

1 Introduction

Climate variability is one of the major drivers of landscape evolution. Understanding the effects of climate change on the Earth's system enables the prediction of the effects of future climate change scenarios. Climate dynamics and their coupling with maritime and terrestrial systems involve various spatial and temporal scales, but not all of them can be captured by the existing instrumental records. Thus, there is a need for a 'paleo-perspective' that narrows the uncertainties in our understanding of the mechanisms governing climate and landscape evolution (Overpeck, 1995).

This study focuses on assessing the climate and landscape evolution in the Ugii Nuur basin located in the steppe region of central Mongolia during the Holocene and its effects on Earth surface processes. The major aim of this study is to access, analyze and interpret terrestrial and lacustrine archives in order to answer the question: How did environments change during the Holocene and what were the forces governing landscape evolution in the Ugii Nuur basin?

Mongolia's climatic and environmental history is of particular interest since it comprises one of, if not the most continental region in the world. Investigating climate and environmental evolution in this area contributes to a better understanding of the sensitivity of continental ecosystems to external forcings. The study site is located in the area where the Westerlies, the East Asian Monsoon and the Indian Monsoon intersect. The evolution of these three wind systems is of vital interest since they govern moisture advection to Central Asia. Understanding their variability in space and time and their interactions enables predictions on how they react to future climate change and how, in particular, ecosystems and water resources in semiarid and arid regions of Central Asia will be affected. The Ugii Nuur basin's location in the steppe region of the Mongolian Plateau is an additional rationale for this study. Only a few studies have been concerned with this area due to its

1 Introduction

remoteness and inaccessibility during the Soviet regime.

Three objectives were set to accomplish the central aim of this study. The first objective is the review of the current state of knowledge on the climatic and landscape history of Central Asia and the environmental characteristics of the study site. The second objective is the analysis and interpretation of lake sediments. Lacustrine archives provide a spatially integrated and temporally lagged signal of the processes both in the catchment and in the lake. Geomorphological forms and materials overcome these limitations by offering additional, yet often spatially and temporally discontinuous archives of landscape evolution. Accessing, analyzing and interpreting these terrestrial archives is the third objective. The fourth objective is a synthesis of the results gained from terrestrial and lacustrine archive analysis.

The structure of the thesis follows the chronological and thematic work process. Chapter 3–6 were written as stand-alone manuscripts for publication in peer-reviewed journals/books. Chapter 2 provides an overview on the current state of knowledge on climate and landscape evolution of the area of interest. Chapter 3 aims at providing a general introduction into the environmental conditions of the study site. Chapter 4 reports preliminary results on terrestrial depositional environments gained by sediment profile analysis and vertical electrical soundings. Chapter 5 contains the results gained from analysis of the lake sediment core UGI-4 and their paleoclimatic interpretation. Chapter 6 aims at drawing a synthesis from the previously published results in the context of Holocene climate and environmental evolution of the Ugii Nuur basin. Moreover, this chapter includes various new records and datings. Finally, chapter 7 provides a synthesis on the conclusions drawn in this study and highlights perspectives on future research objectives.