Climate and Landscape Evolution of the Ugii Nuur basin, Mongolia

Dissertation

zur Erlangung des Doktorgrades
der Naturwissenschaften (Dr. rer. nat.)

am Fachbereich Geowissenschaften
der Freien Universität Berlin

vorgelegt von
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Berlin 2008

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Erklärung

Hiermit erkläre ich, dass ich die Dissertation 'Climate and landscape evolution in the Ugii Nuur basin, Mongolia' selbständig angefertigt und keine anderen als die von mir angegebenen Quellen und Hilfsmittel verwendet habe.

Ich erkläre weiterhin, dass die Dissertation bisher nicht in dieser oder anderer Form in einem anderen Prüfungsverfahren vorgelegen hat.

Basel, 24. November 2008

Wolfgang Schwanghart

Acknowledgments

I am deeply thankful to many people that helped, inspired and encouraged me to progress and complete this dissertation.

First and foremost I want to thank Prof. Dr. Brigitta Schütt, my doctoral advisor, who always supported me in every possible way. Her encouragement and inspiration, her careful reading of my writings and constructive criticism, her way to grant liberty and her organizational skills gave me the framework within I was able to finish this work. I want to thank Prof. Dr. Manfred Frechen not only for providing me with the necessary chronological frame around my work, but for his willingness to supervise my work, for his feedback and for the never-ending patience with my incessant phone calls. I want to thank Prof. Dr. Dr. hc Michael Walther, who drilled the sediment cores, who provided me with every necessary equipment for field work and with whom I shared great discussion and a great time in the field. I am very grateful to Prof. Dr. Nikolaus Josef Kuhn for giving me the time and means to finish this dissertation in Basel.

I want to thank my colleagues and friends who supported me during field work. Altangerel Baterdenet, Baggi, Riccardo Klinger and Judith Mahnkopf. I never want to miss the great time we had. In addition, I am thankful to the participants of the two field studies in the Ugii Nuur basin.

I am very grateful to my colleagues and friends Jonas Berking, Malte Halbey-Martin, Dr. Kai Hartmann, Dr. Philipp Hölzmann, Jan Krause, Christopher Lüthgens, Dr. Steffen Möller, Prof. Dr. Tilman Rost, Anette Stumptner and Dirk Wenske. Your fruitful discussions, support and friendship created a motivating and fun working environment. The same holds true for my colleagues and friends at the University of Basel, Edith Beising, Rosi Gisin, Harald Hikel, Ulli Poppe and Sarah Strähl.

Thanks, Tobias Kümmerle, for sharing Endless Discussions with Sternburger, Coffee, Hamburgers and Entrecôte with me.

I am very thankful to Emmi Krings, Manuela Demirci-Scholz, Dr. Röper, Heidi Strohm and Dr. Sumiko Tsukamoto for technical support and discussions.

My parents and my brother have all been supporting and encouraging me in every way before and during my PhD. I cannot thank you enough for your love and care.

I want to thank my friends in Berlin and elsewhere. I am so glad for the great times we had besides science.

Meike, all words are not enough to express my gratitude for your contribution to all that. *Du bist ein t. B.*

Summary

The major goal of this study is to advance our understanding of climate and landscape evolution in Central Asia during the Holocene. The regional focus is the Ugii Nuur basin located in the steppe region in central Mongolia. Understanding Holocene climate variability and its effects on landscape evolution in this area is crucial to assess the mechanisms of environmental change in the Mongolian Plateau which are largely governed by the interplay of the East Asian monsoon and the Westerlies. Investigating Holocene climate and landscape evolution in this area contributes to linking results gained in the drylands of northern China and the boreal region in southern Siberia.

Electrical resistivity surveys, mapping, geochemical and mineralogical analysis of lake and terrestrial sediments, radiocarbon and luminescence datings, and statistical techniques are employed to assess environmental change during the Holocene. The findings and their discussion in a regional paleoenvironmental context reveal that the Ugii Nuur basin experienced major environmental changes from dry to wetter conditions during the Mid Holocene. An arid period is inferred from 4–2.8 ka, a phase that coincides with remarkable environmental changes in Central Asia. The Late Holocene is characterized by relatively stable, more humid environmental conditions comparable to today. This period concurs with perseverative human activity in this region that culminated in the 13 th century AD with the construction of Karakorum, the capital of the Mongolian Empire under Chengis Khan.

The findings of this study underpin the notion of significant environmental variability in Central Asia during the Holocene. It is suggested that climate evolution on the Mongolian Plateau is largely controlled by moisture supply by the Westerlies. The interactions of the Westerlies and the monsoon regime, however, are still poorly understood and further research is required to link archives of environmental change in the Monsoon dominated and the boreal part of Central Asia.

Zusammenfassung

Die vorliegende Arbeit ist ein Beitrag zum besseren Verständnis der holozänen Klima- und Landschaftsgeschichte in Zentralasien. Der regionale Fokus der Arbeit ist das Ugii Nuur Einzugsgebiet im Steppengebiet der zentralen Mongolei. Dieses Gebiet erfährt eine wichtige Bedeutung, da die Mechanismen des holozänen Umweltwandels auf dem Mongolischen Plateau und der Einfluss der Westwinddrift und des Sommermonsuns in dieser Region noch relativ wenig untersucht wurden, aber ein wichtiges Bindeglied zwischen den ariden und semiariden Gebieten Nordchinas und der borealen Nadelwaldzone Südsibiriens darstellen.

Geoelektrische Verfahren, Kartierung, geochemische und mineralogische Untersuchung von Seesedimenten und terrestrischen Sedimenten, Radiokarbon- und Lumineszenzdatierung, sowie statistische Methoden wurden angewandt um Umweltwandel im Ugii Nuur Einzugsgebiet zu rekonstruieren. Die Ergebnisse und ihre Diskussion in einem regionalen Kontext zeigen, dass das Ugii Nuur Gebiet starken Umweltveränderungen von trockenen zu feuchteren Bedingungen während des mittleren Holozäns unterworfen war. Ein arider Abschnitt von 4–2.8 10^3 Jahren vor heute war gleichzeitg mit gravierenden Umweltveränderungen in Zentralasien. Das späte Holozän ist durch eine relativ stabile, feuchtere Phase gekennzeichnet, die bis heute anhält. Dieser Zeitabschnitt stellt auch eine Phase stetigen Einflusses des Menschen dar, die einen Höhepunkt während des 13 Jhdt. n. Chr. erlebte, als Dschingis Khan seine Hauptstadt im Orkhon Tal gründete.

Die Ergebnisse dieser Studie untermauern die Auffassung einer starken Variabilität der Umweltbedingungen in Zentralasien während des Holozäns. Es wird angenommen, dass die Klimaentwicklung auf dem Mongolischen Plateau weitestgehend durch die Feuchteadvektion durch die Westwinddrift gesteuert wird. Es gibt jedoch noch einige Unsicherheiten im Verständnis der Wechselwirkungen zwischen der Westwinddrift und dem Monsunregime.

Weitere Untersuchungen sind notwendig, um die raumzeitlichen Archive des Umweltwandels in den borealen und Monsun dominierten Bereichen Zentralasiens zu verknüpfen.

Contents

Summary i

Zusammenfassung ii

List of Figures viii

List of Tables x

1 Introduction 1

2 State of the art 3

2.1 Introduction . . . 3

2.2 Definitions . . . 4

2.3 Rationales of climate and landscape evolution research in Central Asia . . 5

2.4 Atmospheric circulation and moisture supply to central Mongolia . . . 6

2.5 Present-day atmospheric dust dynamics in Central Asia . . . 8

2.6 Climate and landscape evolution in Central Asia . . . 11

2.6.1 The Last Glacial Maximum . . . 12

2.6.2 The late Pleistocene/Holocene transition (19-10 ka) . . . 13

2.6.3 Early Holocene (10-8 ka) . . . 17

2.6.4 Mid Holocene (ca. 8–4 ka) . . . 18

2.6.5 Late Holocene (ca. 4–0 ka) . . . 20

2.7 Anthropogenic influence . . . 21

2.8 Discussion . . . 25

2.9 Conclusions . . . 27

3 Environmental characteristics 28

3.1 Introduction 28
3.2 Area of interest 29
3.3 Environmental characteristics 30
3.3.1 Geology 31
3.3.2 Climate 33
3.3.3 Soils 37
3.3.4 Vegetation 38
3.3.5 Drainage 39
3.4 Geomorphological and paleoenvironmental implications 41
3.4.1 Lake systems 41
3.4.2 Relief and morphodynamics 42
3.5 Perspective 44

4 Holocene morphodynamics **45**

4.1 Introduction 46
4.2 State of the Art 47
4.3 Study site 49
4.4 Methods 51
4.5 Results 52
4.5.1 Study site 1 52
4.5.2 Study site 2 57
4.6 Discussion 59
4.6.1 Study Site 1 59
4.6.2 Study site 2 62
4.7 Conclusions 63

5 Holocene climate evolution **64**

5.1 Introduction 64
5.2 Regional setting 66
5.3 Methods 67
5.3.1 Sediment extraction and analysis 67

5.3.2 Age control . . . 68
5.3.3 Statistical analysis . . . 68
5.4 Results . . . 69
5.4.1 Sediment stratigraphy . . . 69
5.4.2 Age model . . . 70
5.4.3 Element composition . . . 70
5.4.4 Principal Components . . . 72
5.4.5 Minerals . . . 73
5.5 Discussion . . . 74
5.5.1 Element and mineral composition . . . 74
5.6 Conclusions and outlook . . . 81

6 Holocene climate and landscape evolution of the Ugii Nuur basin 82
6.1 Introduction . . . 83
6.2 Study site . . . 84
6.3 Methods . . . 87
6.3.1 Sediment analysis . . . 87
6.3.2 Statistical analysis . . . 88
6.3.3 Radiocarbon and luminescence datings . . . 88
6.4 Results and interpretation . . . 90
6.4.1 Lacustrine archives . . . 90
6.4.2 Terrestrial archives . . . 95
6.5 Discussion and paleoclimatic and paleoenvironmental interpretation . . . 97
6.5.1 Pre-Holocene evolution (> 10 ka) . . . 97
6.5.2 Early Holocene (ca. 10–8 ka) . . . 99
6.5.3 Mid Holocene (ca. 8–4 ka) . . . 100
6.5.4 Late Holocene (< 4 ka) . . . 101
6.6 Conclusion . . . 103
6.7 Acknowledgments . . . 104

7 Synthesis 105

7.1 Main conclusions 105
7.2 Future research directions 107

Literature **108**

Curriculum Vitae **126**

Publications **127**

List of Figures

2.1 Summer wind systems, mean july precipitation amounts and the present-day monsoon limit . . . 7
2.2 Mean monthly surface wind velocities and horizontal visibility reduction for Mongolian climate stations . . . 10
2.3 Insolation variability during the late Pleistocene and Holocene in June and December at 60°N and 30°N . . . 12
2.4 Model of horizontal and vertical sediment transport in the basin and range area of Western Mongolia during the Pleistocene and Holocene depending on temperature (glacial and periglacial activity), aridity (aeolian transport and accumulation), and humidity (lake transgression and soil formation) . . . 16
2.5 Temporal and spatial variability of maximum effective precipitation in summer monsoon controlled China based on paleoclimatic proxy data . . . 18
2.6 Simplified timeline of anthropogenic influence in Central Asia and the Ugii Nuur basin . . . 23

3.1 Location of the area of interest . . . 30
3.2 First three principal components (PC) of Landsat ETM+ imagery . . . 31
3.3 Landscape characteristics in the Upper and Middle Orkhon Valley . . . 32
3.4 Outcrop of the Orkhon terrace close to Kharkhorin . . . 34
3.5 Analysis of daily climate station data . . . 36
3.6 Kastanozem profile . . . 38
3.7 Channel morphology at Ugii Nuur headwater area . . . 40

4.1 Location of the study area . . . 48
4.2 Map of the Ugii Nuur basin with locations of the study sites . . . 50

4.3 Profile description in study site 1 and total inorganic carbon (TIC), total organic carbon (TOC) and loss of ignition (LOI) . . . 53
4.4 Element composition of samples taken in study site 1 . . . 56
4.5 One-dimensional electrical resistivity sounding profiles in study site 1 . . . 57
4.6 One-dimensional electrical resistivity sounding profiles in study site 2 . . . 58
4.7 Cross valley profile, locations of one-dimensional vertical electrical soundings (VES) and interpreted subsurface relief in study site 2 . . . 59

5.1 Map of the Ugii Nuur basin . . . 67
5.2 Lithography and age model of the core Ugi-4 . . . 70
5.3 Element composition of Ugi-4 . . . 71
5.4 Compositional and log-ratio transformed Fe, Mn and Fe-Mn ratio . . . 76
5.5 Chronology of principal components and occurrences of minerals . . . 79

6.1 Map of central Asia and location of the study site . . . 85
6.2 Map of the study site indicating locations of profiles described in the text . 86
6.3 Lithology and geochemical and mineralogical sediment composition of UGI-4 and UGI-G3 . . . 91
6.4 Biplots of the PC loadings (vectors) and PC scores (dots) . . . 93
6.5 Factor scores and mineral occurrences of UGI-4 . . . 94
6.6 Lithology, total inorganic (TIC) and organic carbon (TOC) of UGITP-01 . 96
6.7 Lithology, total inorganic (TIC) and organic carbon (TOC) of UGITP-08 . 97
6.8 Grain size distribution in various depths of UGITP-08 . . . 98

List of Tables

4.1 Loss of ignition (LOI), carbonate content and mineral composition of samples taken in the sediment profile in study site 1. 54

5.1 Eigenvalues and variances of PCA before and after Varimax rotation. . . . 72

5.2 Factor loadings (eigenvectors) and communalities of log-ratio transformed variables after Varimax rotation. 73

6.1 List of radiocarbon ^{14}C dates reported in this study. 89

6.2 List of fading corrected IRSL ages of the section UGITP-08. 89

6.3 Factor loadings and communalities of centered logratio transformed variables after Varimax rotation. Loadings > 0.7 and < 0.7 are highlighted bold 92