Climate, Landscape, Settlement and Society: Exploring Human-Environment Interaction in the Ancient Near East

Berichterstattung

Projektinformationen

CLaSS

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Zusammenfassung vom Kontext und den Gesamtzielen des Projekts

The CLaSS project investigates the relationship between climate fluctuations and the emergence of complex social and political formations over the last 8000 years. The focus is on the area known as the Fertile Crescent in the Middle East. Over the course of the period this area saw the emergence of cities, states and empires. Climate fluctuations are generally considered to be a significant factor in these changes because in pre-industrial societies they directly relate to food production and security. In the short term, ‘collapse’ events brought about by extreme weather changes such as droughts have been blamed for declines in population, social complexity and political systems.

Studies seeking to correlate social and climatic changes in the past tend to focus on highly localised analyses of specific sites and surveys or take a more synthetic overview at much larger, even continental, scales. The CLaSS project takes a ground breaking hybrid approach using archaeological data science (or ‘big data’) to construct detailed, empirical datasets at unprecedented scales. Archaeological settlement data, archaeobotanical data (plant and tree remains) and zooarchaeological (animal bones) data will be collated for the entire Fertile Crescent and combined with climate simulations derived from General Circulation Models. The resulting datasets represent the largest of their kind ever compiled, covering the period between 8000BP and 2000BP and an area of 600,000km2.

Collecting data at this scale allows us to compare population densities and distribution, subsistence practices and landscape management strategies to investigate the question: What factors have allowed for the differential persistence of societies in the face of changing climatic and environmental conditions? Answering this question can help us to understand what made past communities resilient to climate change, which may have lessons for today. For example, we can ask whether cities or rural settlements were more successful during climate downturns, or different kinds of political organisation, and try to understand why this is the case. Our datasets on plant and animal exploitation can tell us whether it is better to diversify and rely on lots of different types of food production, or to specialise, or some combination of the two across particular species. The long time depth of complex societies in the Fertile Crescent, as well as the abundance of archaeological and textual data, make it an ideal region in which to study these questions.

Arbeit, die ab Beginn des Projekts bis zum Ende des durch den Bericht erfassten Berichtszeitraums geleistet wurde, und die wichtigsten bis dahin erzielten Ergebnisse

We have designed and populated a database for the archaeological settlement data, which now contains about 40,000 sites. We have another 20,000 ready to go in and we estimate there could be as many as 100,000 by the end of the project. We' also produced a second population proxy dataset of radiocarbon dates, the Near Eastern Radiocarbon Dataset (NERD), which contains 11,000 radiocarbon dates. We've been experimenting with a technique called Summed Probability Distribution (SPD) modelling to turn these dates into population trends.

In the short term, we have been looking at the collapse of societies due to the Rapid Climate Change phase known as the 4.2kya event (Lawrence et al. 2021 PLoS ONE). This was a period of drought around 4,200 years ago, which some have argued resulted in the collapse of the Akkadian Empire, as well as urban abandonment and population decline. We used our settlement and radiocarbon dataset to see if this was really the case, and also looked at the periods before and afterwards to try to make sense of the 'collapse'. We were able to show that although there is a decline in population, in some areas communities actually thrived during the period of aridity. We showed that the real anomaly was not the collapse, but the period of unprecedented urban growth which preceded these declines.

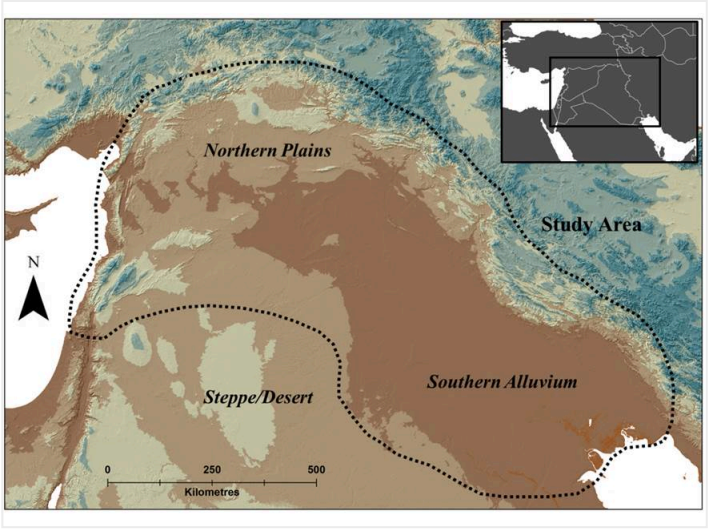
On the long term, we have published a paper (Palmisano et al. 2021) which showed that over the Holocene, the relationship between climate and population changes. For the first half of the Holocene, including after the emergence of agriculture, dryer periods cause population decline. This is what we would expect in a relatively arid environment such as the Middle East. However, during the second half of the Holocene this relationship gets much weaker, and population is decoupled from climate fluctuations. This coincides with the emergence of more complex social organisations, including cities, states and empires. This shows that more complex societies have a different relationship with climate – they are better able to ride out periods of aridity. The question is how did they do this?
In a paper published in Quaternary International (Gaastra et al. 2021) we show that the decoupling outlined above does not correlate with major changes in the types or proportions of plants and animals that past communities were eating. This is important because it suggests the resilience we see in the past was not due to changes in what was being eaten, but rather in how food was produced and organised. We have some interesting hints at this from our work comparing urban and rural sites, which shows that urban sites were likely reliant on rural sites for some animal products. It seems that one of the ways in which resilience was achieved was through larger and more integrated organisational systems. Our research has also looked at some specific sites and periods, including an article (Deckers et al. 2021) investigating olive oil production in the Levant.
Through the climate modelling we have snapshot simulations every 250 years for the last 6,000 years, and two simulations running from 6,000-3,000 and 3,000-1,000BP. We have used the snapshot simulations to look at the 4.2kya event in more detail (Cookson et al. 2019) and show that the event may not have had as significant an impact as some have claimed.

Fortschritte, die über den aktuellen Stand der Technik hinausgehen und voraussichtliche potenzielle Auswirkungen (einschließlich der bis dato erzielten sozioökonomischen Auswirkungen und weiter gefassten gesellschaftlichen Auswirkungen des Projekts)

The two major areas of novelty in the methodology of our project are the scale of the datasets collected, both in space and across time, and the integration of archaeological data with climate modelling. Although we are still in the data collection phase, the information we now have in our databases comprises some of the largest collections anywhere in the world. Over the next year we will continue adding to these datasets, and the aim is to make them available to academics and the public

at the end of the project.

So far, the project has made three major breakthroughs in interpreting our data. Firstly, the empirical support for the decoupling of climate and settlement, as laid out in Palmisano et al. 2021 is extremely significant. This is then supported by the recognition in Gaastra et al. 2021 that this decoupling was not achieved through changes in the types and proportions of plants and animals exploited. Together, these insights set up the next phase of research, which is to understand what did enable communities to overcome climate fluctuations.
The third important insight comes from Lawrence et al. 2021, which demonstrates that the so-called collapse at 4.2kya in Mesopotamia cannot be understood without expanding the spatial and temporal context. Our novel combination of evidence shows that declines in population and urbanisation did occur, but not uniformly, and that they should be understood as the bust of a preceding urban boom. This represents a new approach and new interpretation of the 4.2kya phenomenon.



Map of the study area

Euphrates River in Southern Iraq, with date palms in the background

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