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Climate, Environment  
and Agriculture in Assyria  
in the 2<sup>nd</sup> Half of the 2<sup>nd</sup> Millennium BCE

2011

Harrassowitz Verlag · Wiesbaden

ISSN 1869-845X  
ISBN 978-3-447-06630-3

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## ACKNOWLEDGMENTS

The preparation of this book would not have been possible without the constant support, useful suggestions and patient encouragement of members of the Excellence Cluster TOPOI and Freie Universität Berlin, and it is my pleasure to present the results of a two year fellowship at their side. Most of all, I am indebted to Prof. Dr. Hartmut Kühne, who suggested that cuneiform evidence related to potential climatic change in the 13<sup>th</sup> to 10<sup>th</sup> centuries BCE should be investigated in greater detail, and that this should be accomplished within the framework of a post-doctoral grant of the TOPOI Excellence Cluster. Once I had been awarded this grant, he welcomed me among his staff of the Tall Šēḫ Ḥamad excavation project at the Institut für Vorderasiatische Archäologie of the Freie Universität, and spent many hours supervising the evolution of the project with me. The general orientation of this research, as well as the decisions taken regarding the priority of the material, were discussed jointly with him. He also played a decisive role in the shaping of this book. His proofreading of the final form of the manuscript brought countless ameliorations to its form and to my at times peculiar use of the English language, and he accepted it for publication in the series *Studia Chaburensia*. For this, and for his friendly support over the years, I wish to thank him warmly.

My gratitude also goes to the Board of the Excellence Cluster TOPOI, who considered my candidacy for the post-doctoral fellowship offered within TOPOI Project A-I-15, and welcomed me as one of the members of this intellectual adventure. I wish to particularly thank the directors of the Excellence Cluster, Prof. Dr. Friederike Fless and Prof. Dr. Gerd Graßhoff, as well as the members of Research Group A-I, with whom I shared many discussions during our working sessions. To Prof. Dr. Brigitta Schütt and Dipl.-Geogr. Jan Krause, I may express my appreciation of their countless efforts in bringing together the scholars of Research Group A-I. My special thanks go to the staff of the TOPOI administration, particularly to Dr. Regina Attula, Dr. Hauke Ziemssen and Diana Nickel-Tzschach for their friendly support throughout these two years (and even beyond). Part of this study is based on a TOPOI-travel grant to Tall Šēḫ Ḥamad (Syria) during the summer of 2010.

I was fortunate to discuss some points of this study with several colleagues. I am much indebted to Prof. Dr. Eva Cancik-Kirschbaum (Freie Universität Berlin, Institut für Alt-orientalistik) for fruitful discussions related to the eponymal sequence of the 13<sup>th</sup> century BCE, and most of all for having granted me access to two of her unpublished manuscripts, which helped me elaborate my own hypotheses – and sometimes discard the most adventurous ones. The same applies to Dr. Grégory Chambon (Université de Bretagne Occidentale), who discussed with me matters of metrology and gave me access to his unpublished PhD. However, the hypotheses elaborated in the present book are all mine – and so are the possible mistakes.

Prof. Dominique Charpin (Ecole Pratique des Hautes Etudes, Paris), gave me access to the structure of his ARCHIBAB Database, which was partly applied on my own database. For this, and his great patience with cryptic matters of database programming, I want to thank him warmly. I am also indebted to Dr. Antoine Jacquet (Ecole Pratique des Hautes Etudes, Paris) for his reading and commenting on part of the manuscript.

Finally, it is my pleasure to thank every member of the DFG Excavation Project Tall Šēḥ Ḥamad, who welcomed me as one of them for two years, either in Berlin or during the 2010 season, in which this manuscript was completed. For two years of intensive labor and constant friendship, I wish to thank Anja Fügert, Anja Kaeselitz, Arne Weiser, Chiara Schoch, Ernestine Weckend, Florian Matheis, Franziska Desch, Ibrahim al-Mulah, Janoscha Kreppner, Jens Rohde, Jessica Mahler, Jochen Schmid, Jörg Lemke, Kathrin Schmitt, Konrad Wita, Marina Pucci, Michael Fey, Nina-Ann Müller, Stefan Finke, Stefanie Tiltmann, Susanne Kunze, Tobias Schmidt and Wassim Alrez, as well as all the colleagues and students of the Institut für Vorderasiatische Archäologie und Altorientalistik of the Freie Universität Berlin. Gerne mal wieder!

Paris, December 1<sup>st</sup> 2010

## INTRODUCTION

This book is the result of a two-year (2008-2010) post-doctoral fellowship of the Berlin Excellence Cluster TOPOI (<http://www.topoi.org>), as a part of Research Program A-I-15 “Transformation in Northern Mesopotamia during the Transition from Late Bronze to Iron Age (12<sup>th</sup> to 10<sup>th</sup> centuries BCE)”, directed by Prof. Dr. Hartmut Kühne (Freie Universität Berlin, Institut für Vorderasiatische Archäologie). It focuses on cuneiform evidence related to climatic and environmental changes in Upper Mesopotamia during the Late Bronze and Early Iron Age – that is, on the transition between the Middle- and Neo-Assyrian eras (13<sup>th</sup> – 10<sup>th</sup> c. BCE) –, under special consideration of the palaeo-environmental, archaeological and assyriological material gathered during the excavations at Tall Šēḫ Ḥamad on the Lower Ḥābūr, whose final publication is under way (Kühne [ed.] 1991 & 2008, Röllig 2008a). At a more personal level, this has been a follow-up to my previous achievements in Assyriology, especially my 2006 PhD on *Rural Landscapes of the Middle-Euphrates' Valley in the 2<sup>nd</sup> Millennium BCE*, whose primary focus on Euphratean textual evidence of the Middle (Mari, Terqa) and Late (Emār, Ekālte) Bronze Ages had already guided my steps towards the Lower Ḥābūr in the Middle Assyrian period. My subsequent investment in Middle Assyrian studies while working as a scientific collaborator of Prof. Dr. Eva Cancik-Kirschbaum at the Freie Universität Berlin (2005-2007), substantiated by my participation at the DFG Aššur-Projekt directed by Prof. Dr. Johannes Renger, paved the way to a further enquiry of Middle Assyrian material directly related to my research interests, which finally blossomed under the auspices of TOPOI. Some results of my previous work are available in a series of articles published in journals or collective volumes, but the hazards of scholarship caused this study to be finalized before the earlier ones, which will be issued in the near future (Reculeau in preparation, Reculeau & Feller in preparation).

Interactions between environmental changes, climatic fluctuations, and human groups have been a matter of interest among Near Eastern Archaeologists and, in a more restricted way, Assyriologists, since the 1980's. Especially famous is the case of the alledged collapse of the Akkadian empire in the 22<sup>nd</sup> century BCE (Weiss et al. 1993; Kuzucuoğlu & Marro [ed.] 2007). The transition between the Late Bronze and Early Iron Ages was another case study of social answer to environmental stress, beginning for Mesopotamia with a pioneer article by Neumann and Parpola (1987). Since that date, palaeo-climatic studies have flourished, mostly based on material from neighbouring areas such as the Eastern Mediterranean or the Taurus and Zagros ranges, whereas Mesopotamia proper remains in many aspects a *terra incognita* of these studies. New evidence found its way into the field's literature, at least as far as Archaeology is concerned (Wilkinson 2004 and Kuzucuoğlu 2007), and the paradigms of the late 1980's have been slowly evolving towards a more complex apprehension of man/environments relationships. I will review briefly these paradigms, which have set the frame of my own research.

### *Climatic change and settlement in the Near East during the Late Bronze Age: the state of research*

Following a trend established since ca. the mid-1960's in Mycenaean studies, a correlation between climatic conditions and social change at the transition between Late Bronze and Early Iron Ages in the Near East has been first suggested by B. Weiss. He advocated that the

disintegration of hierarchized societies throughout the Eastern Mediterranean could not be explained only by the irruption of new peoples in the region, but required a broader impetus being susceptible to explain why all these societies at roughly the same time weakened, which turned out to be lethal for several of them. This was, according to him, to be sought in a lasting drought over Anatolia in the final centuries of the 2<sup>nd</sup> millennium BCE (Weiss 1982). This theory was later refined and applied to Mesopotamian civilizations (both Assyria and Babylonia) by Neumann and Parpola (1987). As far as Assyria is concerned, they proposed to explain the so-called “Dark Ages” of the Assyrian Empire, from ca. 1200 to ca. 900 BCE, and more especially the period between Tiglatpileasar I (1114-1076 BCE) and Adad-nīrāri II (911-891 BCE), in terms of increased climatic harshness. They suggested that about 1200 a notable warming occurred both in Europe and the Near East, which lasted until about 900, and was preceded (ca. 1500-1200 BCE) and followed (from ca. 900 BCE to the Hellenistic times) by centuries of comparative cool and humid conditions. Since the winter is the main rainfall season in the Near East, and warm winters tend to produce reduced amounts of rain, the change to a warmer climate between 1200 and 900 BCE had a negative effect on both the local agriculture and the steppe vegetation on which the nomads depend. The seminal nature of their article lies in its multi-disciplinary approach, combining palaeo-climatic studies with archaeological and textual material.

The main point of their demonstration relied on the correlation between changes in moisture in Europe (and at a lower level, in Africa and North-America) and in the Near East: by establishing such a link for modern periods, they suggest that cool episodes known in Europe and Africa in the second half of the 2<sup>nd</sup> millennium BCE, and especially in its last 3 centuries, would be echoed in the Near East (Neumann & Parpola 1987:165-171). Archaeological support for this hypothesis was detected in the final Late Bronze Age layer at Ugarit, interpreted by Schaeffer as a testimony of dryer conditions, and in an episode of higher soil salinization in Babylonia, pointed out by Adams and Jacobsen (1958) for the period between 1300 and 900 (*ibid.*:164-165). A confirmation was found in the streamflows of the Tigris and Euphrates as reconstructed by Kay and Johnson in 1981 on the basis of proxy data from the Lake Van core. They suggested that high waters around 1350-1250, correlated to an important level of moisture, were followed by an abrupt low level with minima around 1150, hence at a dryer period which was followed by a renewed rise after 950 BCE. This would also be echoed by shifts in the course of the Euphrates around 1255 (*ibid.*:164). Finally, several palaeo-botanical indicators were suggested to indicate increased aridity in Northern Syria (Bintliff 1982) and the Negev (Lipschitz et al. 1979, unpubl.), whereas some discordances regarding estimates of the runoff/evaporation ratio of the Dead Sea were discarded as of little significance (Neumann & Parpola 1987:165). These archaeological and natural scientific arguments were confronted with several mentions of nomadic incursions, poor or even lost harvests, droughts, etc. in cuneiform sources of the period (*ibid.*:171-177).

Neumann and Parpola’s study, followed two years later by further arguments regarding correlations between rainfall and streamflows (Alpert & Neumann 1989), has gained a great popularity among Assyriologists and Near-Eastern Archaeologists. The opposition between a warmer mid-2<sup>nd</sup> millennium BCE and a drier final episode towards the end of the millennium is echoed in many recent studies on the Middle Assyrian period (ex. gr. Bagg 2000:87, Freydank 2009, Kühne 2010). However, the dramatic effects of the drought suggested for the last

centuries of the Bronze Age have been discussed on the basis of recent discoveries and new theoretical approaches.

The main point regards the very notion of weakening of the Assyrian Empire in the so-called “Dark Ages” following the death of Tukultī-Ninurta I (1233-1197 BCE). The traditionally assumed position of an empire reduced to the bare nucleus of Assyria, except for the short-lived conquests of Tiglatpileсар I and Aššur-bēl-kala, has been contradicted by excavations and surveys, especially in the Syrian Ġazīra. They show that an Assyrian presence of some sort was maintained on the Middle Euphrates and the Ḥābūr way after Tukultī-Ninurta I's murder. As has been stressed by Kühne, a proper territorial control was organized on the Lower Ḥābūr by the Assyrians in the 13<sup>th</sup> century BCE, with a three-tier settlement system along a regional canal on the eastern bank of the Ḥābūr, and Tall ʾUmm ʿAqrēbe as an outpost on the steppe road to the Assyrian capital. If we still lack textual evidence of the Assyrian presence in Dūr-Katlimmu after 1150, pottery shows that the site was maintained, apparently under direct Assyrian rule, and its mention in the ‘Broken Obelisk’ demonstrates that this was also the case at the time of Aššur-bēl-kala in the first half of the 11<sup>th</sup> century. More important, the whole settlement pattern of the Middle Assyrian time remained untouched after 1200 – including the steppe site of Tall ʾUmm ʿAqrēbe, which was in use at least until the second half of the 12<sup>th</sup> century, even if pottery from the second half of the 12<sup>th</sup> century is present in a more limited number (Kühne 1995). Upstream on the Ḥābūr, local dynasties, vassals of the Assyrians, were established at that time in the Land of Māri, around Ṭabēte (Tall Ṭaʿbān) and Dūr-Aššur-kettī-lēšir (Tall Bdēri), as well as in Šadikanni (Tall ʿAḡāḡa). This questions the effects of the assumed dry episode: even a steppic settlement like Tall ʾUmm ʿAqrēbe seems to have been little affected during the 12<sup>th</sup> century. Unfortunately, the transition between the later MA III pottery, roughly contemporary with Tiglatpileсар I, and phase A of Neo-Assyrian pottery prior to the end of the 9<sup>th</sup> century remains difficult to apprehend. It seems nevertheless that the settlement pattern in the earlier Iron Age, similar to that of the late Middle Assyrian one, suggests a smooth transition, marked more by continuity than by disruption (Bernbeck 1993).

Doubts concerning the weakening of Assyria are echoed by several surveys showing that the “crisis years” (Ward & Sharp-Joukowsky 1992) which marked the end of the Late Bronze Age presented many regional discrepancies, both in forms and dates. In many regions, the decline in population was effective long before the 12<sup>th</sup> century BCE. In Northern Iraq, it began at the end of the Middle Bronze Age and lasted through the Late Bronze Age, making the period of Assyrian domination a historical minimum of occupation (Wilkinson & Tucker 1995). This phenomenon is paralleled in Inner Syria (McClellan 1992), in the Ḥābūr plain (Meijer 1986; Eidem & Warburton 1996) and in the Balīḥ valley. Southern irrigated districts suffered more than northern rain-fed ones (Lyon 2000), which seems contradictory to climate-induced depopulation. Along the Euphrates, in what is nowadays the zone of uncertainty for rain-fed agriculture between the Tabqa dam and the Great Bend of the Euphrates, the Late Bronze Age is marked by a decline in number of settlements, accompanied by a phenomenon of nucleation inside a fortification (Tall Munbāqa/Ekālte, Tall Maskana/Emār, etc.; Wilkinson 2004:194). However, texts show that these sites were surrounded by rural villages which left no archaeological traces (Mori 2003; Reculeau 2008a). In North-Western Syria, decline seems to have been less effective, even for sites in marginal zones like Tall ʾUmm al-Marra, and the 1200 ‘crisis’ appears to have been short-lived and soon followed by a period of vitality (see for Tel Afis; Mazzoni 1995).



These differences in rhythm and amplitude of weakening and resilience of Late Bronze Age societies have led scholars to insist on the fact that settlement decline traditionally attributed to the 12<sup>th</sup> century BCE had deeper roots, and that the whole second half of the second millennium BCE could be seen as a period of depopulation (see especially McClellan 1992 and Wilkinson 2004:187-188). This does not imply a complete challenging of Neumann and Parpola's theories, but more an adjustment in terms of chronology. Wilkinson (1995:151) pointed out that the dates they used rely on proxy data from the Lake Van core, which has been re-dated in 1991 by van Zeist and Bottema, who suggested a downward shift of ca. 1700 years. New studies of Lake Van material suggest that cooler and wetter conditions prevailed in the Near East from the 8<sup>th</sup> millennium down to 6700 BP, marked by an expansion of woodland coverage. This coverage would have remained quite stable until the beginning of the Late Bronze Age (1450 BCE), marked by its progressive but constant decline (Bottema & Woldring 1990). Yet, as is often the case with pollen indicators, distinguishing between climatic and anthropogenic activities remains often a difficult task. In his recent synthesis on possible climatic changes in the 2<sup>nd</sup> millennium BCE, Wilkinson stressed a number of studies, based on material from Lake Van, the Eastern Mediterranean or the Israeli Soreq Cave, suggesting that after a meso-Holocene phase of slightly wetter conditions, atmospheric humidity began to decrease from the last third of the 3<sup>rd</sup> Millennium onwards; according to the Lake Van core, this general trend is affected by periods of more intensive droughts, to which the whole Late Bronze Age belongs (Wilkinson 2004:14-17).

*Natural Sciences, Archaeology and Cuneiform Texts:  
bringing together the dissimilar*

With insistence on palaeo-climatic studies, archaeological evidence and textual material related to climate and climatic change likewise, Neumann and Parpola have set the stage for a comprehensive study of Mesopotamian societies facing climatic stress. Yet, bridging the gap between theory and praxis can in the present case prove rather perilous. Not only is the nature of evidence studied by these respective disciplines very dissimilar, but they also operate at different scales, both geographical and chronological. Discrepancies between relative and absolute chronologies for Mesopotamian history in general, and the problematic sequence of Middle Assyrian eponyms in particular, only adds to the difficulties. The requirements of scholarly specialization also play their part, and no single scholar can pretend to master all the fields whose results have a word to say on the reconstruction of past climates. In that perspective, multi-disciplinary approaches such as the one conducted within Tall Šēḫ Ḥamad's excavations remain the necessary basis of our understanding of past environments, and cannot be replaced by a study based on one single discipline.

As an epigraphist and a historian, I felt that I needed to confront the results issued by Assyriology with those reached by scholars of other disciplines. By so doing, it soon appeared that palaeo-environmental studies from the last decades, and especially palaeo-climatic data, formed an important corpus of evidence which, to my knowledge, remains poorly known from scholars in my own field. This is why I decided to discuss in the present book not only cuneiform evidence, but also tried to offer the most comprehensive overview of the state of research on climatic and environmental reconstructions of the 2<sup>nd</sup> millennium BCE. From the beginning I was aware of the danger of presenting material and results sometimes well

beyond my personal competence. Yet, memories of an ancient training in geography at the Ecole Normale Supérieure in Fontenay/S'-Cloud (France) at least gave me the courage to confront myself with papers and evidence whose complexity at times made them as cryptic to me as a good old Middle Assyrian tablet might appear to a specialist of oxygen isotopes or diatoms. By so doing, I learned a lot, and try to share this knowledge with Assyriologists and Near-Eastern Archaeologists, while focusing on the period under study for the present book. I hope that I did not misunderstand a point or failed to report properly the authors' view in the process, and if I did I apologize and plead good will.

The presentation of environmental and climatic change in Upper Mesopotamia during the 2<sup>nd</sup> millennium BCE, forms the first part of this book, which is subdivided into three chapters. In the first one, I have sketched present-day geography of the area under study, recalling its main traits and insisting on the recent changes caused by anthropogenic activities, in order to give a picture of what might have been its 'natural' state in the present climatic conditions. The second chapter offers a synthetic view of different studies on Near-Eastern climate in the Middle and Late Bronze Ages. This is based on long-term sequences, pollen and palaeo-botanical samples and sediment archives (especially fluvial ones). The third chapter, at last, briefly presents climate reconstructions derived from a computer-based model called "Macrophysical Climate Modeling", which has been used to modelize the climates of Late Bronze Age Anatolia and Syria (Bryson & Bryson 1997 & 1999; Riehl & Bryson 2007).

The second part of the book presents the assyriological study proper, going back to evidence, matters and methods more familiar to me – as well as to most of the readers, I guess. Clay tablets written during the administrative operation known as the 'clearance of the grain-heap' (*pišerti karu'e*) register barley and wheat yields. They are the most pertinent textual indicators of climate and potential climatic change in the Middle Assyrian period. They offer the basis for a quantitative study of yield variations during the 13<sup>th</sup> century BCE, an opportunity rarely met in Mesopotamian studies. Thus, they give a more trivial point of view than that of literary texts and royal inscriptions – which had already been investigated at length by Neumann and Parpola. Several other directions of research had been first envisioned, especially regarding the distribution of wild species of plants and animals attested in archaeological and textual material, but it was finally decided, in accordance with Hartmut Kühne, that they required a detailed analysis which could not have been performed in due time.

Middle Assyrian yields have been an object of scholarly debate since Postgate's initial remarks on MARV 2 23 (Postgate 1990), and especially since Freydank's pioneer study of the *pišerti karu'e* documents of Aššur (Freydank 1994a); yet, the impetus of the present study was the publication by Röllig of material from Dūr-Katlimmu (Röllig 2008a), which expanded in an unprecedented way the number of available texts and opened the door to statistical analyses. The publication of Freydank's paper on Kār-Tukultī-Ninurta as an agrarian province (Freydank 2009), shed new light on the material, and guided part of my reflections.

The second part of this book is divided into chapters four to seven. In chapter four, I offer a reconstruction of the zones of dry-farming and irrigation agriculture in Upper Mesopotamia during the Late Bronze Age on the basis of the Middle Assyrian textual and archaeological

evidence. Analyses of the yields cover the three following chapters, with chapter five introducing several methodological issues related to yield reconstructions from textual evidence – with special emphasis on the bias caused by the nature of the documentation, the use of several different capacity units, and the problem of converting ancient units into modern ones. These points being established, I present in chapter six a synthetic view of Middle Assyrian yields documented throughout the kingdom, and conclude that the traditionally assumed correlation between higher yields and irrigation agriculture on the one hand, and lower yields and dry-farming on the other hand, is not confirmed by the evidence. Finally, I present in chapter seven two case studies, preceded by some remarks on Middle Assyrian chronology: the first on the Lower Ḥābūr over a period of ca. 40 years during the 13<sup>th</sup> century BCE, the second on Kār-Tukultī-Ninurta at the very end of that century. Both cases allow a reconstruction of highly irregular and globally poor yields in irrigated context, which in turn can be correlated with the long-lasting drought suggested by palaeo-climatic data for the whole Late Bronze Age – of which the dry episode of ca. 1200-1000 BCE appears rather as the terminal phase than as a change in climatic dynamics.