

sDiv Workshop Summary sFossil – Integrating Phylogenies, Fossils and Earth System Dynamics

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Focal areas of discussion

As outlined in the proposal, the goal of this workshop was to establish a framework for a better integration of phylogenetic, fossil and geological information. Specifically, there is a need to evaluate and quantify the relative importance of different geological processes in shaping biodiversity dynamics. Thus, the primary focus during the workshops was the development of a conceptual framework for the integration of bio- and geosciences and the associated mutual benefits for biologists and geologists:

- 1) What do we gain from better integrating geological and biological processes (Earth history & evolutionary history)?
- 2) How can data be integrated? What are the strength and weaknesses of the data and methods? How to deal with uncertainty appropriately (when combining different types of data)?

Furthermore, several subgroups established specific empirical projects that incorporate Earth Surface Processes and evolutionary processes.

Given the broad range of disciplines (including biological and geological sciences) and novelty of the workshop topic, communication and collaboration between evolutionary biologists, ecologists, paleontologists and geologists is necessary. Thus, a considerable amount of time was reserved for general discussions among all participants. One afternoon was organized as a mini-symposium with a few selected talks to provide an overview of the current research, challenges and opportunities in the different fields as well as introducing some of the key work packages (complemented by the iDiv seminar).

Content of presentations

Susanne Fritz – Integration of neontological and paleontological data to understand evolutionary dynamics

Jussi Eronen – Trait ecometrics in fossil mammal communities

Daniele Silvestro – Estimation of species diversification dynamics from phylogenies and fossil data

Carina Hoorn – Biodiversity and mountain building

Andreas Mulch – Co-evolution of landscapes and life

iDiv seminar: Alexandre Antonelli - One Step Ahead: Integrative Solutions to Identify Tipping Points in Biodiversity

Proposed outputs

A conceptual paper with contributions from all workshop participants on the integration of biological and geological processes is in preparation. In addition, subgroups will focus on particular projects including empirical as well as simulation-based studies, e.g. the integration of geological processes and rates of species diversification and/or trait evolution.

Publication efforts are led by

- a) Jan Schnitzler (conceptual paper)
- b) Susanne Fritz (paper on environmental correlates of mammalian species diversity)
- c) Alexandre Antonelli (review paper on biodiversity and mountain building)
- d) Daniele Silvestro & Jan Schnitzler (paper on diversification dynamics of equids and bovids)

General working atmosphere and feedback on sDiv support

The support provided by the sDiv team together with the excellent meeting facilities were key to the success of the workshop.

Next steps

There was a broad consensus that a better integration is needed to understand the evolution of biotas and their feedback on Earth Surface processes. The network of researchers established at this workshop will develop comprehensive vision of how quantitative analyses can integrate neontological, paleontological, and geological data and approaches to evaluate the fundamental processes shaping diversity patterns in space and time.

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