial and temporal scales, with particular focus on long-term (paleontological) biodiversity patterns. The meeting brought together 17 in-person participants from 11 institutions and 7 countries, including both early-career and senior researchers. Eight participants were self-funded, highlighting the group’s strong engagement.

The primary aim of this second meeting was to advance and finalize work on three sTime projects that were already well developed (see below). Given this aim, we invited the leads of each project, alongside key sTime contributors, to focus on completing remaining analyses and manuscripts. Participants were assigned to one of the three projects, and the meeting was structured around three dedicated working groups.

The meeting began with plenary presentations on each of the three projects, providing an overview of the research questions, progress to date and challenges. These presentations were followed by group discussion and clarification of goals and action items for each working group (breakout groups).

The three projects are:

(1) Walking the line: the scales of biodiversity phenomena. This synthesis examines how biological processes are distributed across scales of time, space, and levels of organization. Mapping existing theory onto these three scales highlights that the hierarchy of biological processes are correlated across them. Mapping available data onto the same scale space indicates not only novel opportunities to study patterns of biodiversity across scales, but also knowledge gaps. Our conceptual framework of scale space helps in building, evaluating and communicating eco-evolutionary mechanistic models. This project is led by Prof. Thiago Rangel.

(2) H*ow does species richness change across timescales?* Using Hill numbers (effective number of species), this project examines alpha-diversity dynamics across the BioDeepTime database of modern and fossil assemblage data. Previous work on short timescales (years to decades) has shown that species richness is stable through time. We find that, even across longer timescales (centuries to millennia), richness also remains constant, suggesting that local communities are regulated around a long-term equilibrium in diversity, despite ongoing species turnover. We also find that variation in richness change is dependent on temporal extent and temporal separation of samples. This project is led by Dr. Marina Rillo and Mauro Sugawara.

(3) Biotic differentiation and homogenization on long timescales. Analysing local and regional diversity changes through time (alpha and gamma diversities, respectively), this project examines the spatial variation of species diversity (beta diversity) of BioDeepTime pollen subset over geologic time. We found a balanced occurrence of homogenization and differentiation, and, using climate models, we test whether beta diversity increases as environments become more heterogeneous spatially. Following sTime goals, we test whether the observed patterns are sensitive to temporal separation and spatial scale of the regional pool. This project is led by Dr. Ben Shipley and Dr. Zach Miller.

The second day was devoted to focused work in the three breakout groups. Each group concentrated on data analyses, interpretations and manuscript development. The day concluded with a joint, all-group discussion session, during which participants presented methodological issues and interpretation challenges that would benefit from input from the full group.

On the morning of the third day, breakout groups continued working on completing the key tasks and ideas discussed in the previous day. In the afternoon, the sTime group presented the iDiv seminar, highlighting the advantages of studying long time scales to understand the process of extinction. The day ended with breakout groups reporting on progress to the whole group and discussed remaining challenges.

The final workshop day included time for the working groups to organise and delegate final tasks required to finalize the manuscripts. We plan to submit these three projects for publication by spring 2026, which represent three key deliverables for our sTime project.

Next Steps and Future Directions

Beyond the completion of the three focal projects, the second sTime meeting served to discuss the other ongoing projects of the sTime group and the continued development of the BioDeepTime database. Jansen Smith presented plans for acquiring new data for BioDeepTime version 2.0, particularly to fill the biodiversity data gap of decadal to centennial temporal scales. The next step of sTime will focus on mechanistic models of biodiversity dynamics and environment. Based on the conceptual framework of project (1) and the empirical observations of projects (2) and (3), our ongoing sTime projects are focussing on generating theoretical expectations from process-based models to assess the rate and environmental drivers of biodiversity dynamics through time.

As previously, our sTime working group aimed to create an inclusive, supportive, and welcoming environment where ideas could be shared openly. We sought to encourage active participation and discussion from all attendees. This inclusive atmosphere was strongly supported by the great facilities and resources provided by iDiv. Our group benefited from the guidance in workshop organisation, well-equipment meeting spaces, and dedicated breakout room to do focussed collaboration, brainstorm, and develop ideas. We are very grateful for the excellent iDiv support, which was instrumental in the success of the meeting.