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New archaeometric data on Roman wine amphorae from *Gallia Narbonensis*. The pottery workshop at *Lattara* (Lattes, South France)

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INTRODUCTION

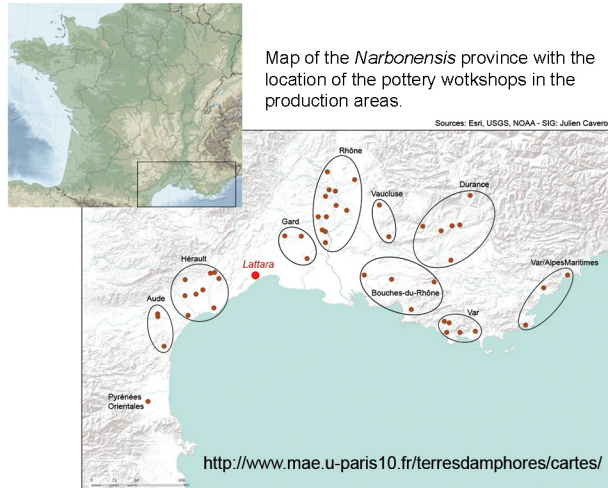
Viticulture was one of the main economic activities developed in the *Narbonensis* province during the Early Roman Empire. Numerous wine production centres and amphorae workshops emerged along the river basins.

Most of the amphora types produced to trade wine in the Western and Eastern Mediterranean exhibit globular/ovoid bodies with flat bases (types G1, G2, G3 and G4). Nevertheless, the contemporary Italic and Hispanic prototypes with pointed bases (Dr.1B and Dr.2/4) were also imitated in some pottery centres.

An important pottery workshop during 75-125 AD was located in the port city of *Lattara* (Lattes). The excavation of a massive pottery dump covering the large fosse of a destroyed kiln provided c. 1300 amphorae (mainly G1 and G4) together with slipped/unslipped wares, cooking pots and building materials.



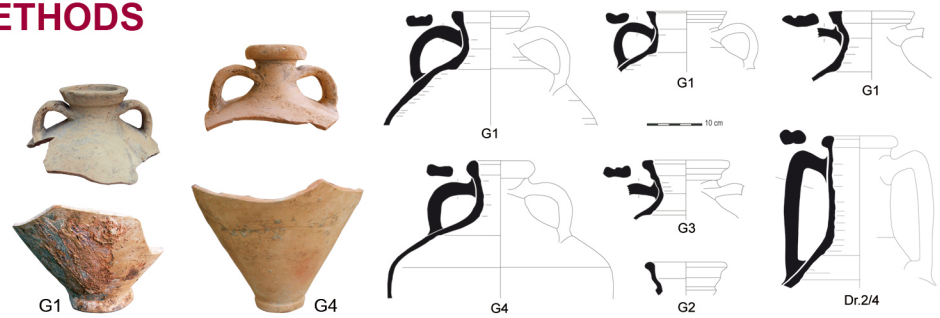
Amphorae from the pottery dump



SAMPLING AND METHODS

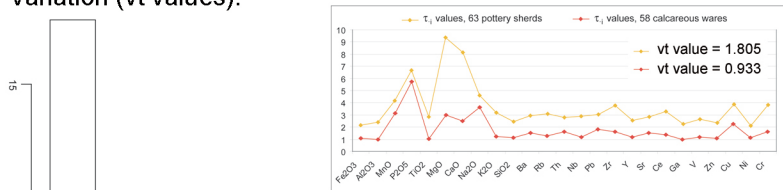
The geochemical composition of 57 amphorae (types G1, G4 and a few G2, G3, Dr.1 and Dr.2/4), 4 common wares and 2 bricks was examined through XRF and XRD. Thin section analysis was carried out on 26 selected samples. Seven clayey sediments from the dump were also analysed to obtain a reference local elemental pattern to investigate the possibility of local provenance.

The results were compared with the XRF database of the amphorae produced at several workshops in the *Narbonensis* province, created by the UMR7041 ARSCAN and MSH MOM Lyon 2 (FRA) and available online (http://www.mae.u-paris10.fr/terresdamphores/).



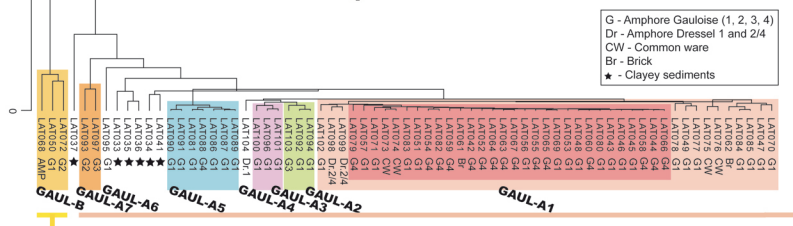
Photographs and drawings of the amphora types recovered in the pottery dump of *Lattara*

The Compositional Variation Matrix provides the τ_i and the τ_j values; most of the variability is introduced by MnO, P₂O₅, MgO, CaO, Na₂O, K₂O, Pb, Zr, Ce, Cu, Co. The clays significantly contribute to the total variation (τ_i values).



Two main groups were identified:

- **GAUL-A:** Calcareous pottery, clustered in 7 chemical groups from which A1 corresponds to the *Lattara* RG.
- **GAUL-B:** Comprises 3 low calcareous sand tempered sherds classified as "gauloise sableuse".



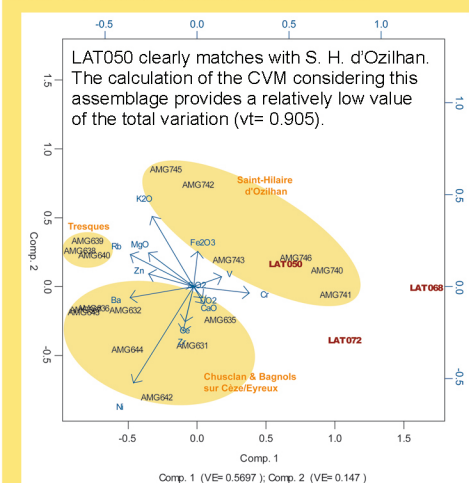
Cluster analysis performed on the log-ratio transformed subcomposition Fe₂O₃, Al₂O₃, TiO₂, MgO, CaO, Nb, Zr, Y, Ce, Ga, V, Zn, Ni and Cr using SiO₂ as divisor, measuring the mean squared Euclidean distance and the centroid clustering algorithm; RG: Reference Group.

REGIONAL POTTERY PRODUCTION

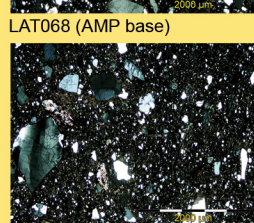
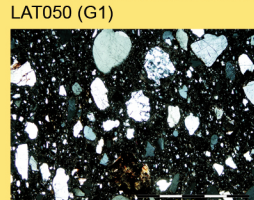
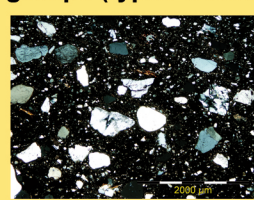
GAUL-B: Low calcareous sand tempered groups (types G1&G2)

Coarse fabric with abundant subrounded inc. c.f.: *** Qtz; ** Met, Kfs, Cht, Ms, op; * Cal

XRF data of samples LAT050, 68, 72 was compared with the 'sableuse' G1 amphorae produced in 4 *figlinae* from the Rhône basin in the Gard area.



Principal Component Analysis on the log-ratio transformed subcomposition Fe₂O₃, TiO₂, MgO, CaO, K₂O, SiO₂, Ba, Rb, Zr, Ce, V, Zn, Ni and Cr using Al₂O₃ as divisor.



LAT050 (G1)
LAT068 (AMP base)
LAT072 (G2)
Thin-section photomicrographs (40x, XPL)

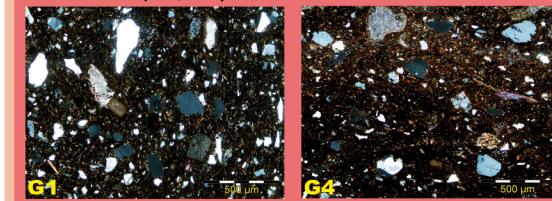
RESULTS

GAUL-A: Calcareous medium-coarse groups

(Thin-section photomicrographs 100x, XPL)

LATTARA POTTERY PRODUCTION

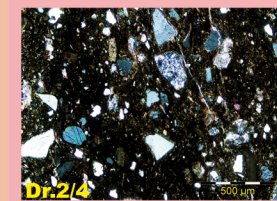
GAUL-A1 (G1, G4)



c.f.: Common, sub-angular inclusions
*** Qtz, Cal, Ca-fos
** Ms, Kfs, Met, Fe-Sed, op
* Am, Ep, Cpx, Grt

LOCAL-REGIONAL POTTERY PRODUCTION

GAUL-A1'



c.f.: Mod. abundant inc.
*** Qtz, Cal, Ca-fos
** Cht, Ms, Kfs, op
* Met, Am, Ep, Cpx

GAUL-A1''



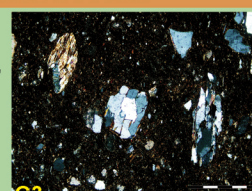
c.f.: Common, sub-ang/r. inc.
*** Qtz
** Ms, Kfs, Pl, Cal, Ca-fos
* Cht, Met, op

REGIONAL POTTERY PRODUCTION

GAUL-A2 (Type G1)

c.f.: Common sub-ang. inc., medium/coarse grain size.

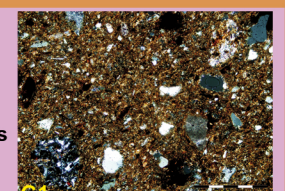
*** Qtz, Met, Cal
** Ms, Kfs, op
* Bt



GAUL-A3 (Type G1)

c.f.: Mod. abundant inc., sub-angular to sub-round.

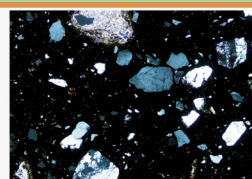
*** Clst, op, Qtz, Cal, Ca-fos
** Kfs, Ms, Met, Volc
* Cpx, Bt, Cht



GAUL-A4 (Type Dr.1B)

c.f.: Abundant, sub-round inclusions.

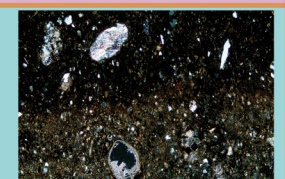
*** Qtz, Met, Cal, Ca-fos
** Cht, Kfs, Pl
* Ms, Grt, op



GAUL-A5 (Types G4, G1)

c.f.: Few inc., sub-angular to sub-rounded.

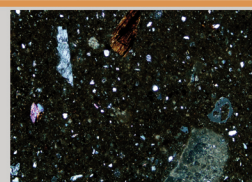
*** Cal, Ca-fos, Qtz
** Kfs, Pl, Met
* Am, Cpx



GAUL-A6 (Type G1)

c.f.: Few inc., sub-angular.

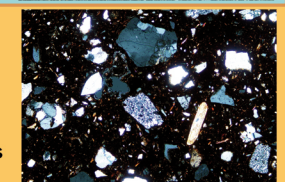
*** Qtz, Met, Bt, op
** Ms, Kfs, Cal, Ca-fos
* Cht, Sed.



GAUL-A7 (Types G2, G3)

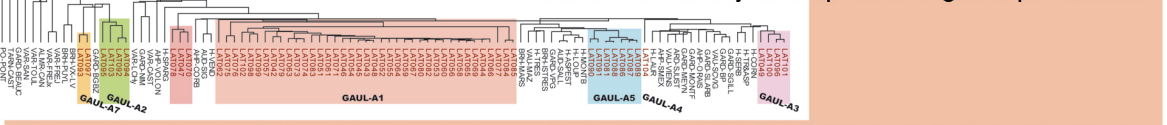
c.f.: Abundant inc., sub-rounded.

*** Qtz, Met
** Cht, Kfs, Ms, Cal, Ca-fos
* Am, Ep, op, Cpx



(Am: amphibole; Bt: biotite; Ca-fos: foraminifer; Cal: Calcite; Cht: chert; Clst: claystone; Cpx: clinopyroxene; Ep: epidote; Grt: garnet; Kfs: K-feldspar; Met: metamorphic rock; Ms: muscovite; op: opaque mineral; Pl: plagioclase; Qtz: quartz; Sed: sedimentary rock; Volc: volcanic rock)

XRF chemical data of the calcareous sherds from *Lattara* was compared with the compositional averages (RG) of several amphora productions in the *Narbonensis* province. The former are joined in a main group (A1 = *Lattara* Reference Group). Group A-3 resembles the amphorae produced in the central Hérault basin. The provenance of the rest of the sherds is uncertain but they correspond to regional productions.



Cluster analysis performed on the log-ratio transformed subcomposition Fe₂O₃, TiO₂, MgO, CaO, K₂O, SiO₂, Ba, Rb, Zr, Ce, Zn, Ni and Cr using Al₂O₃ as divisor, measuring the mean squared Euclidean distance and the centroid clustering algorithm; AHP: Alpes-Haute-Provence; ALMR: Alpes Maritimes; ARD: Ardèche; AUD: Aude; BRH: Bouches-du-Rhône; GARD, H: Hérault; PO: Pyrénées Orientales; TARN, VAR, VAU: Vaucluse

CONCLUSIONS

The study reveals that the main amphora types produced in *Lattara* were the G1 and G4 together with common wares, building materials and probably the Dressel 2/4 type. The G1 was mainly used for local-regional diffusion and the G4 for large-scale trade. Imports from other pottery workshops located in the *Narbonensis* (G1 from the central Hérault basin, sand tempered amphorae from the Rhône basin in the Gard area and other regional productions) have been recognised.

ACKNOWLEDGEMENTS

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