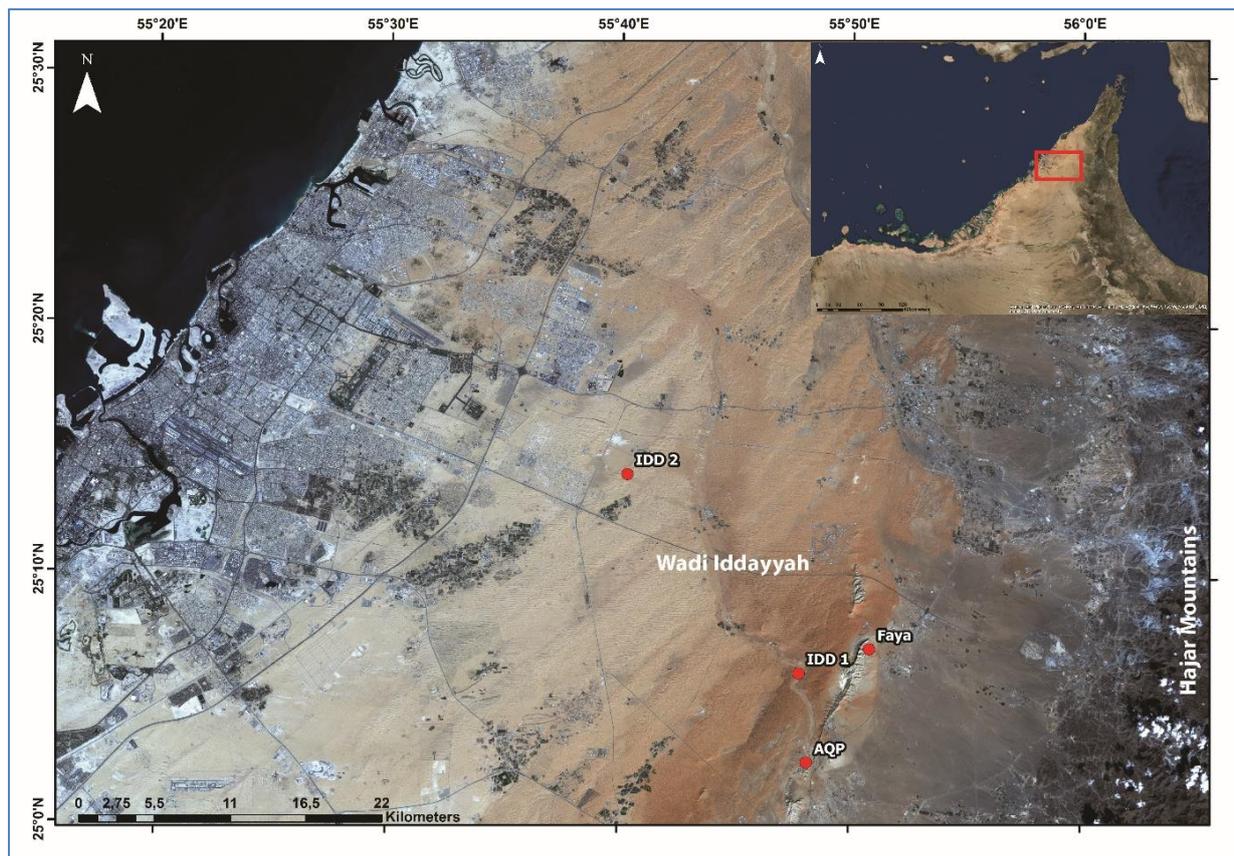


# A chronological investigation of palaeoenvironmental change in Wadi Iddayyah, UAE

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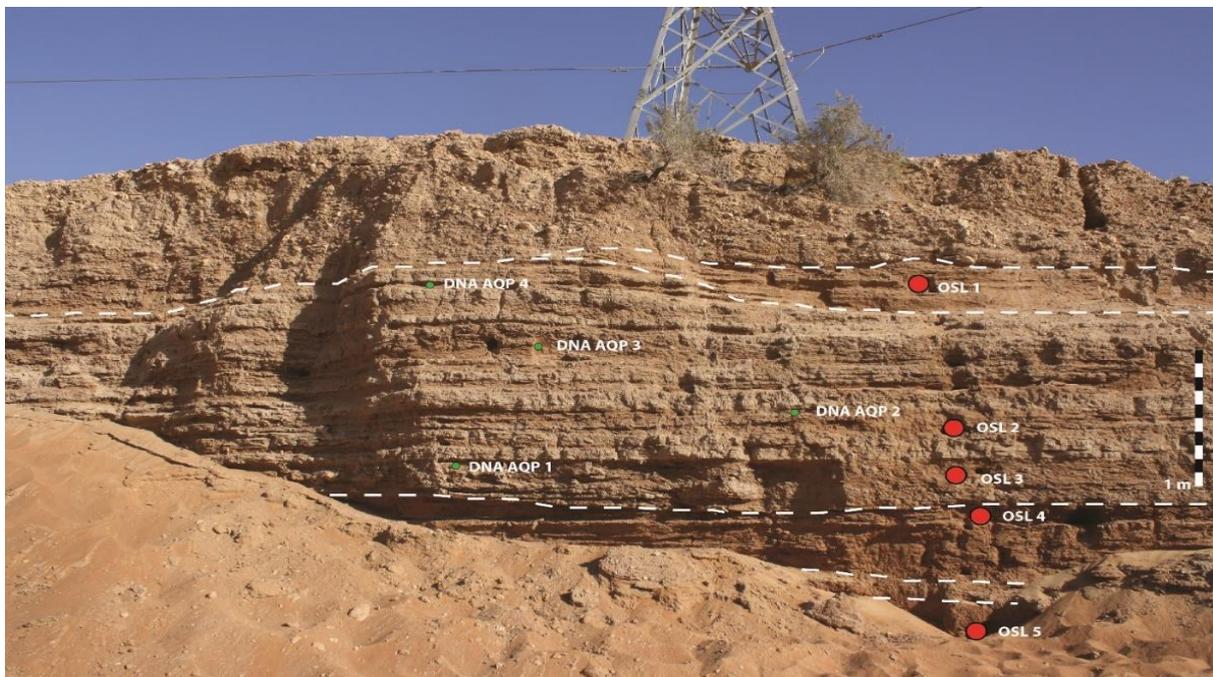
Arabia is now recognised as an important geographical location with respect to early human demography (Armitage et al., 2011; Groucutt et al., 2015), with some suggesting that periods of climatic amelioration facilitated important demographic shifts by creating conditions more conducive to seasonal range expansions (Parton et al., 2013, 2015). Despite this, spatial and temporal heterogeneity in Arabian palaeoclimatic records mean that our understanding of climate change during key periods in the Late Pleistocene (e.g. Marine Isotope Stage 3) is based on a handful of securely dated records. To help address this, this project will generate new independent, age-constrained, empirical data from three exposed, stratified sequences of fluvial gravels, silts and sands along an unexplored ~30 km section in Wadi Iddayyah, UAE (Figure 1). The system is the main drainage feature within the Jebel Faya complex and as such offers a unique opportunity to study the relationship between climate change and long-term (130 ka) human occupation in the region.



**Figure 1: Map showing the location of Wadi Iddayyah (Copernicus Sentinel-2 data 2017). Inset is a general overview of the study area in the UAE (Esri Basemap 2018)**

Previous palaeoclimate work in the Wadi Iddayyah region recorded several episodes of lake formation during MIS 3, corresponding with phases of early human occupation at Jebel Faya (Parton et al., 2013). Given the potential importance of the drainage network for understanding climate-human demography in Arabia, a 30 km stretch of the wadi was surveyed in March 2018, leading to the identification of three keys sites for further investigation.

The first site, Aqabah Pylon (AQP) (N25°2.569' E055°48.166'), is located at the junction of Wadi Iddayyah and Wadi Baraq and comprises ~5 m of fluvial gravels, sands and silts (Figure 2). Initial inspection of the section suggests the sequence has a similar stratigraphy to the lake deposits reported by Parton et al. (2013), who recorded five separate phases of lake formation between 61 – 58 ka. The chronology of the site will be confirmed via Optically Stimulated Luminescence (OSL) dating, which will allow us to correlate the two sequences, and further palaeoenvironmental investigation conducted in the laboratory. The investigation of the vegetation remains using both phytolith and eDNA analyses will help determine the stability and duration of the flooding episodes identified at the site and thereby the extent to which each may have facilitated the expansion of early human populations across the landscape.



**Figure 2: Aqabah Pylon (AQP) section showing the position of the OSL (red circles) and eDNA (green circles) samples.**

The second site, Wadi Iddayyah 1 (IDD 1) (N25°6.135' E 55°47.820'), is located on the edge of the main wadi channel and comprises ~3.80 m of aeolian sands (Figure 3). The sequence shows several distinct changes in aeolian deposition which will be investigated through palaeoenvironmental analyses. The chronology of the site will provide important information on the timing of dune mobilization and the associated interaction of aeolian and fluvial processes along the wadi.

The third site, Wadi Iddayyah 2 (IDD2) (N25°14.039' E55°40.343'), is a series of fluvial terraces (Figure 4) which run along the right-hand side of the wadi. The terraces reach a total thickness of ~3 m and are comprised of alternating layers of sands and silts. Determining the age of the terraces and thus the sequence of terrace deposition will provide important information on the timing of phases of fluvial activity within the wadi.



**Figure 3: Wadi Iddayah 1 (IDD 1) section showing the location of the OSL samples (red circles).**



**Figure 4: Wadi Iddayah 2 (IDD 2) fluvial terraces A to C**

The sections at each site were logged in detail and sampled for further laboratory investigation. Tube samples were also extracted for OSL dating and eDNA samples collected using small DNA free tubes. A total of 55 samples were collected from the three sites for palaeoenvironmental (sedimentological and geochemical) investigation. This work is currently being undertaken at Oxford Brookes University. OSL dating will be performed by K. Dähling at the University of Freiburg, Germany, under the supervision of Prof. Frank Preusser.

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