

# Holocene rapid climate change and vegetation response in Cappadocia, Turkey

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## Background

Multi-proxy approaches to integrated regional studies of environmental variability during the late Glacial and Holocene can provide valuable insights into the ways that significant shifts in climate have affected natural



*Volcanic maar Nar Lake in Cappadocia, Turkey*

ecosystems, landscapes and human activities over decadal, centennial and millennial timescales. For the eastern Mediterranean region in particular, there is current and active debate between past climatic variations and vegetation dynamics during the humid phase of the early Holocene as well as the impacts that punctuated aridification events throughout the Holocene had on natural and cultural change in this

region. The eastern Mediterranean also has a long history of human occupation, so these landscapes have also been transformed by human-induced land cover changes. The extent to which climate change in Anatolia has caused natural environment change over these millennia, and how these changes have influenced and interacted with the emergence – and in some cases decline – of complex societies and civilizations (e.g., Hittites) and the extent to which complex societies and civilisations impacted upon the natural environment are questions that still need to be addressed by archaeologists, palaeoecologists and palaeoclimatologists. Addressing research questions such as these requires a multi-proxy approach where continuous and well-dated proxy records of climate and vegetation change from the same core sequence can be compared with systematic archaeological and historical records of human settlement. The Cappadocia region of Anatolia is well suited to this task. It contains an exceptionally rich and well-studied archaeological record (e.g., Allcock and Roberts, 2014), and also possesses volcanic maar lakes, which contain an important suite of predominantly laminated sediments which preserve an archive of climate variations, vegetation, land use, and soil erosion.

## Aim

This PhD research project builds upon previous work by the project supervisors at the sites of Eski Acıgöl and Nar Gölü, lakes in the Cappadocian Volcanic Province of Anatolia (Turkey). Recent high resolution



*Annually laminated lake sediments from Nar Gölü*

reconstructions of climate change reaching back to 13.8 Ka BP, produced from multi-proxy analysis of the sediments from the key study site of Nar Gölü, show for example that the transition into the Holocene occurred in less than 200

years, with over half the shift in oxygen isotopes occurring in just 9 years (Dean *et al.*, 2015; Roberts *et al.*, 2016). Our highly resolved, partially annually laminated, sediment record will allow for high resolution reconstructions of climate-environment-human interactions over the course of the Holocene, focussing in on the 9.3, 8.2, 4.2 and 2.8 Ka events. The research student will work as part of a collaborative research project between the Universities of Birmingham, Hull and Isparta (Turkey). Specifically, this PhD project will focus upon pollen and charcoal analyses as the key proxy indicators to investigate human-environment interactions. To improve calibration, fossil pollen will be analysed in conjunction with modern pollen retrieved from core surface samples, moss samples and Tauber pollen traps that have been deployed in the Nar catchment since 2010. Results will then be compared with existing  $\delta^{18}\text{O}$  climate (Dean *et al.*, 2015) and archaeological data (Allcock and Roberts, 2014). Excellent laboratory facilities are available in the School including modern palynological processing and microscopy laboratories. You will receive training in relevant palaeoecological field and laboratory techniques. Opportunities will be provided to obtain teaching experience as part of the project.

## References

- Allcock, S. and Roberts, C.N. (2014) Changes in regional settlement patterns in Cappadocia (central Turkey) since the Neolithic: A combined site survey perspective. *Anatolian Studies* 64, 33-5.
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- Roberts, C.N., Dean, J.R., Eastwood, W.J. *et al.* (2016) A tale of two lakes: a multi-proxy comparison of Late Glacial and Holocene environmental change in Cappadocia, Turkey. *Journal of Quaternary Science* 31, 348-362.