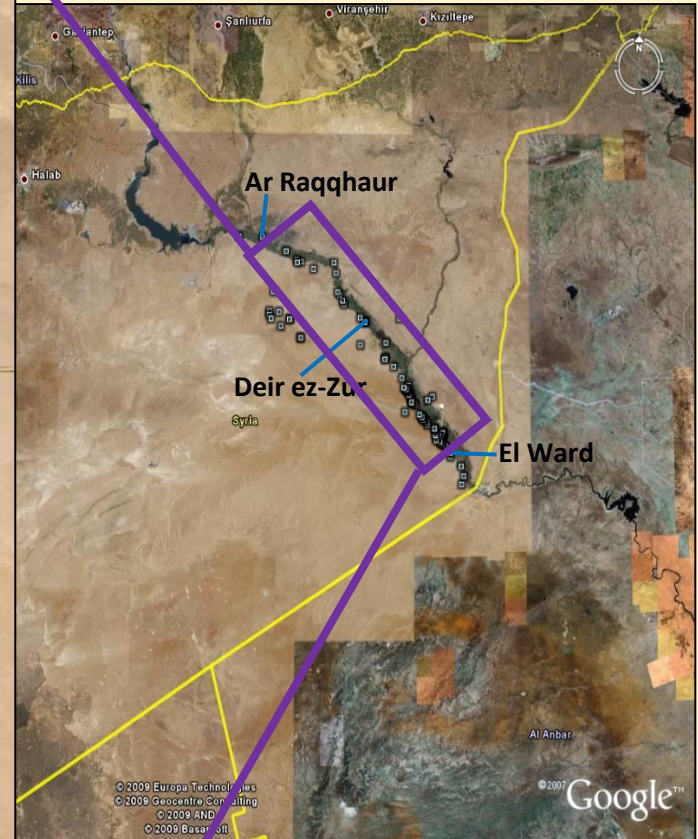


# Big river & Quaternary deposits: A sedimentary study of the Euphrates river system

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Dominic Tatum



# Introduction: The Euphrates



# Stratigraphy

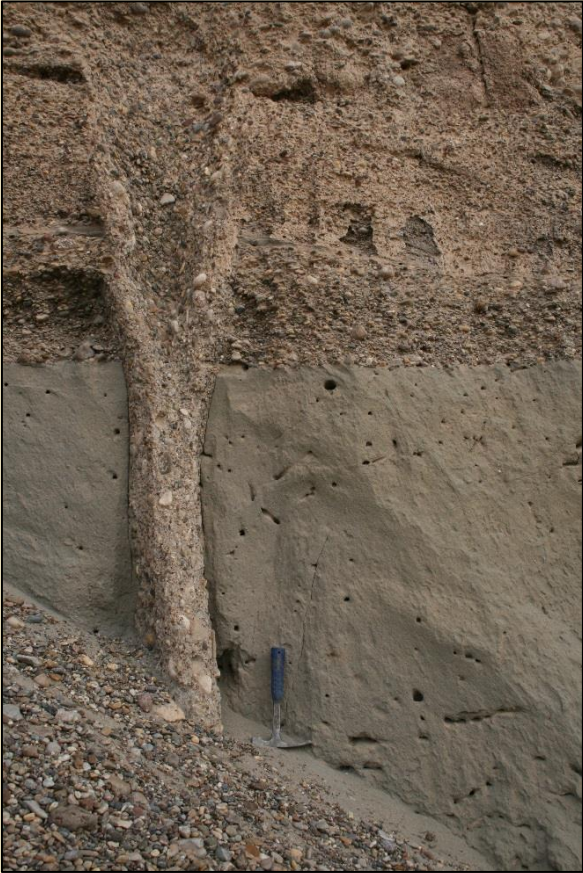


Pliocene  
Mayadin Formation



Pleistocene  
Al Furat Group

# Examples of facies



# Examples of Facies architecture



**Lateral fluvial bar**

**Size of feature: ~ 15 m preserved in section**

# Big rivers and Quaternary deposits:

## A sedimentary study of the Euphrates river system

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### 1. Introduction

There is interest of using sedimentary architecture to determine the presence of big river (>1000 km) systems in geological deposits. Miall (2006) suggests that you can use the scale of fluvial deposits, along with plate tectonic setting and provenance studies to identify large river systems in the sedimentary record. Whilst there are many studies on the scale of sedimentary features in modern rivers, it is known that the preserved deposits may differ from the active deposits. The nature of sedimentary deposits of Plio-Quaternary big river systems is less studied but arguably represents a better analogue for big river fluvial deposits in the sedimentary record. The Quaternary deposits of the Euphrates fluvial system are well preserved a present an opportunity to study the sedimentary architecture of a big river system

### 2. Study area

The Euphrates River has a length of ~2800km and is the longest river in SW Asia. From its source near Mount Ararat in NE Turkey, the Euphrates flow initially west and south, then SE across the Arabian Platform in Syria and Iraq to the Persian Gulf. This research focuses on the reach of the Euphrates stretching from Ar Raqqaq to El Ward (Figure 1).

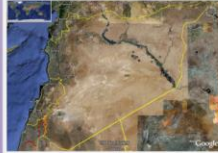


Figure 1 – Location map and geological map for Euphrates river system. Yellow lines show the Syrian border. Letters marked on geological map refer to sample sites (see 3).

### 3. Location sites

A total of six sites (4 Pliocene and 2 Quaternary) were identified as Neogene deposits in the Euphrates Valley during field studies. Sediments are preserved in cliff sections or exposed in quarries.



**Location A: Ar Rahbah castle and quarry**  
The Mayadin Formation is exposed for > 100 m laterally and 12 metres vertically in a cliff.



**Location C: Dewir**  
At Dewir, a 300 m long, 20 m high cliff exposes a full succession of sediments from the Doura Europis Formation through to the Mayadin Formation.



**Location E: Ayash Quarry At Aysah.**  
A quarry approximately 150 m wide exposes the sands and gravels of the Quaternary Al Furat Group.

**Location B: Ain Ain Road section**  
The Upper Pliocene Mayadin Formation is exposed for > 350 m laterally and 20 metres vertically in a road section.



**Location D: El Ward quarry exposure**  
The Mayadin Formation is exposed for 20 m laterally and ~10 m vertically in a quarry outcrop.



**Location F: Al Khawr Quarry**  
The Quaternary Al furat group is exposed in a large quarry. The faces of the quarry mainly face to the north and east



**4. Results** A total of 16 distinct facies have been recognised in the outcrops which have been further grouped into six facies groups as described below:



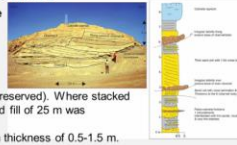
The facies were further grouped into the following facies associations (FA) and interpretative equivalence:

- FA1. Channels/braided channels- dominance of A + B1, B2, D1 and D4
- FA2. Meandering channels- dominance of B + A3, A4, C1, D1 and D4
- FA3. Abandoned channels- dominance of B and C + E2 (and F1)
- FA4. Overbank deposits- dominance of B and C, + E2 (and F1)
- FA5. Crevasse splay- dominance of B + C1
- FA6. Palaeosols- dominance of E2, + B3 and C2.

### 5. Discussion/ conclusions

#### Scale of sedimentary architecture

Fluvial bars: <15 m preserved in sections.  
Fluvial channels: Small channels- 50 m wide with fill depths of 5-7 m, large channels- up to 500 m wide and depths of 7 m (depth not fully preserved). Where stacked sequences were observed combined fill of 25 m was observed.  
Crevasse splays: widths of 30-60 m thickness of 0.5-1.5 m.



#### Impact on reservoir quality:

- Best deposits from large meandering rivers as demonstrated here by the Quaternary deposits
- Local tectonic features- hard to predict, introduce low permeability materials (gravels) into higher permeability (sands)
- Look for similar tectonic setting in geological past to find suitable fluvial reservoirs

#### To conclude:

There are issues for accurately determining scale of sedimentary features in big river deposits but the Euphrates river deposits provide excellent analogue sections over a relatively extensive area.

Sedimentary architecture indicates that the Pleistocene system was of similar size to the modern fluvial system but a higher energy system

The best quality deposits come from Quaternary deposits which were deposited by a large meandering river.