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## OBJECTIVES

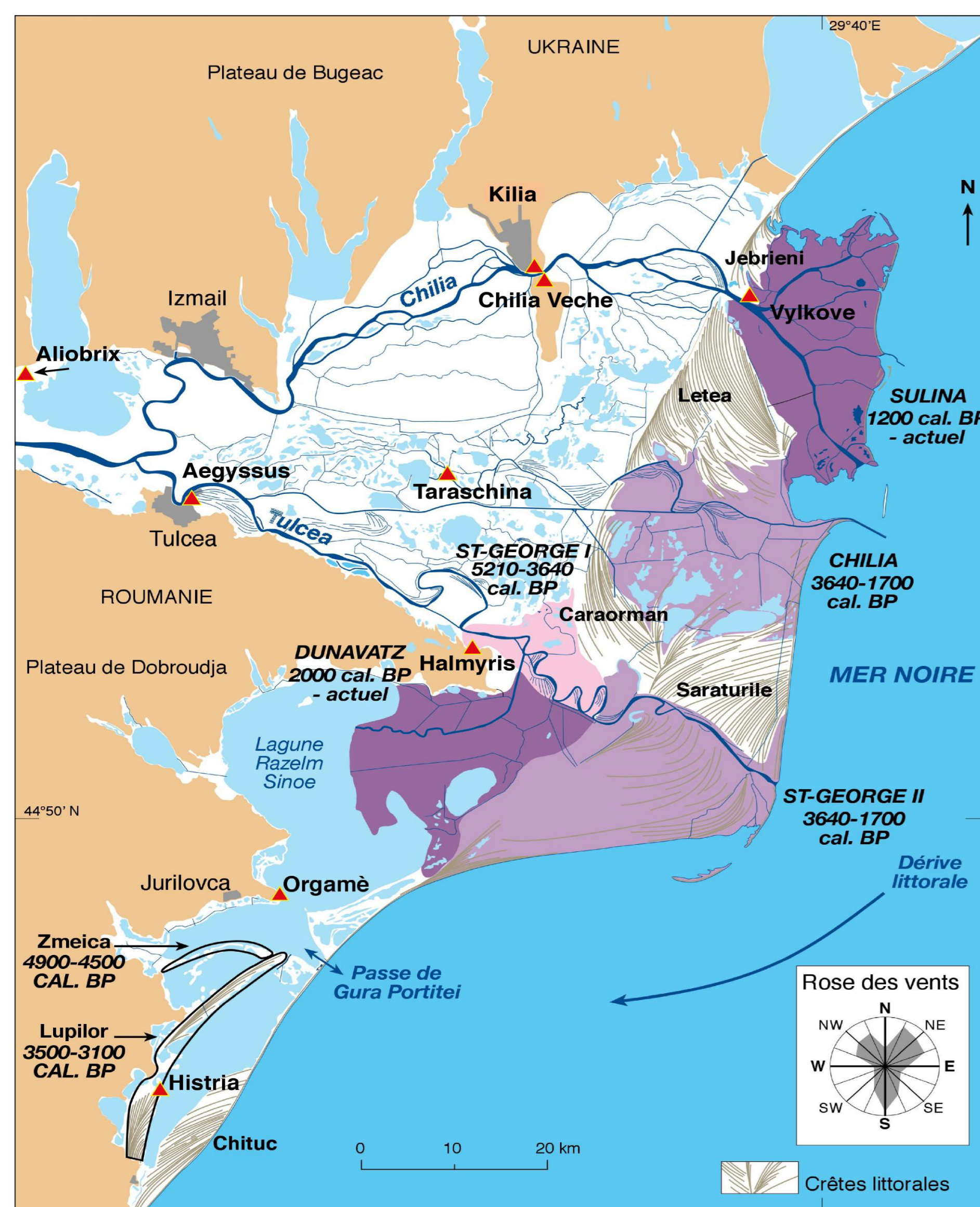
**Describing the forcing agents governing the historical development of deltaic societies and the geomorphological context of their environments during the Holocene.**



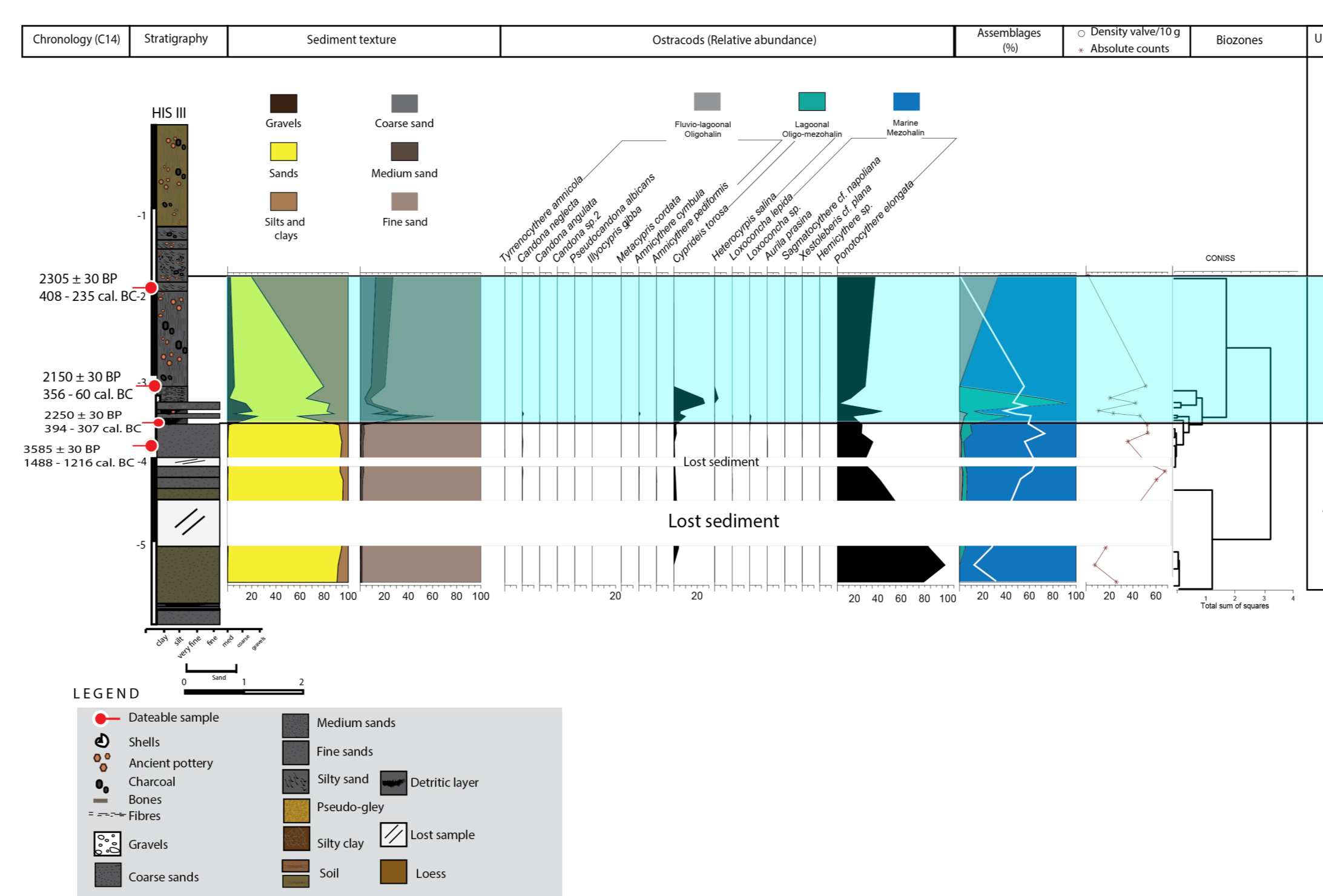
**HISTRIA/ISTROS - ONE OF THE OLDEST MILESIANS COLONIES IN THE BLACK SEA.** LOCATED IN THE SOUTHERNMOST UNIT OF THE DANUBE DELTA, IT WAS FOUNDED DURING THE SECOND HALF OF THE 7TH C. BC AND WAS INHABITED WITHOUT INTERRUPTION UNTIL THE FIRST HALF OF THE 7TH C. AD. PHOTO CREDITS: COSMIN DANILA.



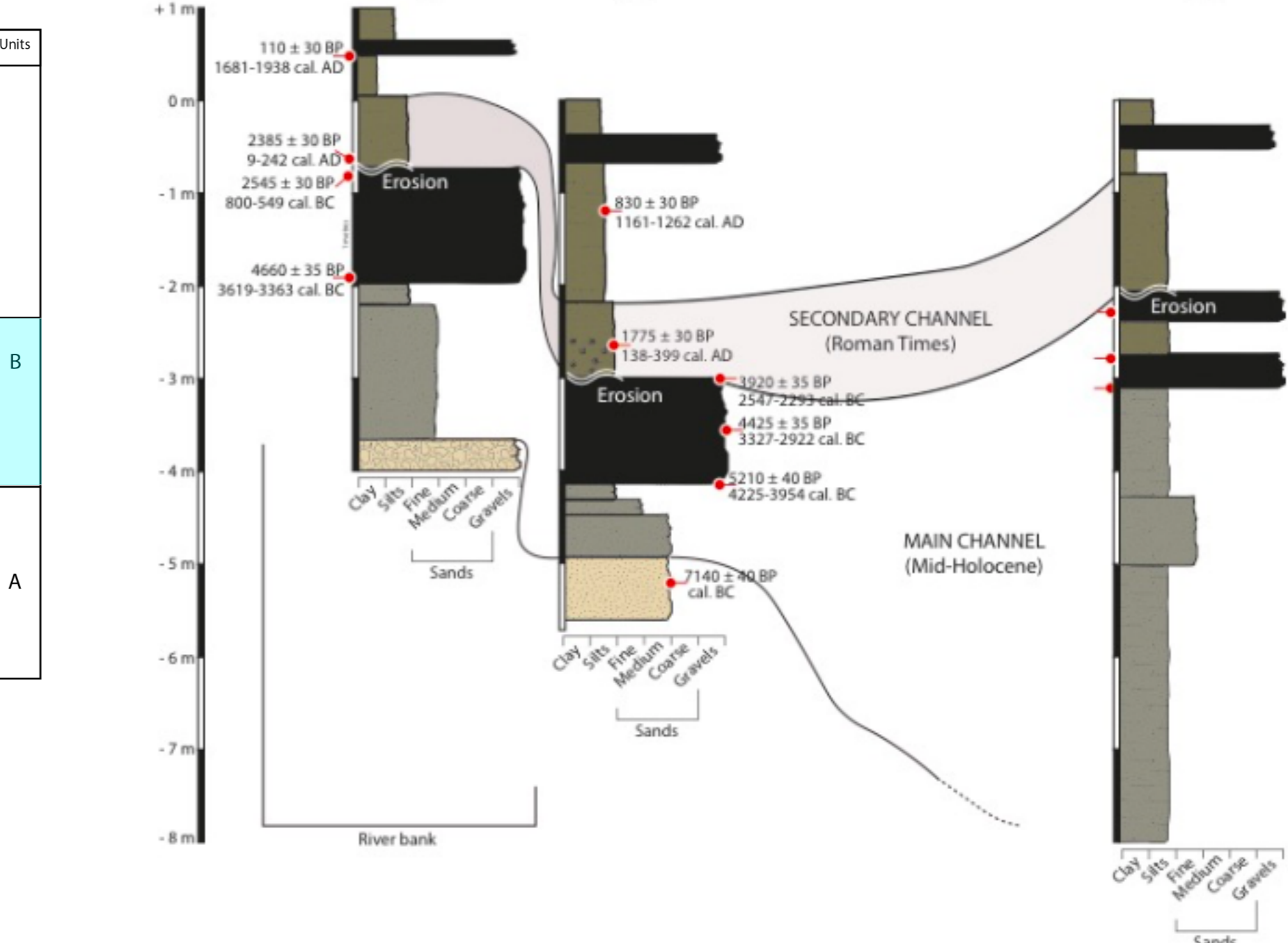
**HALMYRIS - ON NORTHERN DOBROGEA, NORTH OF THE DUNAVAT PROMONTORY, THE ROMAN FORTRESS OF HALMYRIS WAS FOUNDED IN THE LATE 1ST CENTURY ON A GETAE SETTLEMENT DATED BACK THE MIDDLE OF THE 1ST MILLENNIUM BC. FACING THE ST. GEORGES ARM OF THE DANUBE, HALMYRIS PLAYED AN IMPORTANT ROLE ON THE ROMAN DEFENSE SYSTEM (THE DANUBIAN LIMES).** PHOTO CREDITS: NATIONAL INSTITUTE OF HERITAGE, ROMANIA.



**GEOMORPHOLOGICAL SETTING OF THE DANUBE DELTA.** THE DELTA CAN BE DIVIDED INTO TWO DISTINCT GEOMORPHOLOGICAL UNITS: (i) THE WESTERN FLUVIAL DELTA; (ii) THE EASTERN AND SOUTHERN MARINE DELTA.



**HISTRIA/ISTROS - THE HIGHLIGHTED UNIT IS CHARACTERIZED BY A RAPID SILTATION, DUE TO A PROTECTED ENVIRONMENT. THE POTTERY SHREDS DISCOVERED INTO THE CORE, WHICH CHRONOLOGICALLY CORRESPOND WITH THE <sup>14</sup>C AGES, ALONG WITH THE GRANULOMETRIC CHANGE, LEAD US TO THE HYPOTHESIS OF THE LOCALIZATION OF HARBOUR BASIN IN THIS SPOT. (BIVOLARU 2016)**



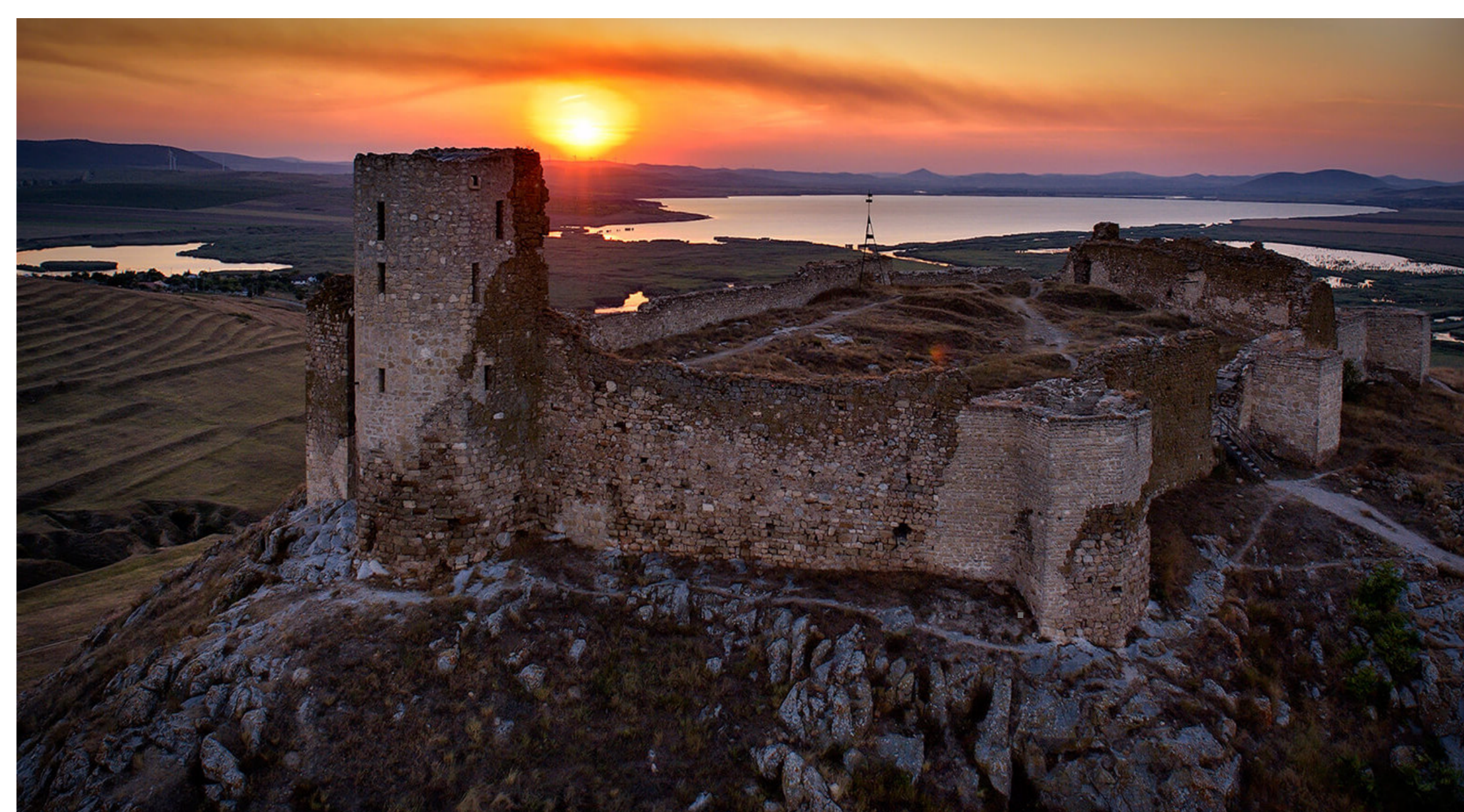
**HALMYRIS - THE STUDY OF THE THREE CORES DRILLED NEAR HALMYRIS REFLECTS THE PRESENCE OF A PALAEO-CHANNEL. CORE HAI (MAGNE, 2016), CORES HAI1 AND HAI3 (GIAIME 2016).**

## PRELIMINARY RESULTS

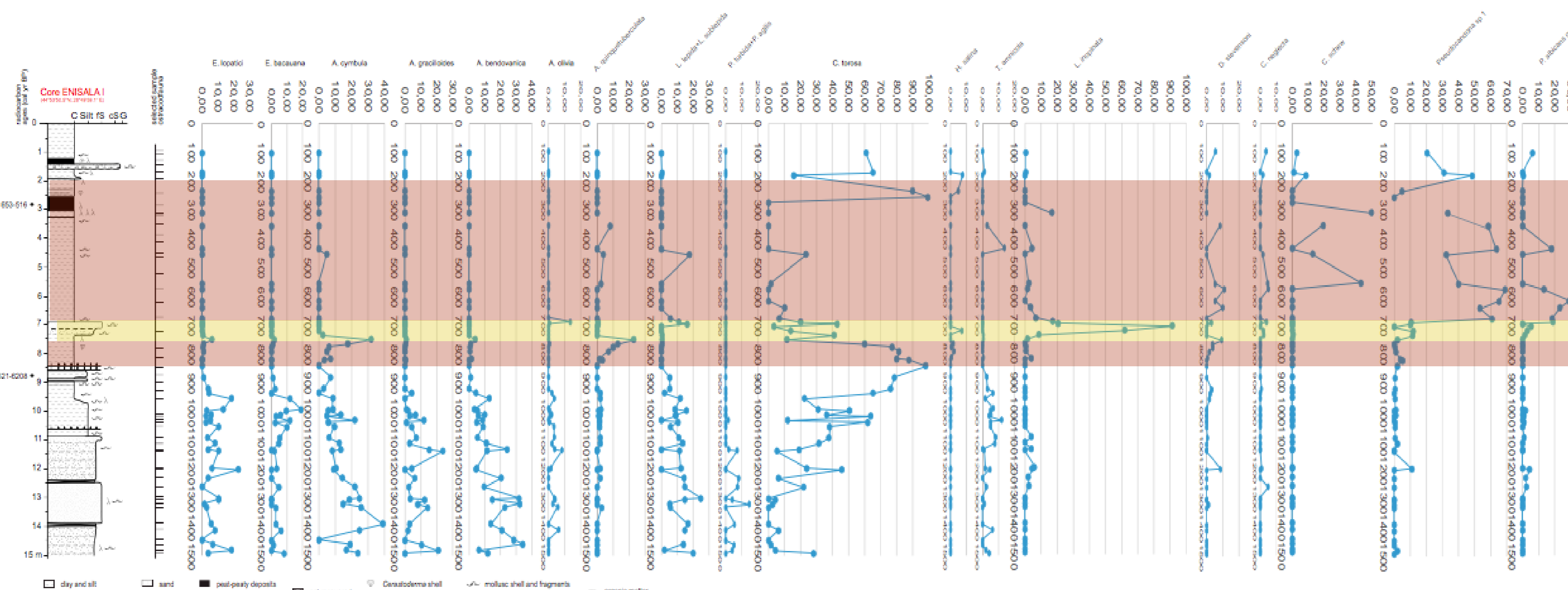
- **THE ROMAN HARBOUR OF HALMYRIS:** was probably founded in a St. George secondary channel that flowed in close proximity to the site (north of it), between 7th c. BC - 7th c. AD.
- **AT HISTRIA:** we may have a first phase of anchorage on a pocket beach during the Archaic period, followed by an artificial basin starting with the Hellenistic period in the central-northern part of the site:
- **AT ENISALA:** the analyses indicate the presence of a shallow lagoon between Neolithic-Middle Age.

## MATERIALS AND METHODS

- **LONG CONTINUOUS CORES:** described and sampled directly at the investigated site in a range between 5 to 10 cm.
- **BIO-SEDIMENTOLOGICAL ANALYSES:** (i) mollusks and ostracods; (ii) granulometry and texture.
- **CORE STRATIGRAPHIES:** divided into units and described according to their texture, grain size and macrofossil content.
- **CHRONOLOGICAL FRAME:** radiocarbon data (Poznan Radiocarbon Dating Centre).



**ENISALA - THE RUINS OF THE MEDIEVAL FORTRESS. THE SITE IS LOCATED IN THE CENTRE OF THE MARITIME DELTA, HALF-WAY BETWEEN HISTRIA AND HALMYRIS, ON THE HIGHEST HEADLAND (112 M), BETWEEN BABADAG AND RAZELM LAKE. THE AREA HAS BEEN INHABITED SINCE NEOLITHIC.** PHOTO CREDITS: WWW.FOTOARIANA.RO



**ENISALA - THE DISTRIBUTION OF OSTRACOFAUNA, WHICH TRANSLATES A PROGRESSIVE ENCLOSURE OF THE BAY. THE OSTRACODS SPECIFIC FOR A OLIGOHALYNE WATER BODY ALONG WITH THE DOMINANCE OF SILTS AND CLAYS ARE SPECIFIC FOR A LAGOONAL ENVIRONMENT (RED HIGHLIGHTED UNIT), BETWEEN NEOLITHIC - MIDDLE AGE. THE YELLOW UNIT SHOWS A FLUVIAL WATER INPUT, CHARACTERIZED BY A SANDY FRACTION AND THE DOMINANCE OF LIMNOCYTHE INOPINATA.**

## SELECTIVE BIBLIOGRAPHY

- BAILEY, N.G., FLEMMING, N.C., 2008. ARCHAEOLOGY OF THE CONTINENTAL SHELF: MARINE RESOURCES, SUBMERGED LANDSCAPES AND UNDERWATER ARCHAEOLOGY. *QUATERNARY SCIENCE REVIEWS* 27, P. 2153-2165.
- BIVOLARU, AL., GIAIME, M., ROSSI, V., BOTTEZ, V., MARRINER, N., MORHANGE, C., 2016. BETWEEN THE DANUBE DELTA AND THE BLACK SEA: PRELIMINARY RESULTS OF A MULTI-PROXY STUDY OF TWO ARCHAEOLOGICAL SITES (HISTRIA AND HALMYRIS, ROMANIA). *ARCHAEOLOGY AND ART*, IN PRESS.
- GIAIME, M., 2016. *GEOARCHÉOLOGIE DES PORTS ANTIQUES EN CONTEXTES DELTAÏQUES: QUELQUES EXEMPLES DE MÉDITERRANÉE ET DE MER NOIRE*. UNPUBLISHED PHD THESIS, AIX-MARSEILLE UNIVERSITY.
- MARRINER, N., MORHANGE, C., 2007. GEOSCIENCE OF ANCIENT MEDITERRANEAN HARBOURS. *EARTH-SCIENCE REVIEW*, 80.
- VESPREMEANU-STROE, A., PREOTEASA, L., ZĂINESCU, F., TĂȚUI, F., 2016. THE EVOLUTION OF DANUBE DELTA AFTER BLACK SEA RECONNECTION TO WORLD OCEAN, IN M. RĂDOANE AND A. VESPREMEANU-STROE (EDS.), *LANDFORM DYNAMICS AND EVOLUTION IN ROMANIA*, 521-551. SPRINGER SWITZERLAND.

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