



Why do ancient aqueduct carbonate deposits matter?

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How did the Roman aqueducts function successfully for centuries?





Hierapolis, Turkey



Ancient Aqueduct Carbonate

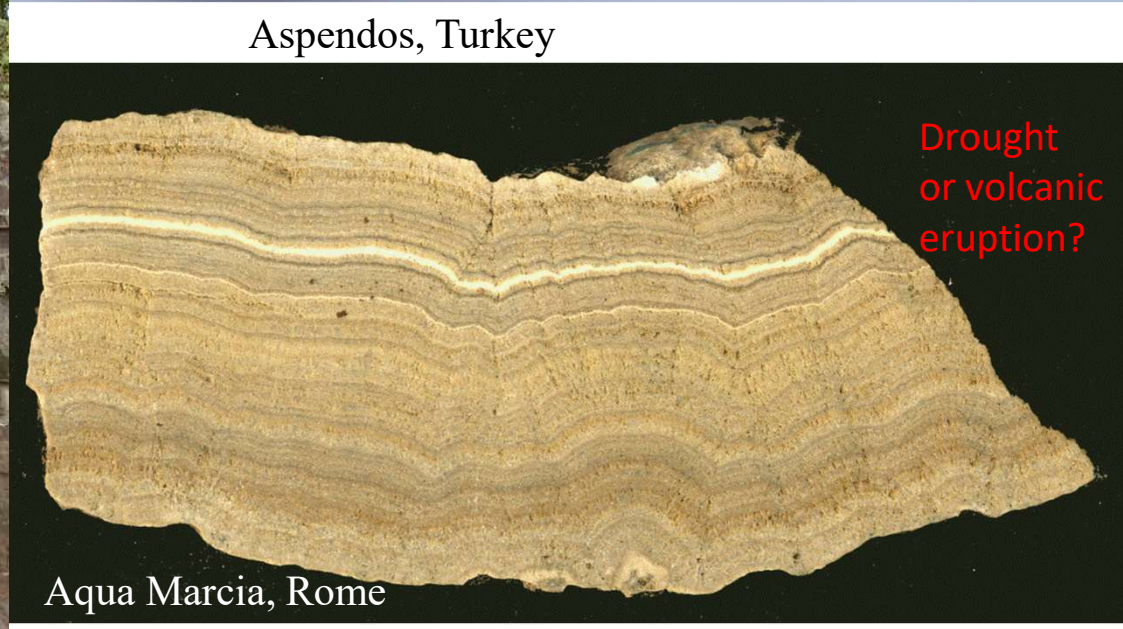
earthquake



Laodicea, Turkey



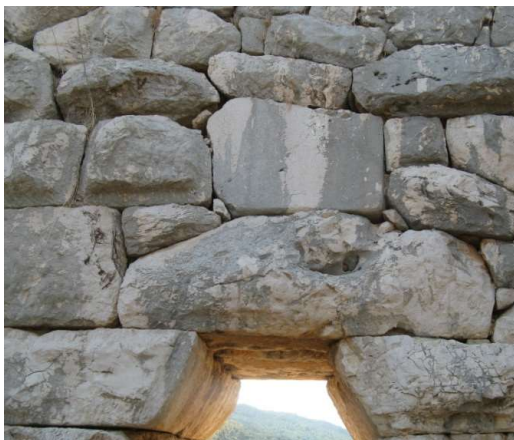
Köln, Germany



Aspendos, Turkey

Drought
or volcanic
eruption?

Aqua Marcia, Rome



Kalksinter



Events

start of flow

68AD earthquake

end of flow

Governor

V. Fl. Eprius Marcellus

Sextus Marcius Priscus

Emperor

Claudius

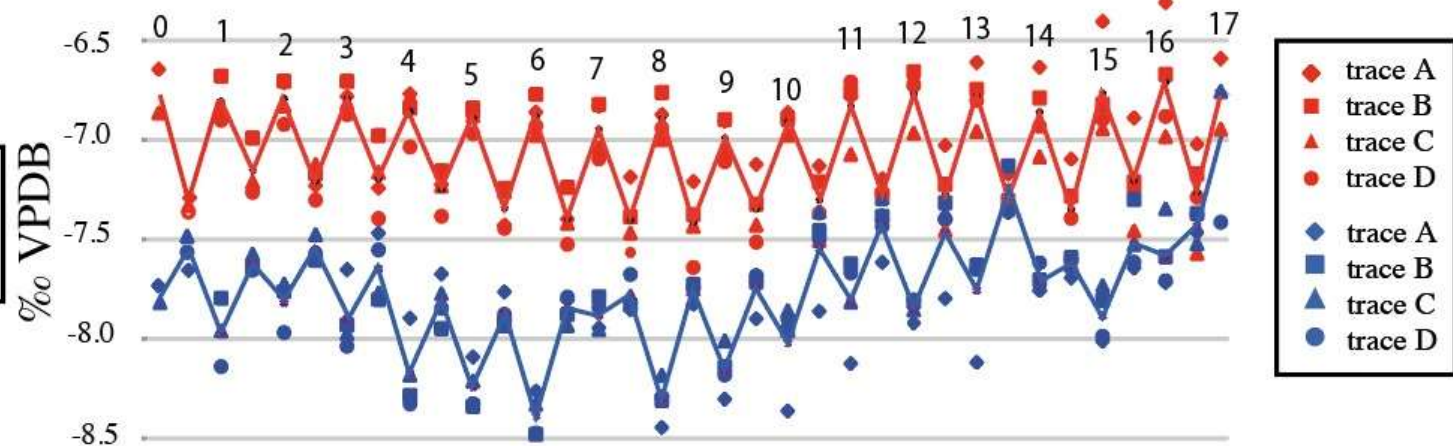
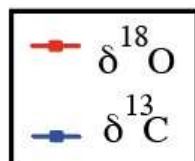
Nero

GOV Vespasian

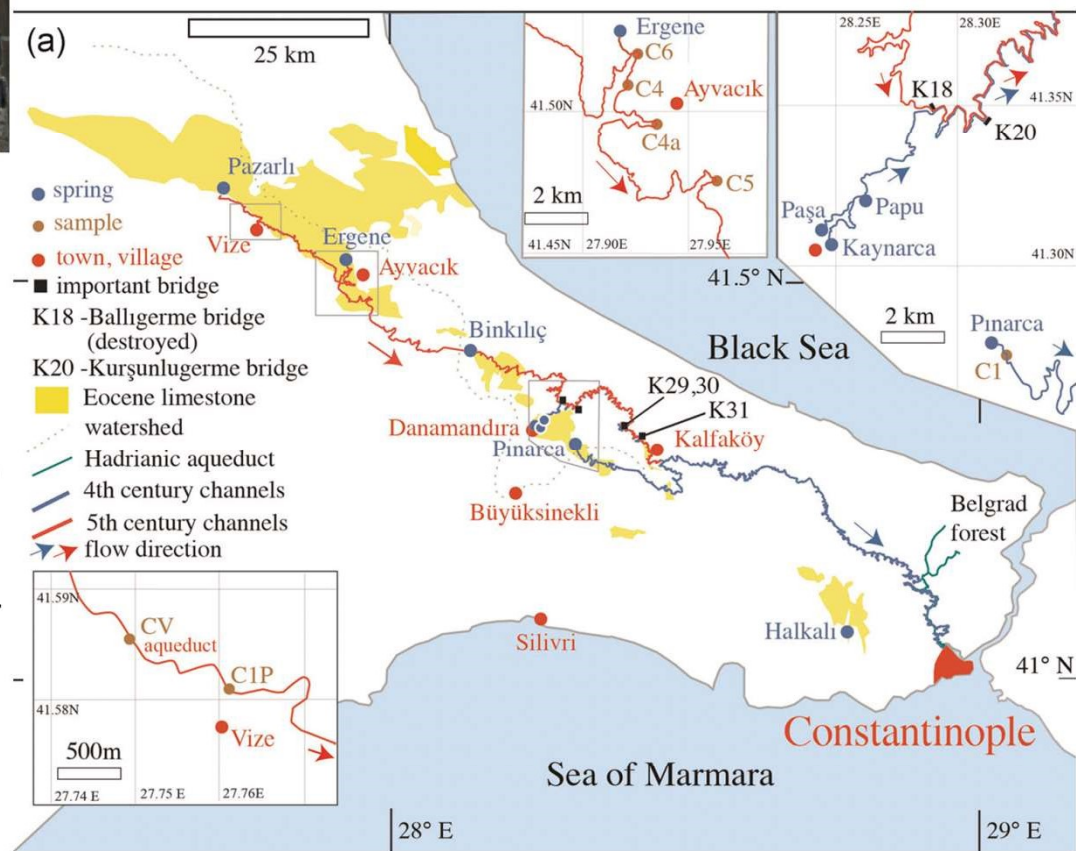
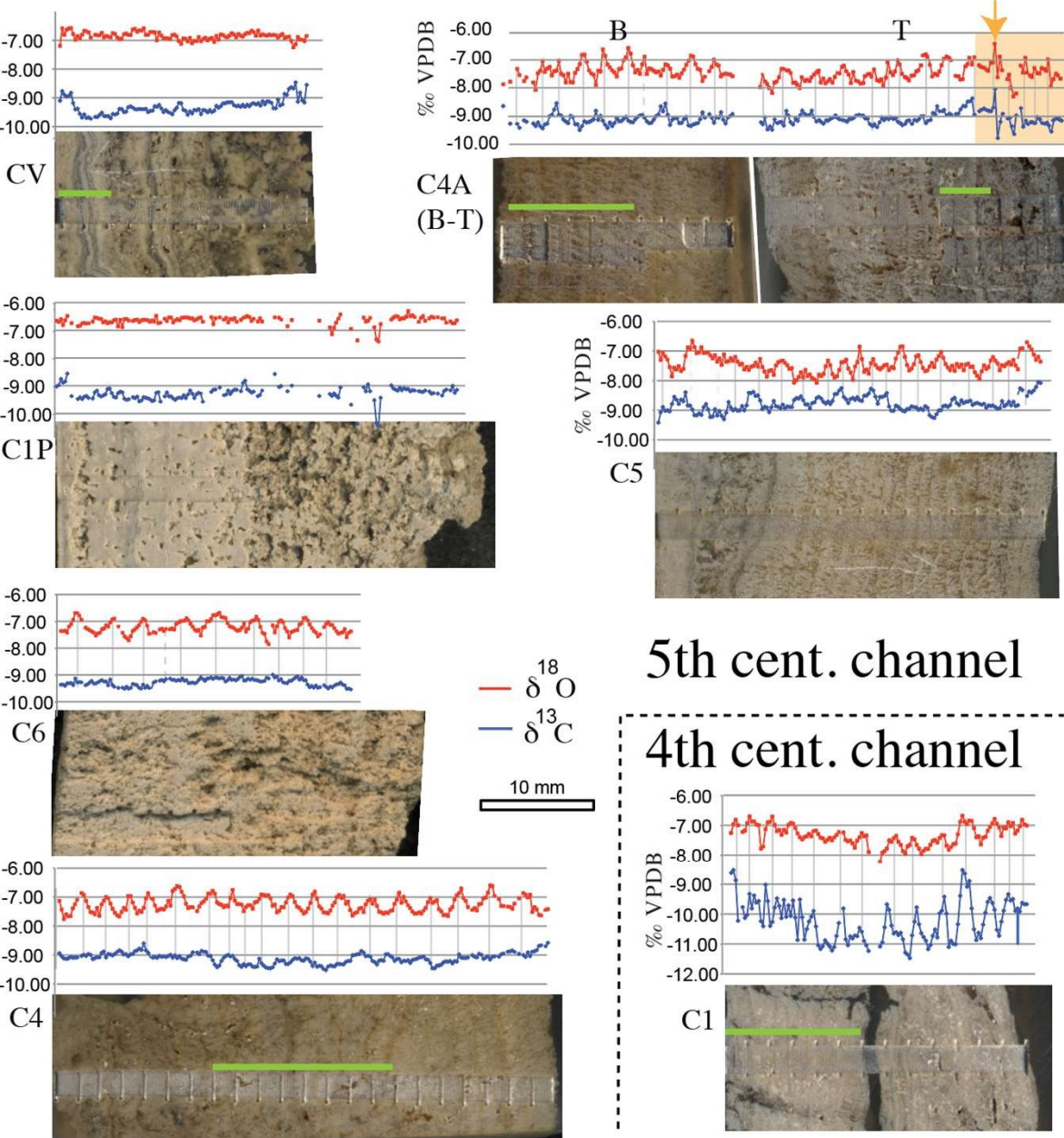
Year

| | | | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | AD |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|

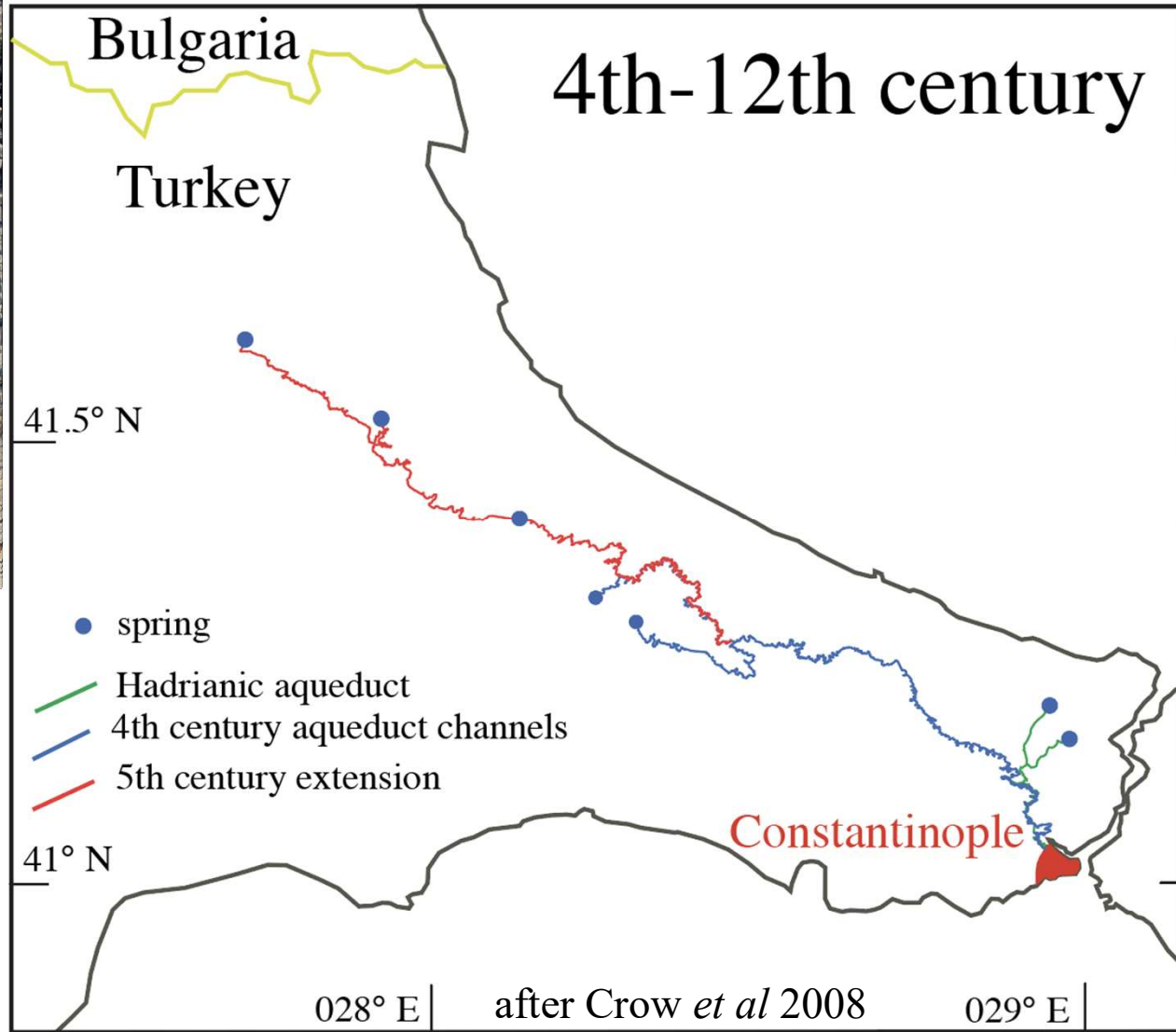
Stack



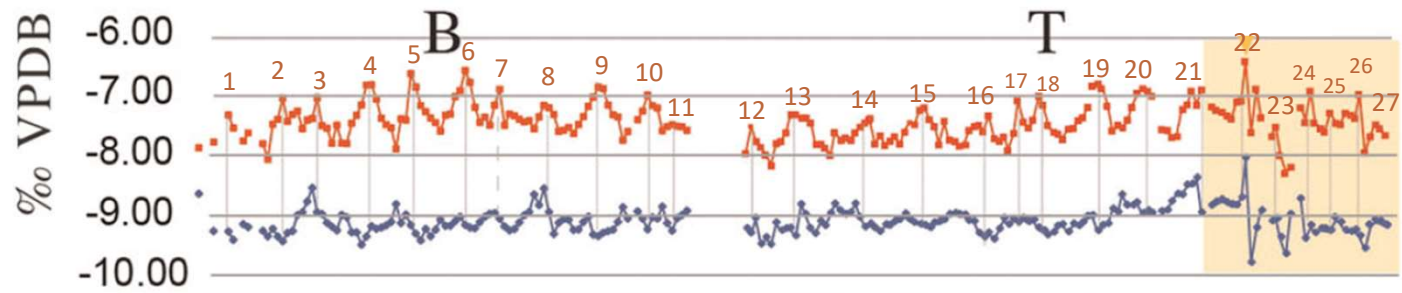
Ancient earthquake: *Patara* aqueduct, Turkey



Valens aqueduct, Turkey



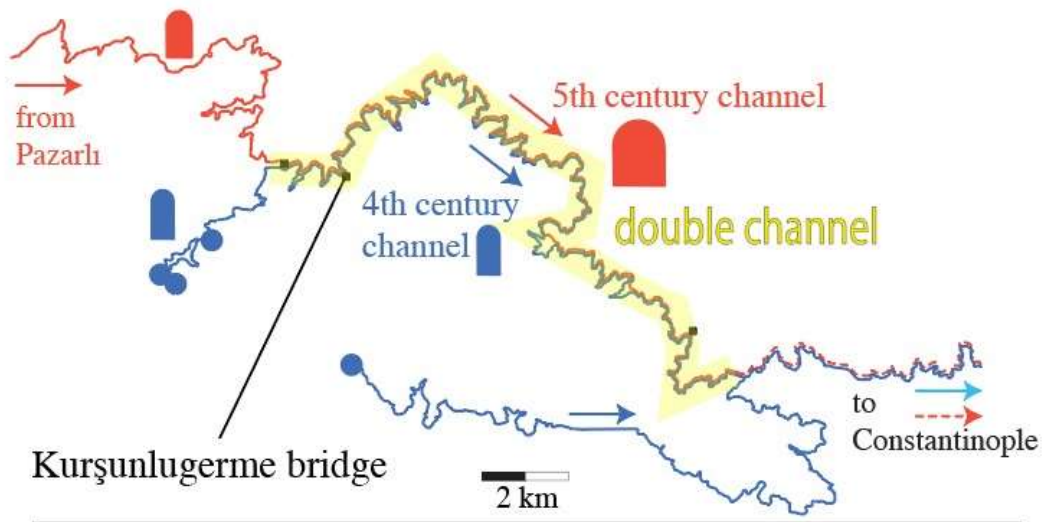
The longest aqueduct of the ancient world...426km!



C4A
(B-T)



27 years of service...?



Valens aqueduct - Constantinople

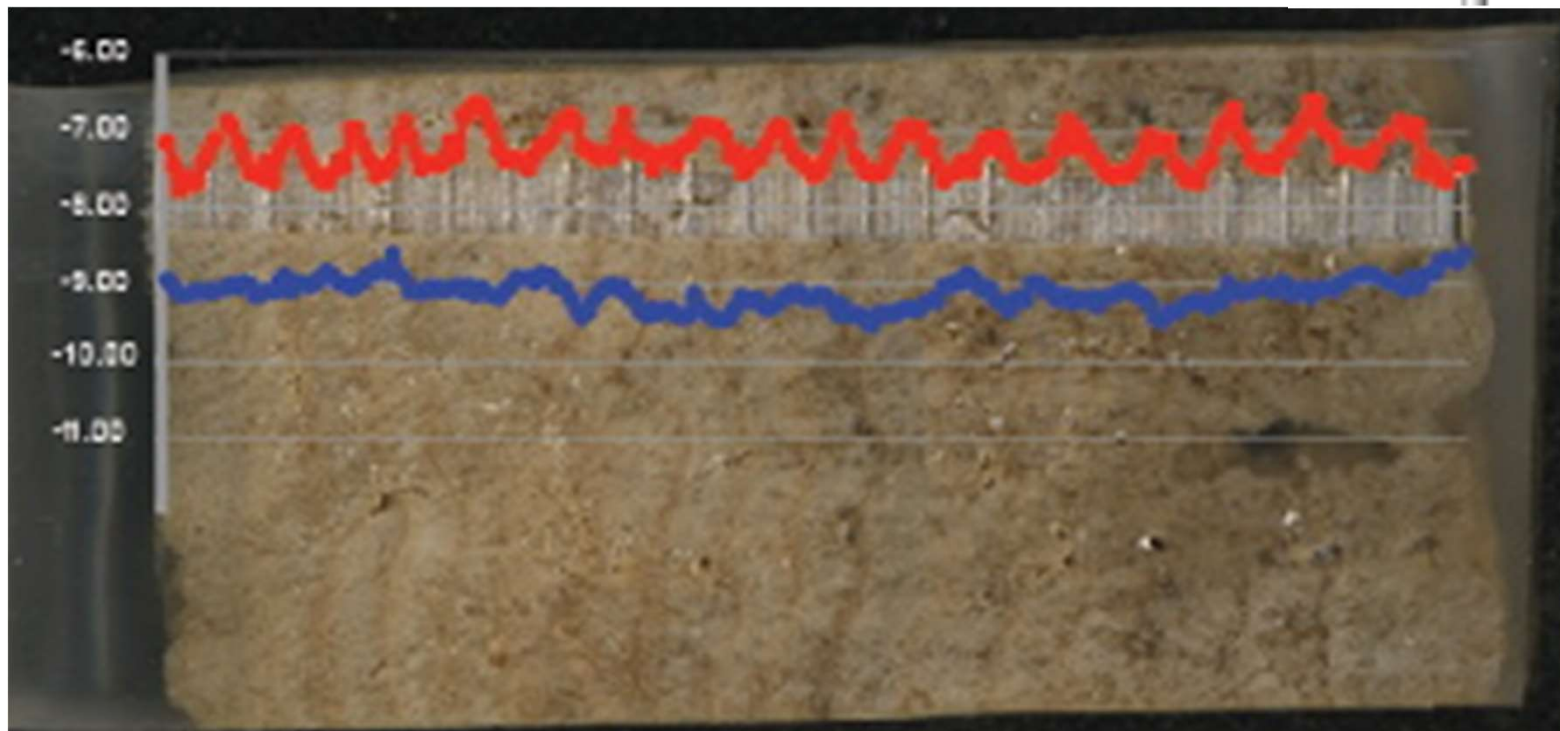


Rome



At least 50 km long double channel:
Continuous supply/maintenance?

Sudden abandonment in the 12th century



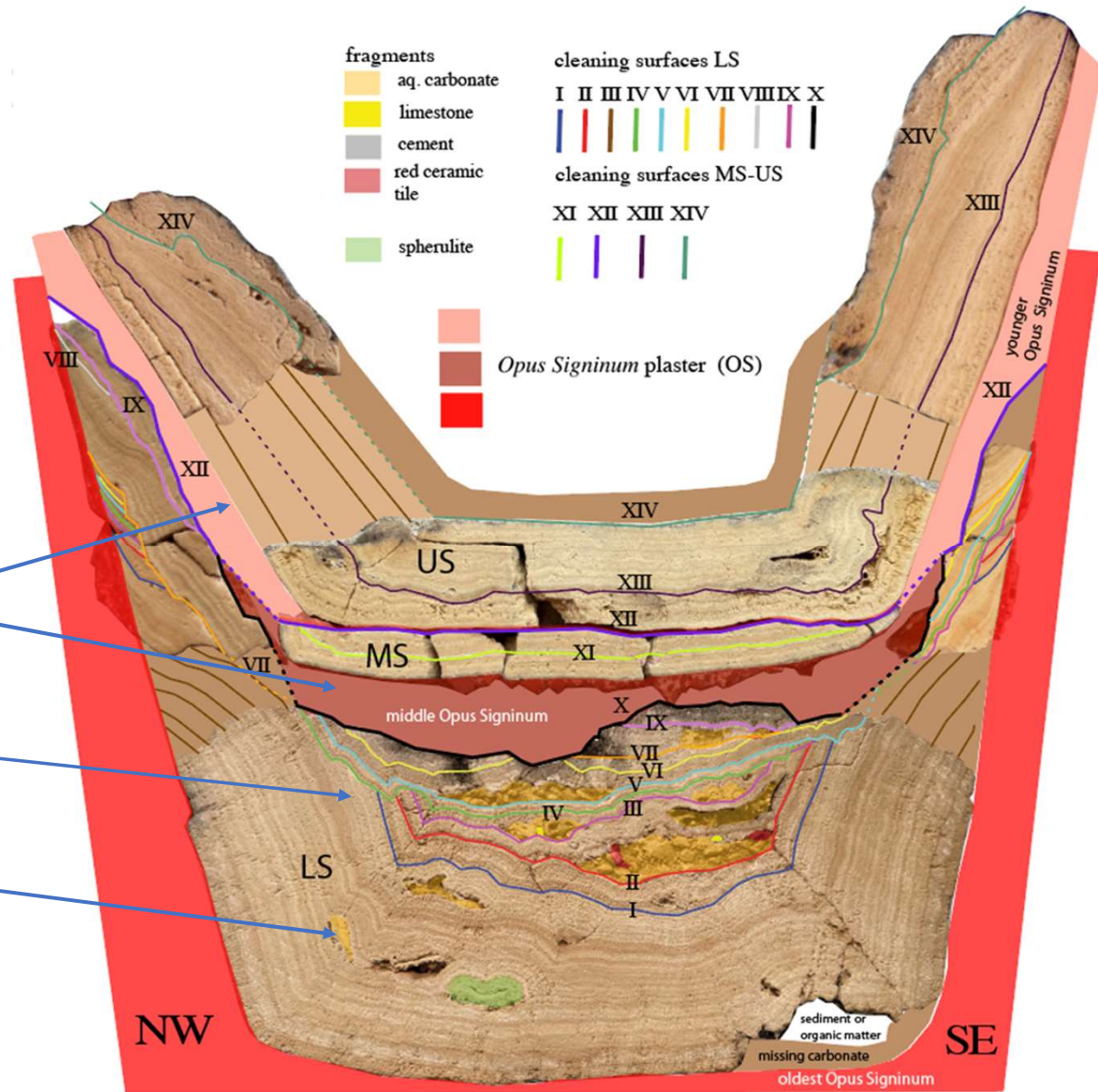
Divona aqueduct:

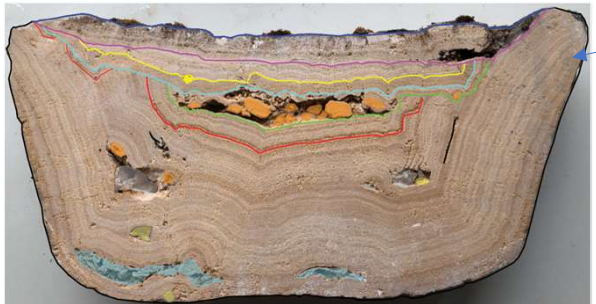
300 years of maintenance

Water interruptions/repairs

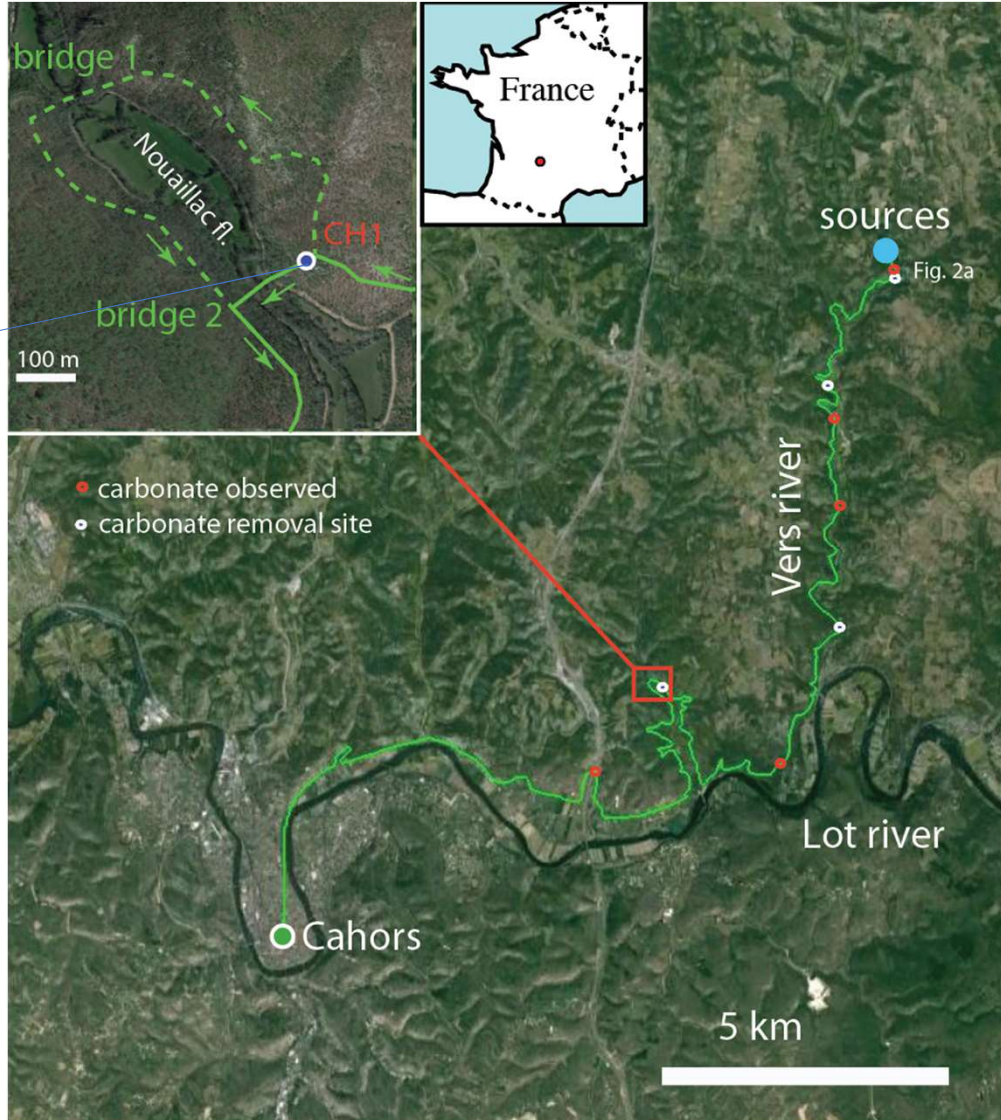
Cleaning surfaces in-situ

Cleaning surfaces upstream





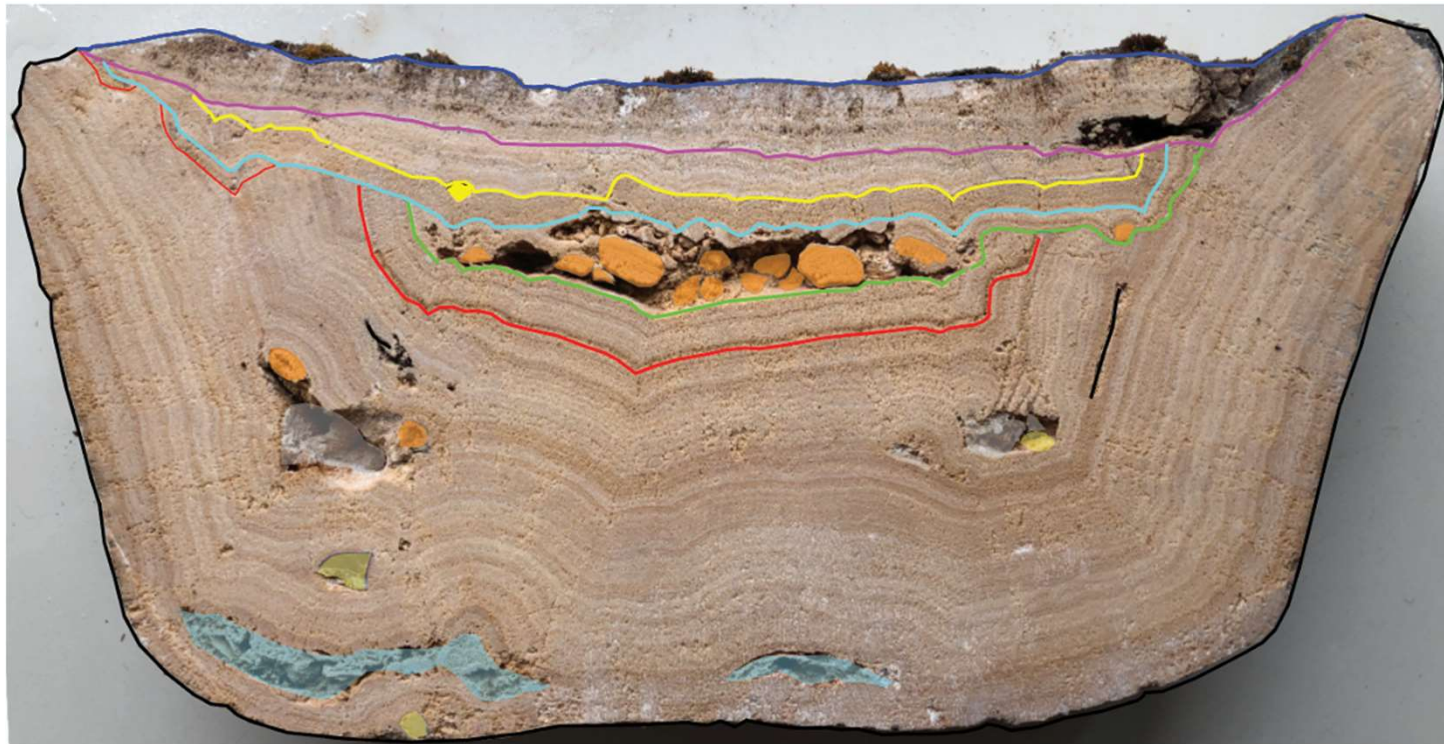
sample site

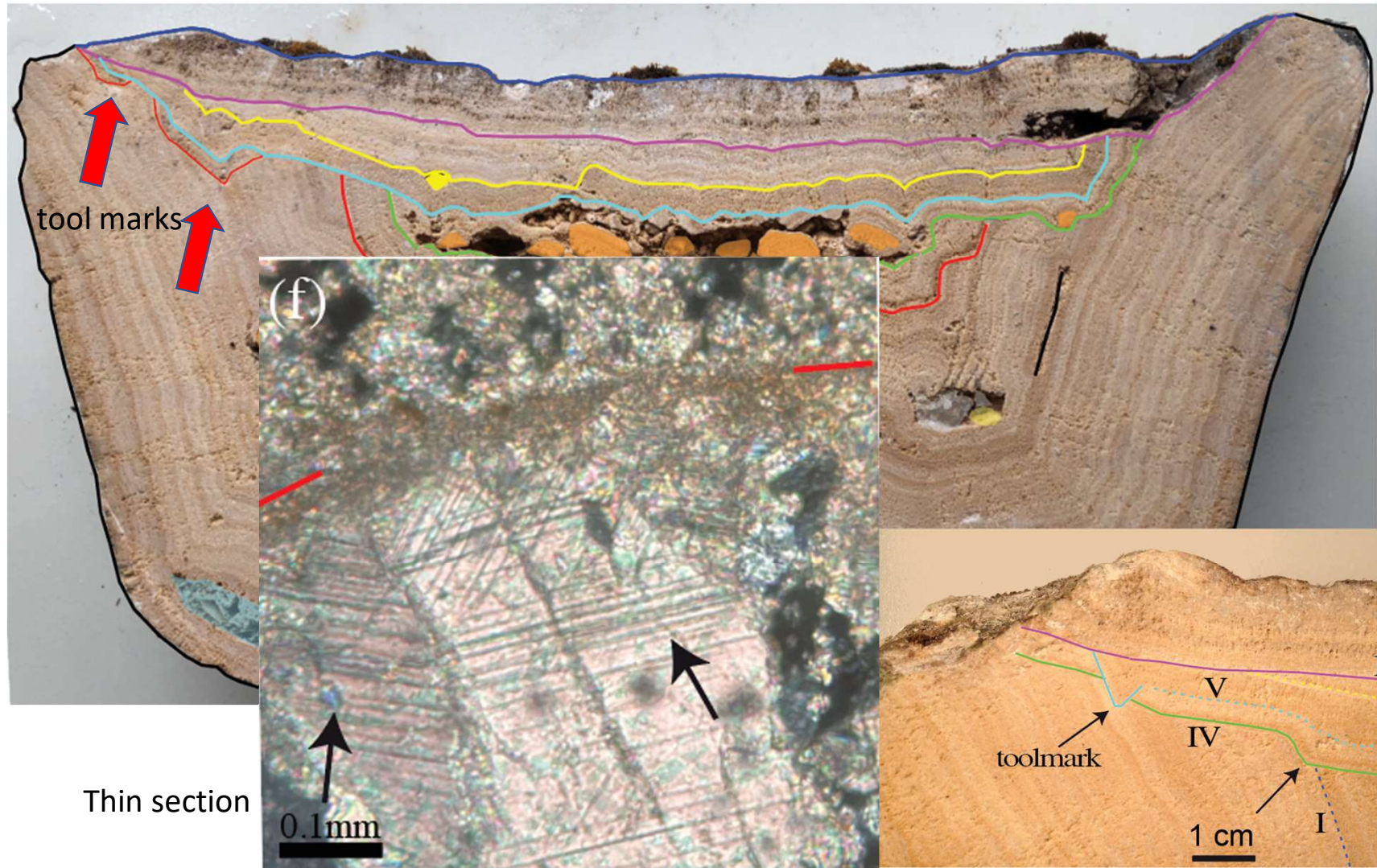


Cahors (*Divona Cadurcorum*)
15 BC – AD 12 to ± 4th century

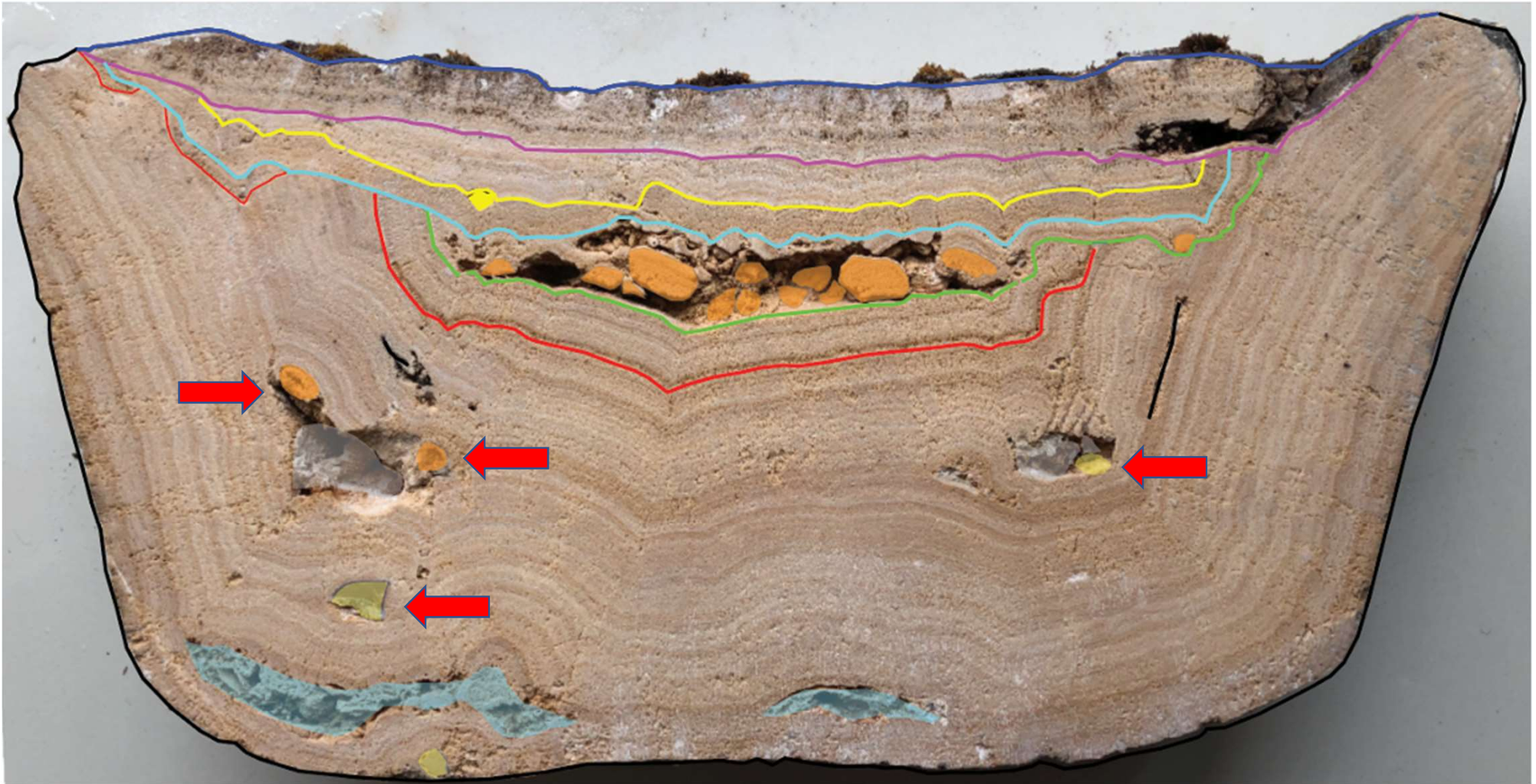
Why did the workers leave maintenance traces?

- 1- Sloppy maintenance
- 2- Rapid working for the shortest break
- 3- Lack of knowledge of dimensions
- 4- Adequate cross-section



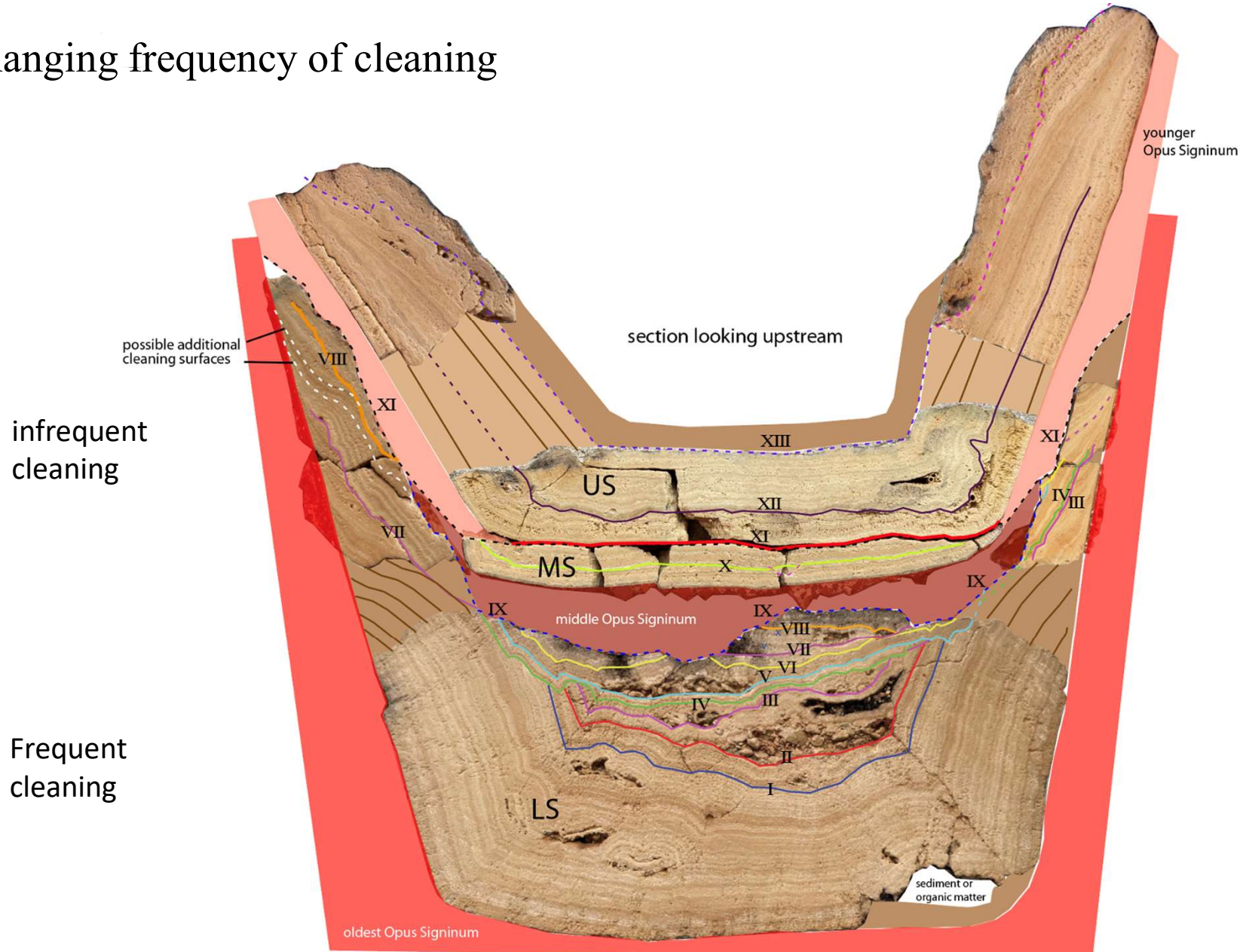


Deformation twins in calcite crystals and tool marks



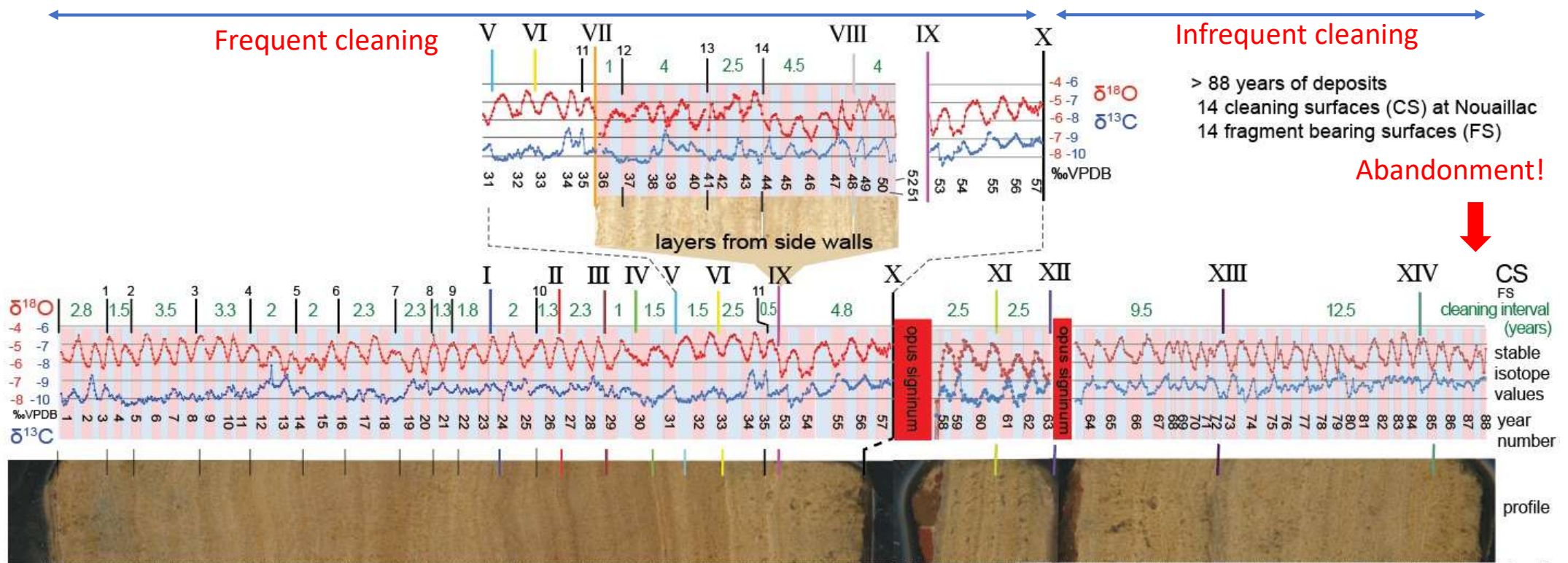
Mortar, limestone, spherulite, tile fragments...upstream maintenance traces

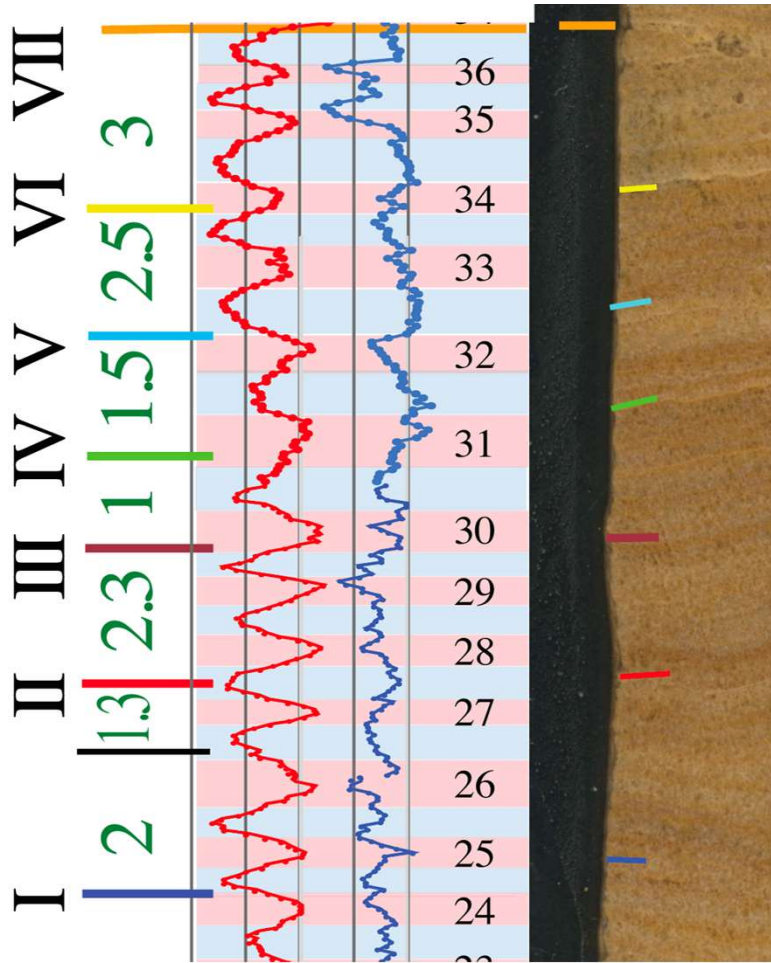
Changing frequency of cleaning



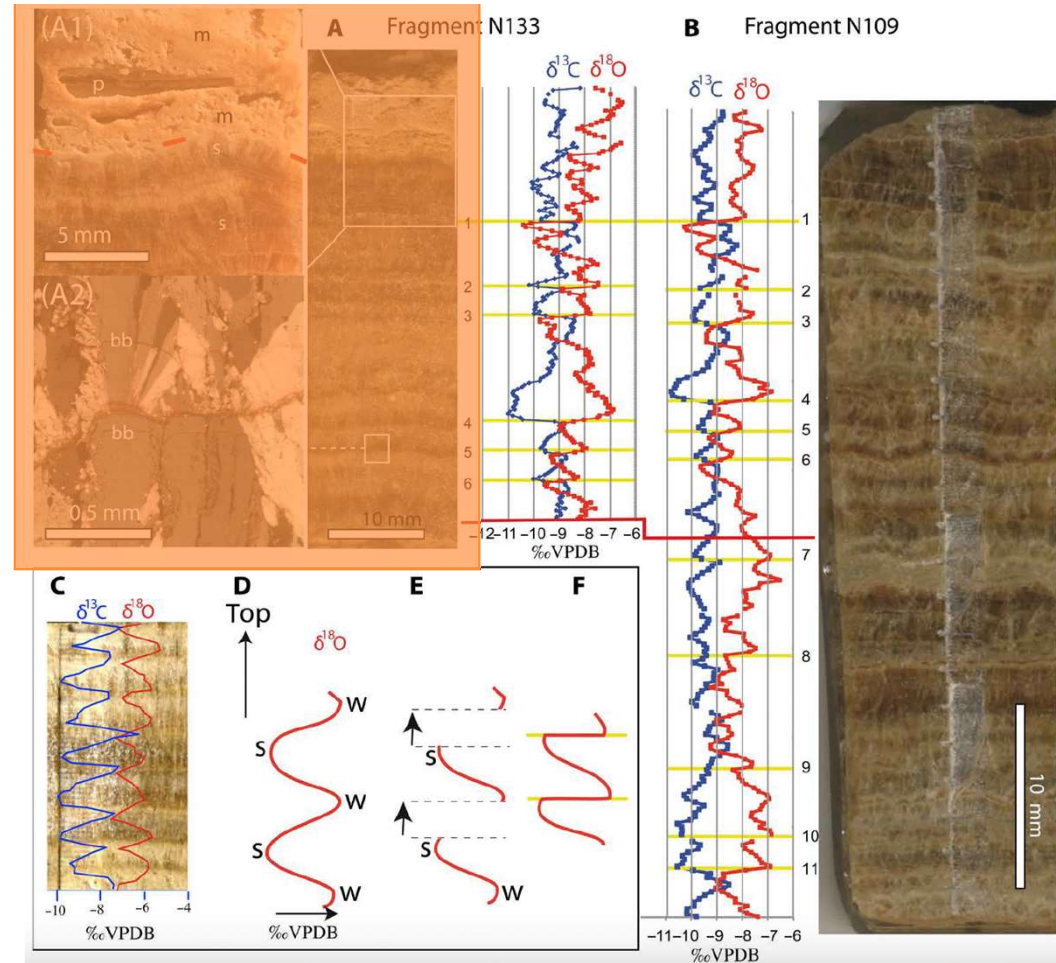
Life story of 88 years

Changing frequency of maintenance: changing socio-economy, maintenance strategy, population...





Divona aqueduct

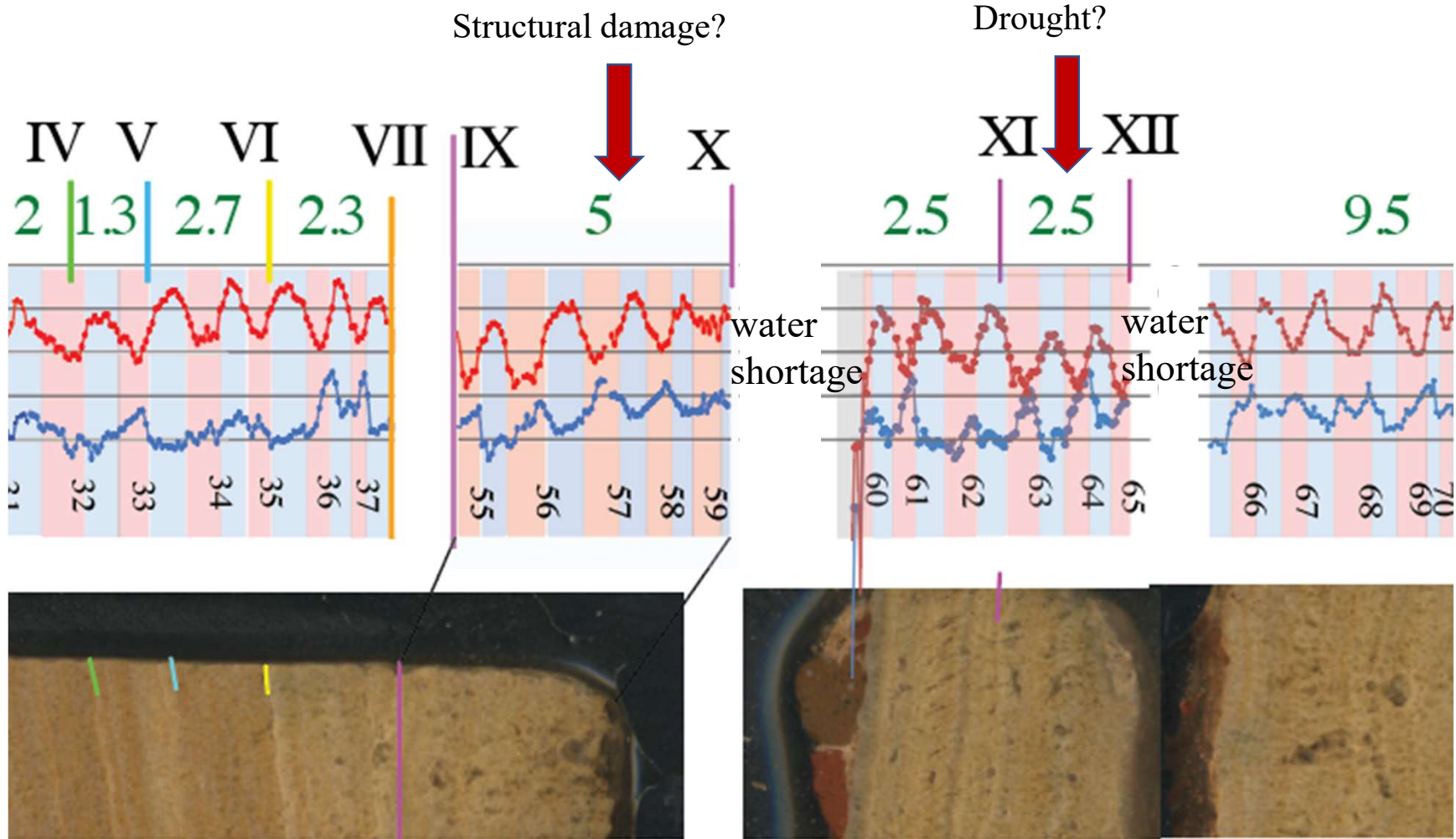


Aspensos aqueduct
Urban aqueduct

Barbegal mill complex

Frontinus on maintenance: Do it with the greatest speed and no maintenance in summer!

Truncations: evidences of times of water interruptions



Gradual abandonment of the aqueduct of *Divona*

