Neutron Activation Analysis in Archaeological Pottery from Mendoza, Central Western Argentina.

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OBJECTIVE & ARCHAEOLOGICAL CONTEXT.

The aim of this paper is to explore archaeometric analyses by NAA on ceramics sherds of two differents areas of Mendoza: Tunuyán and Atuel River Basins (table 1), located in the north and south of the province, respectively (figure 1). In Central Western Argentina, ceramic technology has been dated *ca.* 2000 years BP. It varies in terms of manufacture and decoration. Differences in cultural, social and economic organization were also present in the area. The Atuel and Diamante river basins are in a transition zone, with farmers and pastoralists to the north and hunter-gatherers to the south (table 1).

The Tunuyan river basin crosses the center of the province. Ceramic selected for NAA proceed from two sites of a western sector of this area: Agua Amarga (AA) and Puesto La Isla (PLI) (table 1, figure 1). As well as Tunuyan area, Atuel river basin cross complementary resources areas, west to east, and have a diverse altitude (table 1). For this region, ceramic sherds from six archaeological sites were selected: Los Gallegos (LG 1), Rincón del Atuel (RA 1), Arbolito 1 (AR 1), Puesto Jaque 2 (PJ 2), Arroyo Malo 1 (AMA 1), Risco de los Indios (RI) (table 1, figure 1).

Archaeological Sites	Region	Location	Altitude (masl)	Archaeological Context	Period	Type	N Sample (NAA)
Agua Amarga	Tunuyan river basin	S33°28'18.5"-W69°08'59.7"	1083	Farmers	Late Holocene	1500-500 years AP	10
Puesto La Isla		S33°29'55.4"-W69°08'59.7"	1007				20
Los Gallegos 1	Atuel river basin	S34° 47' 43.31"-W67° 57' 8.15"	525	Hunter-Gatherers	Late Holocene	1500-500 years AP	10
Rincón del Atuel 1		S34°45'31"-W68°22'14"	747				25
Arbolito 1		S35°5'52.8"-W68°44'15.1"	1300				25
Puesto Jaque 2		S35°10'42"-W69°59'07"	1970				9
Arroyo Malo 1		S34°51'01"-W69°52'11"	2000				17
Risco de los Indios		S34°23'36.6"-W69°52'22.9'	2400				17

Table 1. Archaeological context of selected ceramic sherds for NAA.

MATERIALS & METHODOLOGY.

For NAA analysis, 133 ceramics sherds were selected from Tunuyan and Atuel river basin (table 1). Tipological and technological variability was considered in ceramic selection, reach all types possible present in archaeological sites. Methodology of chemical analysis and statistical procedures follow Glascock (1992) proposal. Methodology were first apply in each area and, later, a new PCA with samples of both regions were carried out keeping labels of earlier groups. Finally, results were screened to determine whether they were consistent with other archaeological data, such technological attributes and geographical location.



Figure 2. First line, View of archaeological sites. From left to right: Agua Amarga, Puesto La Isla, Los Gallegos 1, Rincón del Atuel 1, Risco de los Indios. Second line. Ceramic sherds for NAA. From left to right. Types: Aconcagua, Agrelo, Viluco, Arbolito, Nihuil, Atuel Cepillado.

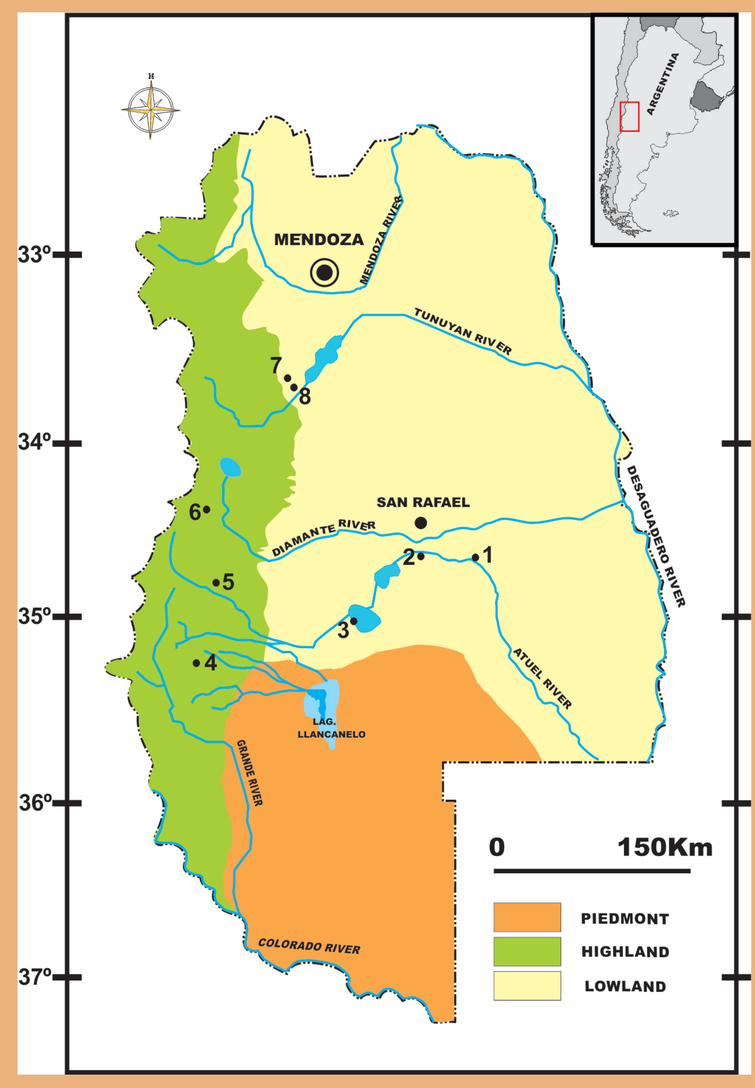


Figure 1. Map of Mendoza Province with archaeological sites. Atuel river basin: 1) Los Gallegos 1; 2) Rincón del Atuel 1; 3) Arbolito 1; 4) Puesto Jaque 2; 5) Arroyo Malo 1; 6) Risco de los Indios; Tunuyan river basin: 7) Agua Amarga; 8) Puesto La Isla. In color ecological areas.

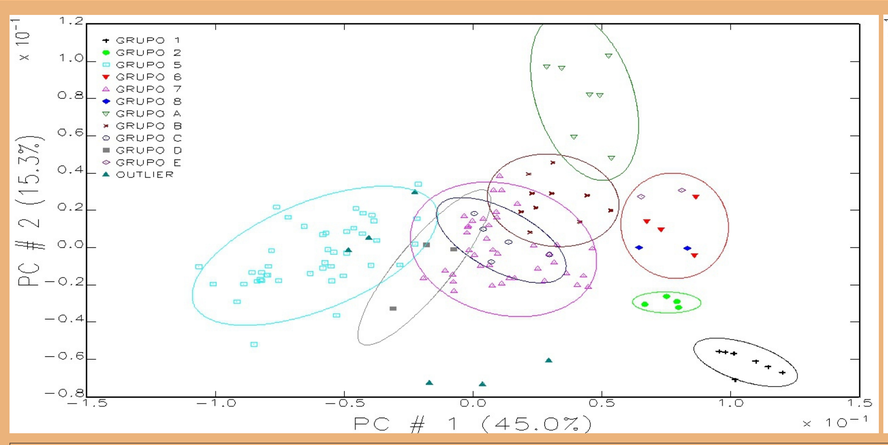
RESULTS.

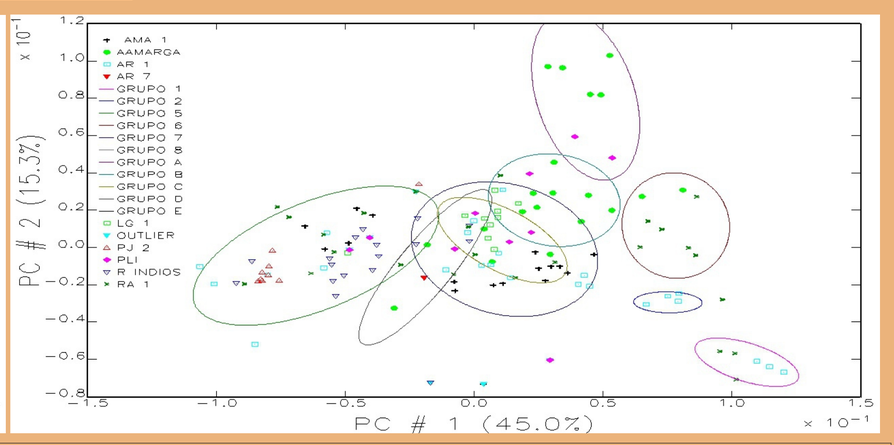
Table 2 shows 11 chemical groups identified and six specimens ungrouped (outliers). Five groups correspond to northern sites (AA, PLI), and six to southern sites (LG 1, RA 1, AR 1, PJ 2, AMA 1, RI).

Samples in group A are technologically homogeneus and correspond to Viluco Inca type. They probably come from Uspallata valley, distant 100 km approximatelly. Group B, C, and D have very heterogeneus specimens, having different technological attributes. Specimens of these groups correspond to Viluco and Agrelo types, with red and grey surface, respectively. Group B have the higher presence in AA site.

Specimens from group 1 & 2 match up with Atuel cepillado type from RA 1 & AR 1. It is consider locally made in lowlands (Lagiglia 1977). Group 5 has a major quantity of samples and it is present in all Atuel river basin sites. It is related with Nihuil & Overo types, that are consider of southern origin. Group 6 is technologically very homogeneus. Group 7 is the second most abundant group. Group 8 is integrated by two Viluco sherds from RA 1, that differ from group 6. Finally, there are 6 ungrouped sherds that behave as outliers.

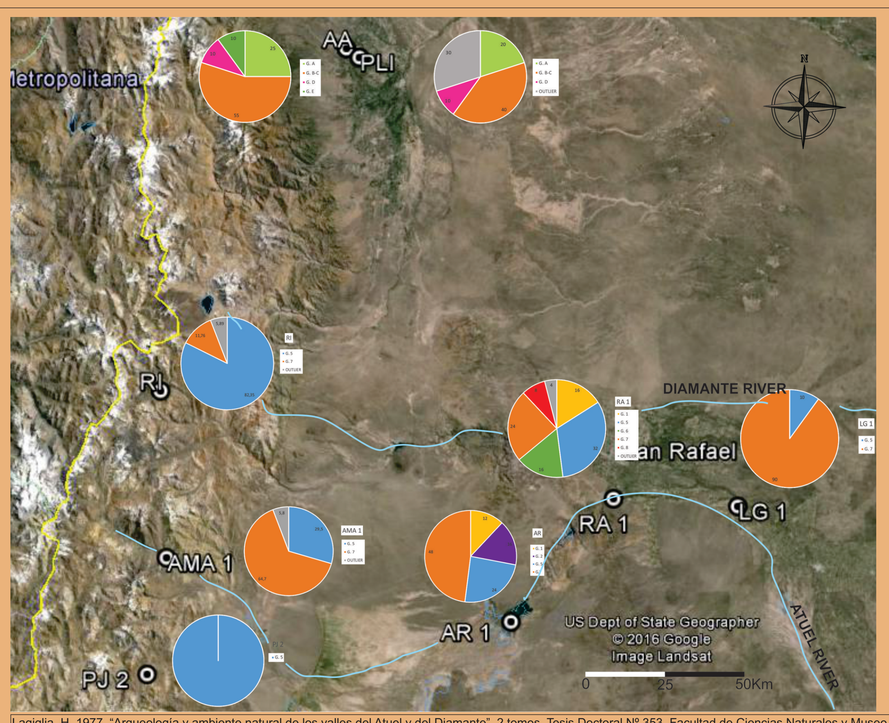
Arch. Sites	Chemical Groups												Total
	A	B	C	D	E	1	2	5	6	7	8	Outliers	
AA	5	8	3	2	2								20
PLI	2	2	2	1								3	10
LG 1								1		9			10
RA 1						4		8	4	6	2	1	25
AR 1						3	4	6		12			25
PJ 2								9					9
AMA 1								5		11		1	17
RI								14		2		1	17
Total	7	9	5	3	2	7	4	43	4	40	2	6	133





Left: Table 2. Chemical groups identified, distributed by archaeological sites. Up and center: Figure 3. PCA of first two principal components of defined chemical groups from Tunuyan and Atuel river basin. Up and right: Figure 4. PCA of first two principal components of chemical groups (ellipses) and distribution of samples by archaeological sites. Below: Figure 5. Trends of chemical groups from Mendoza province. Group A: Light green, group B, C & 7: orange, group D: pink, group E & 6: dark green, group 1: yellow, group 2: violet, group 5: blue, group 8: red, outliers: gray.

Figure 3 shows the results of the PCA of the first two principal component of chemical groups identified from both areas, Tunuyan river basin (A-E, Outliers) and Atuel river basin (1-2, 5-8, Outliers). Figure 4 shows the distribution of pot sherds by site in all defined chemical groups (ellipses). PC 1 & PC 2 explain 65% of the sample. We can stress then: a) A, 1 & 2 are distinct chemical groups and are clearly separated of the entire sample, being group A from north of Mendoza and 1 & 2 from southeast; b) Group 6 (from RA 1, Atuel basin) is grouped with group E (from AA, Tunuyan basin). Although group 8 is shown togheter, it has different composition; c) Group 5 and two outliers from PLI have the same chemical composition. The first one is composed by southern highland types, as Nihuil & Overo, while the last ones are from Western side of Andes types (Aconcagua & Diaguita); d) Finally, group 7, B & C seem to be the same chemical group, while group D is separated by U, Th and Cr elements. This group has great technological variability and correspond to northern and southern types, as Viluco and Agrelo for the first one, and Atuel, Arbolito for the second ones.



TRENDS AND FUTURE WORK.

These are the first results of NAA techique applied to ceramics from Mendoza province. As hypothesis we propose some preliminary trends (figure 5). First, there are two groups from Tunuyan river basin (A & D), one of them is exotic, that may be have origin from Uspallata valley. Second, are two defined southern groups in Atuel river basin, one from highland, related with western side of Andes (group 5), and another one from lowlands (group 1 & 2). Third, there is one group that is only present in AA and RA 1 (group 6 & E). Finally, if we consider group 7, B & C as one chemical group, we can propose that is a regional chemical type, because it is present in Tunuyan as in Atuel river basin. These patterns allow us to establish new hypothesis about role of ceramic technology in Mendoza province and about relationships between southern hunter-gatherers and northen farmers.

Lagiglia, H. 1977. "Arqueología y ambiente natural de los valles del Atuel y del Diamante". 2 tomos. Tesis Doctoral Nº 353. Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata.

Glascock, M.D. 1992. Cap. 2. Characterization of Archaeological Ceramics at MURR by Neutron Activation Analysis and Multivariate Statistics. Neff, H. Ed. Chemical Characterization of Ceramic Pastes in Archaeology. 11-26.

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