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Archaeometry of Neolithic Tavoliere Ceramics: Preliminary Results of a New Project

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Abstract

This short paper describes a new project, initiated in 2013, that both broadens the geographical scope of the archaeometric study of Neolithic Tavoliere ceramics and clays and also employs a previously unused (in the Tavoliere context) analytic technology, pXRF (portable X-ray fluorescence), to identify trace elements. The principal advantages of pXRF are that it is non-destructive and that samples can be processed relatively quickly outside the laboratory. In addition to describing the project scope, some early results relating to the distribution and clay sourcing of Passo di Corvo wares and broader clay sources from the 2013 field season are reported.

Riassunto

Questo articolo presenta un nuovo progetto iniziato nel 2013 che amplia il bacino geografico delle ricerche archeometriche riguardanti le ceramiche neolitiche e le argille del Tavoliere delle Puglie, impiegando per la prima volta in questa area. l'analizzatore portatile di fluorescenza a raggi X (pXRF), per misurare gli elementi

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chimici presenti in traccia nelle ceramiche. Il vantaggio principale del pXRF è dato dal fatto che il metodo di analisi non è distruttivo e il campione può essere analizzato velocemente al di fuori del laboratorio. In questo contributo vengono delineati gli scopi del progetto e i risultati preliminari delle ricerche effettuate nel 2013 con una particolare enfasi sulla problematica connessa distribuzione delle ceramiche del tipo Passo di Corvo delle materie prime utilizzare per produrre questa e le altri classi ceramiche neolitiche presenti in questa area.

Previous archaeometric analysis of Neolithic Tavoliere ceramics has focussed on materials from the area of the Amendola Plateau (e.g. Cassano *et alii* 1994; Cassano *et alii* 1997; Cassano *et alii* 1995a; Cassano *et alii* 1995b; Cassano & Manfredini 2004). Across the entire Tavoliere at least 560 Neolithic sites are known covering an area from the Fortore in the north to the Ofanto in the south and from the Apennine foothills in the west to the Gulf of Manfredonia in the east (Brown, 2001-2003). The project reported in this short paper seeks to expand the coverage of archaeometric analyses to a representative sample of Neolithic sites across the Tavoliere. We began work in 2013 and anticipate the project continuing for a member of years.

Among the key questions that the project seeks to address are:

- How widely were ceramics exchanged in the Neolithic of the Tavoliere?
- To what extent were local rather than more distant clay sources employed?
- Was fine ware production centralised?

The project approach is to obtain ceramic samples from sites by fieldwalking after the harvest, to obtain clay samples from watercourses near the fieldwalked sites and also to analyse ceramic samples from museum collections and the storage facilities of the Soprintendenza per i Beni Archeologici della Puglia. During the 2013 field season we obtained samples of ceramics from 12 sites (see Figure 1) and also examined materials from the Museo Civico di Foggia and the excavations at Masseria Pantano, Foggia. We also obtained clay samples from 6 watercourses (see Figure 2). All field findspots are georeferenced with a handheld GPS (see Figure 3 - the Neolithic ditches are clearly visible but only the southern area was free of crops at the time of our visit) and all data are incorporated into a GIS database.

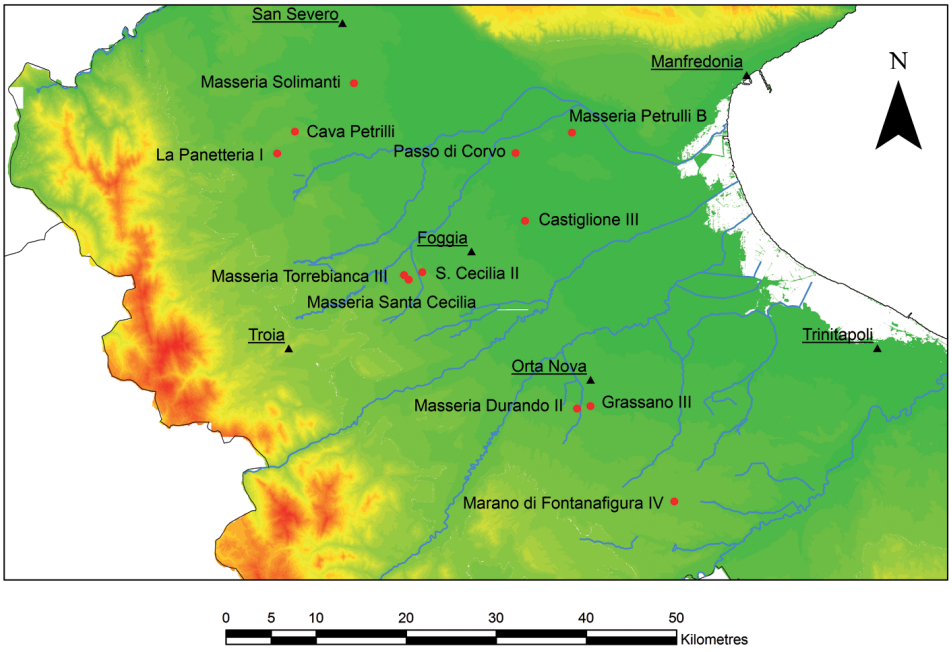

Fig. 1 – Sites visited to collect ceramic samples during 2013.

At certain points in this paper the sites are referred to by the numbers assigned to them by Jones (1987): Passo di Corvo, for example, is coded as J198. Table 1 below provides a key.

Table 1 Site names and site codes

Jones site number	Site name
J1	La Panetteria I
J4	Cava Petrilli
J49	S. Cecilia II
J50	Masseria S. Cecilia
J53	Masseria Torrebianca III
J75	Masseria Durando II
J86	Grassano III
J139	Marana di Fontanafigura IV
J172	Castiglione III
J195B	Masseria Petrulli B
J198	Passo di Corvo
J217	Masseria Solimanti

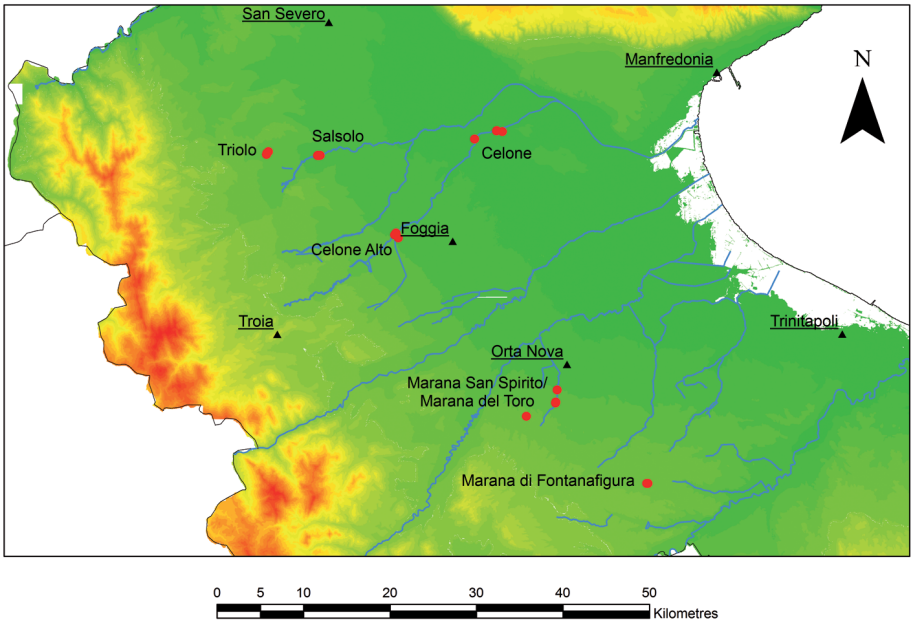

Fig. 2 – Sites visited to collect clay samples during 2013.

Fig. 3 – Ceramic findspots at Santa Cecilia II, 23 June 2013.

The trace elements that characterise the clay sources are identified using a Bruker III-SD pXRF (portable X-ray Fluorescence) spectrometer. The pXRF works in the same way as a lab-based XRF but has the advantage that it can be used in the field. The spectrometer contains an X-ray source that is used to irradiate the samples and thereby stimulate fluorescence. Each element has a characteristic fluorescence and the data gathered can, after calibration, be presented as elemental presence in ppm (parts per million). The trace elements employed in our analyses are: rubidium, strontium, yttrium, zirconium and niobium. Each ceramic sample is analysed on both the outer and the inner surface.

Analysis with the pXRF spectrometer has been undertaken in archaeology for some years, particularly in obsidian studies (e.g. Sheppard *et alii* 2011, Milic 2014) but also, more recently, to analyse ceramics (e.g. Speakman *et alii* 2011, Frankel and Webb, 2012 and Tykot *et alii* 2013).

In total the team analysed 328 Neolithic ceramic fragments from the field (see Figure 4) along with 106 pieces from the Museo Civico di Foggia and the storage facilities of the Soprintendenza per i Beni Archeologici della Puglia.

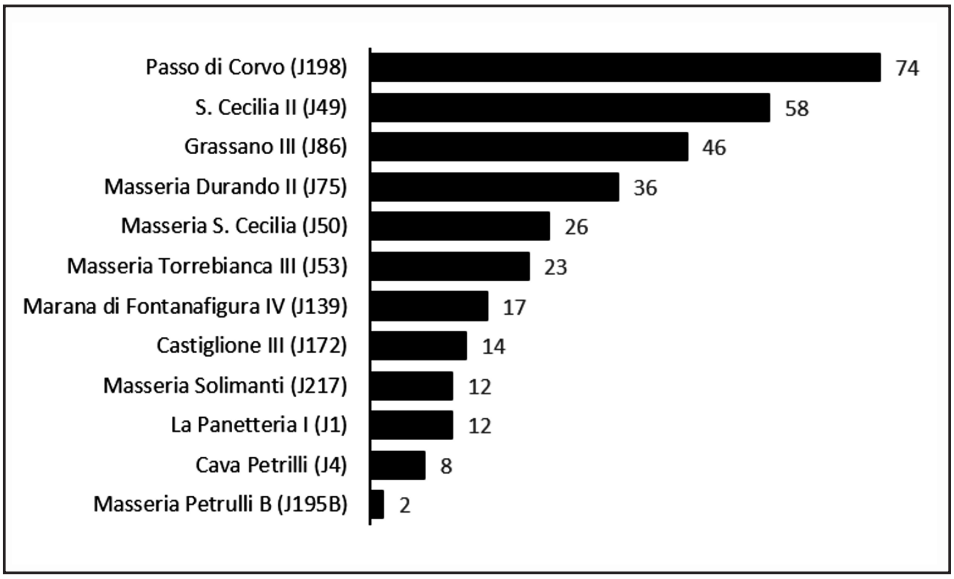

Fig. 4 – Number of fragments of Neolithic ceramics found by site during 2013.

The majority of the sherds were non-diagnostic but Table 2 below shows that a substantial number of diagnostic fragments were also recovered.

Table 2 Numbers of diagnostic sherds by site

Type	J1	J4	J49	J50	J53	J75	J86	J139	J172	J195B	J198	J217
Impressed ware			5	1	3	12	14	1		1	1	
Ingubbiato ware			4								11	
La Quercia ware			7			7	9	1	4		1	
Matera Scratched ware							1					
Passo di Corvo ware						2		1			3	

Construction of the database and integration of the trace element data, descriptive data and geographical data was completed in early 2014 but some preliminary analyses had been undertaken on the collected samples of Passo di Corvo ware and on the clay sources in time for the San Severo conference in November 2013.

Figure 5 below shows the three sites at which the team recovered fragments of Passo di Corvo ware from the field surface: Passo di Corvo, Masseria Durando II and Marano di Fontanafigura IV. Interestingly the latter two sites are 30 km or more from the type site, Passo di Corvo.

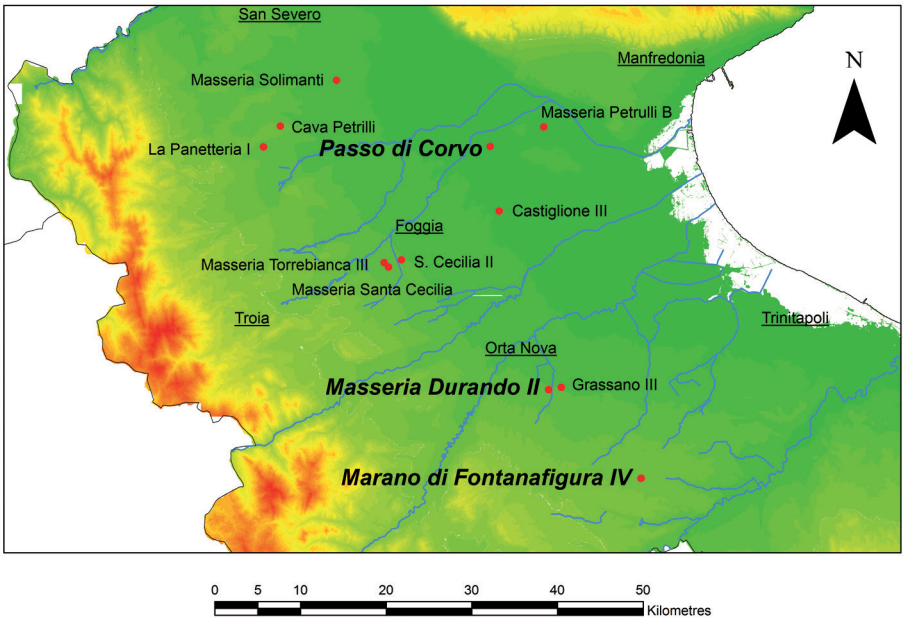

Fig. 5 – Sites at which Passo di Corvo wares were found (larger, bold italic labels) during 2013.

The pXRF spectrometer yielded trace element concentrations for the five elements listed above for each sample. As 5-dimensional Euclidean spaces are beyond simple visualisation, the data yielded by the pXRF is usually subjected to Principal Components Analysis (PCA). This technique allows - in many cases - for a relatively accurate representation of the basic structure of the n-dimensional data in 2 (or 3) dimensions. PCA is widely used in archaeometric studies (Baxter 1994; 2003; Shennan 1997) to render data more readily comprehensible to the investigator.

Figure 6 shows the 2-dimensional representation of the trace element data for the Passo di Corvo wares. The closest grouping would appear to be samples J198-67 and J198-90, both from Passo di Corvo (J198) itself.

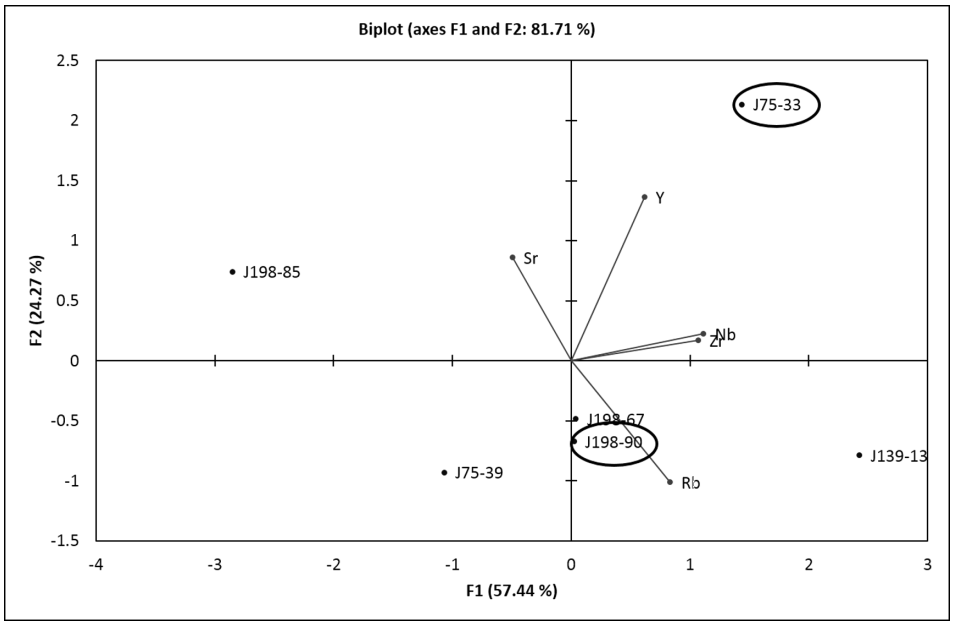

Fig. 6 – PCA chart for Passo di Corvo wares.

However, as we see in Figure 7, the trace element composition of J198-90 actually appears closer to that of J75-33 than it is to J198-67. Similarly, J198-67's trace element composition looks very similar to that of J139-13.

This observation is interesting for three reasons:

- Archaeologically it is of interest that Passo di Corvo wares:
  - seem to be made from several distinct clay sources
  - of similar trace element composition are being found at sites 30+ km apart

- Methodologically it is of note that the "standard" PCA approach fails to reveal an apparent similarity in trace element compositions.

It is obviously too soon to generalise on the basis of these observations but they point to interesting future analyses as the dataset is expanded during the 2014 field season.

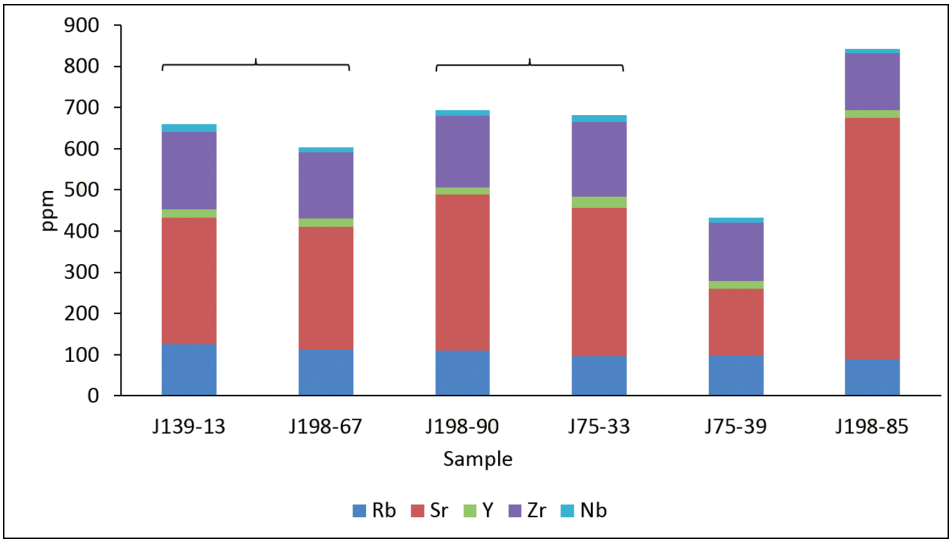

Fig. 7 – Trace element composition of Passo di Corvo ware samples.

Turning now to the clays (Figure 8), the PCA chart appears to show a certain degree of homogeneity along particular watercourses alongside a degree of variation between watercourses. Such variation has been noted before by, for example, Muntoni and potentially bodes well for our ability to match clay sources and ceramic end-products as we amass more data.

During the 2014 field season the team will continue its work sampling ceramics and clay sources. Once the new data are combined with those from the 2013 season a comprehensive series of statistical analyses will be undertaken. These analyses will go beyond simple PCA representations to incorporate CART analysis and non-parametric ANOVA approaches.

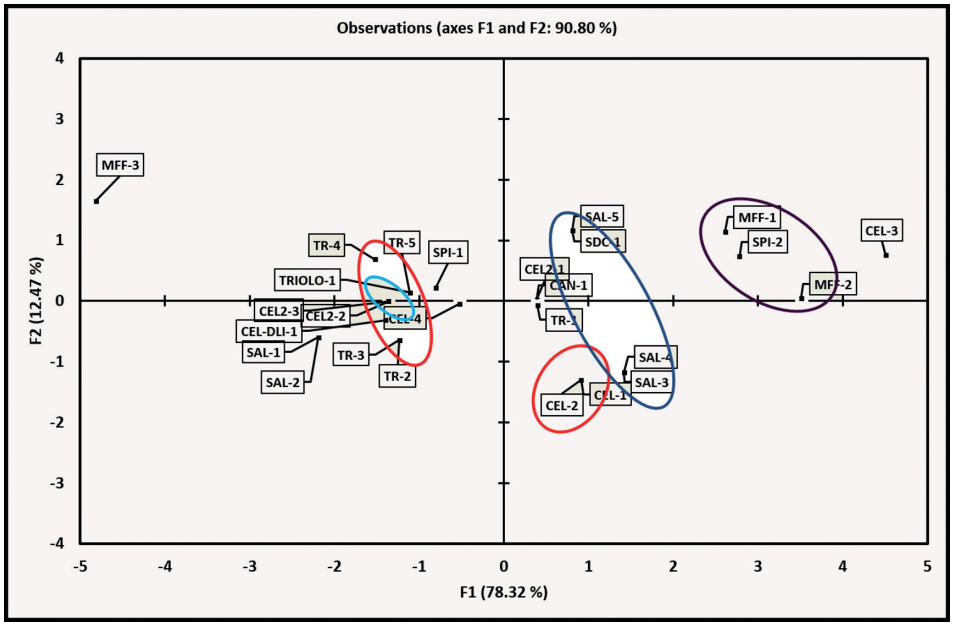

Fig. 8 – PCA chart for clays.

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