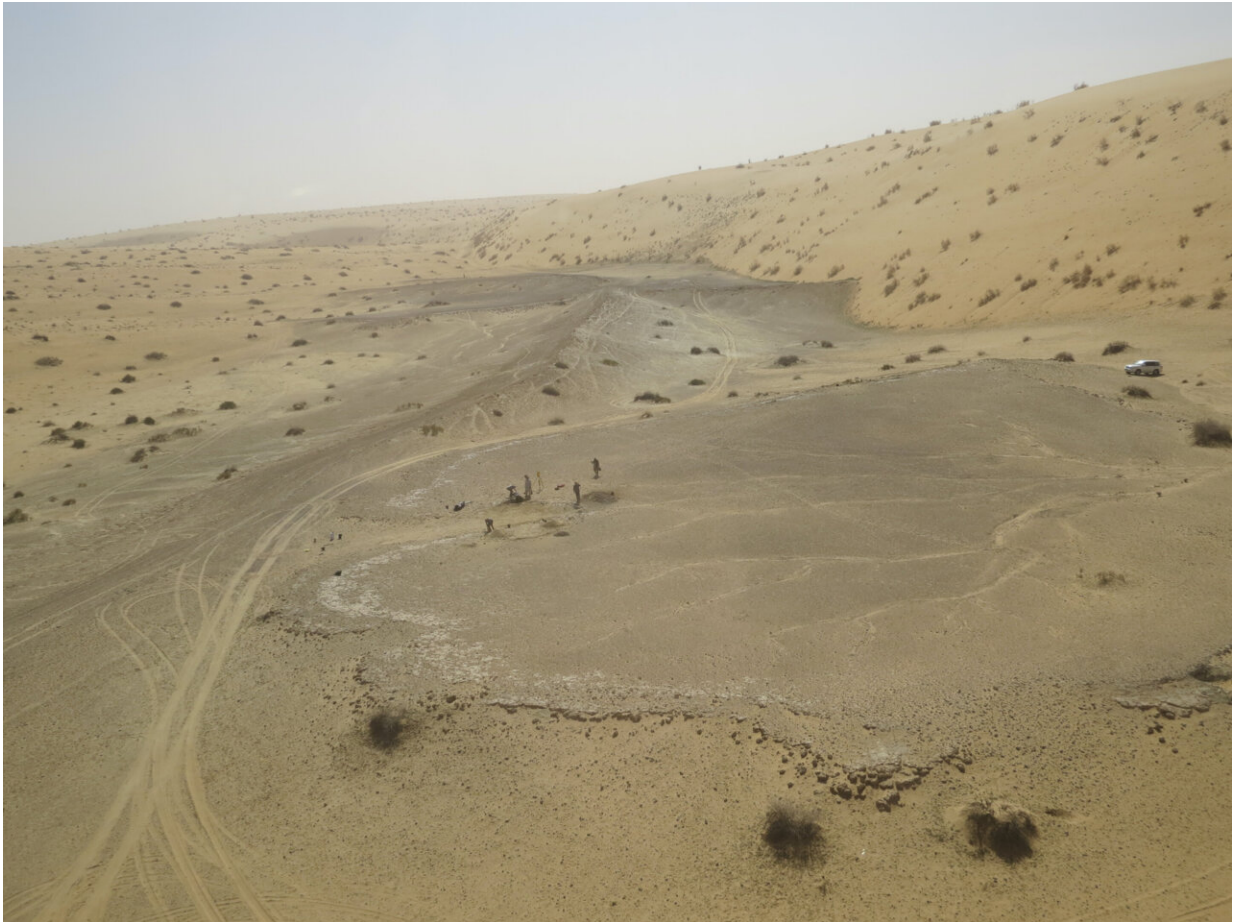


# Prehistoric climate change repeatedly channelled human migrations across Arabia

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The site of Khall Amayshan 4 in northern Saudi Arabia, where evidence of repeated visits by early humans over the last 400,000 years was found, associated with the remains of ancient lakes. Credit: Palaeodeserts Project (Michael Petraglia)

Recent research in Arabia—a collaboration between scientists at the Max Planck Institute for the Science of Human History in Jena, Germany, the Heritage Commission of the Saudi Ministry of Culture, and many other Saudi and international researchers—has begun to document the incredibly rich prehistory of Saudi Arabia, the largest country in Southwest Asia. Previous research in the region has focused on the coastal and woodland margins, while human prehistory in the vast interior areas remained poorly understood.

The new findings, including the oldest dated evidence for humans in Arabia at 400,000 years ago, are described as a breakthrough in Arabian archaeology by Dr. Huw Groucutt, lead author of the study and head of the "Extreme Events" Max Planck Society Research Group in Jena, Germany, based at the Max Planck Institute for Chemical Ecology.

The discovery of thousands of stone tools reveals multiple waves of human occupation and shows changing [human culture](#) over time. At the site of Khall Amayshan 4 (KAM 4), nestled in a hollow between large dunes, researchers found evidence for six phases of lake formation, five of them associated with stone tools made by early humans at around 400,000, 300,000, 200,000, 100,000, and 55,000 years ago. Each phase of human occupation is characterized by a different kind of material culture, documenting the transition from the Lower Paleolithic Acheulean 'handaxe' culture to different kinds of stone flake-based Middle Paleolithic technologies. Excavations at the Jubbah Oasis, 150 km to the east, also recovered stone tools, dating to 200,000 and 75,000 years ago.



A 400,000 year 'handaxe' stone tool from Khall Amayshan 4. Credit: Palaeodeserts Project (Ian Cartwright)

## Green Arabia

The dating of the archaeological sites—achieved primarily through a technique called luminescence dating, which records the length of time since tiny grains of sediment were last exposed to sunlight—shows that each occupation dates to a time when rainfall is known to have increased in the region. In addition, all of the stone tool assemblages are associated with the distinctive sediments produced by freshwater lakes. The findings therefore show that, within a dominant pattern of aridity, occasional short phases of increased rainfall led to the formation of thousands of lakes, wetlands, and rivers that crossed most of Arabia, forming key migration routes for humans and animals such as hippos.

While today the Nefud desert is a very arid region, deep hollows between the large sand dunes created places for small lakes to form

during occasional increases in rainfall. As a result, the Nefud region was periodically transformed from one of the most uninhabitable parts of Southwest Asia into a lush grassland that provided opportunities for repeated population movements.



A storm arrives during archaeological excavation of the remains of ancient lake in northern Saudi Arabia, where ancient humans lived alongside animals such as hippos. Credit: Palaeodeserts Project (Klint Janulis)

## Wider implications

Unlike bones and other organic materials, [stone tools](#) preserve very easily, and their character is largely influenced by learned cultural



behaviors. As a result, they illuminate the background of their makers and show how cultures developed along their own unique trajectories in different areas. The Khall Amayshan 4 and Jubbah Oasis findings reflect short-lived pulses of occupation that represent the initial phases of migration waves.

Each phase of human occupation in northern Arabia shows a distinct kind of material culture, suggesting that populations arrived in the area from multiple directions and source areas. This diversity sheds unique light on the extent of cultural differences in Southwest Asia during this timeframe, and indicates strongly sub-divided populations. In some cases the differences in material culture are so great as to indicate the contemporary presence of different hominin species in the region, suggesting that Arabia may also have been an interface zone for different hominin groups originating in Africa and Eurasia. Animal fossils indicate a similar pattern: although the north Arabian fossil record shows a prominent African character, some species came from the north, while others represent long-time residents of Arabia.

The findings highlight the importance of filling in the gaps in the hominin map. "Arabia has long been seen as empty place throughout the past," says Dr. Groucutt. "Our work shows that we still know so little about human evolution in vast areas of the world and highlights the fact that many surprises are still out there."

"It's remarkable; every time it was wet, people were there," says project leader Prof. Michael Petraglia, from the Max Planck Institute for the Science of Human History. "This work puts Arabia on the global map for human prehistory," he adds.

The study is reported in *Nature*.

**More information:** Multiple hominin dispersals into Southwest Asia

over the past 400,000 years, *Nature* (2021). [DOI: 10.1038/s41586-021-03863-y](https://doi.org/10.1038/s41586-021-03863-y) ,  
[www.nature.com/articles/s41586-021-03863-y](https://www.nature.com/articles/s41586-021-03863-y)

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