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Petrography and chemical composition of groundstones from Çatalhöyük Neolithic site

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Introduction

Çatalhöyük Neolitic Site is located near Çumra Village at the large Konya Plain of Interior Turkey (Fig.1). Since its discovery in 1950s, the excavations revealed its uniqueness as being the first urban complex in the world at 7500 BC which was occupied by thousands of people, in addition to the wealth of information coming from the findings on wall paintings, sculptures, textiles, ceramic artifacts, mud balls, stone artefacts and houses of a Neolithic village (http://catal.arch.cam.ac.uk).

During the excavations a lot of stone material and artefacts are collected, especially at the Neolithic East mound. Among these, groundstones indicate agricultural activities and food processing, and thus their presence and mobility/immobility may give valuable information about the social and economic life styles of the Çatalhöyük people. So, one of the major concerns is to find the geological sources of stone materials although the raw material sources seem to be scarce based to the geomorphological observations.

This study aims to establish the links between the raw material sources of the Çatalhöyük groundstones based on their chemical and petrographic analyses.

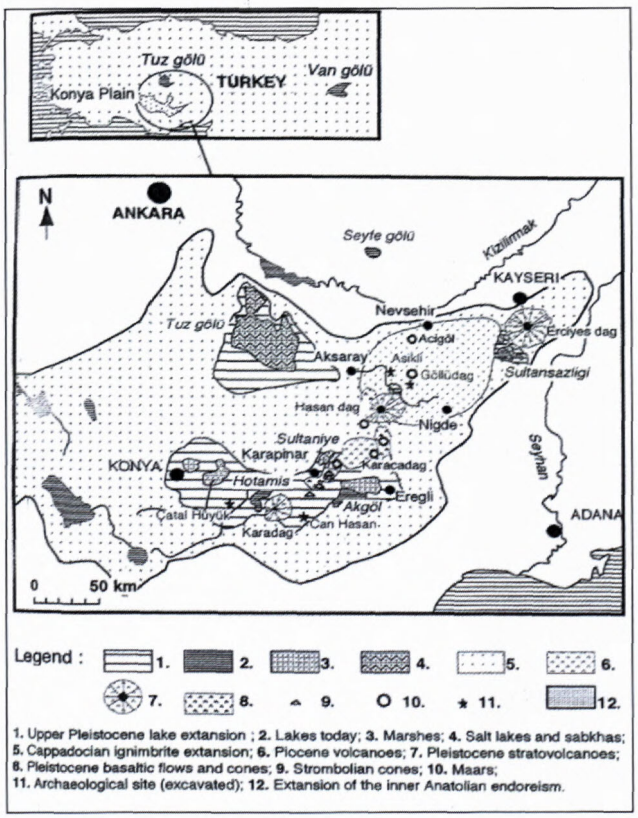

Fig. 1. Location map of the Çatalhöyük archaeological site (adopted from Karabiyikoglu and Kuzucuoglu; 1998)

Sampling and Methods of Study

Groundstone samples are collected from the East mound which is Neolithic in age, together with only one sample (Sample/Unit No: 2910) from the West mound, which belongs to Chalcolithic age (Table 1). Field samples were collected from igneous rocks including a volcanic neck and from the limestone outcrops in the region. River gravels were also sampled from the exposures of river deposits.

Thin sections of all samples were prepared and examined with a polarizing microscope to study their mineralogical compositions, textures and alteration products. XRF analyses were carried using the facilities at Turkish Atomic Energy Autorithy Laboratories, Ankara. The chemical data obtained were statistically analysed.

Results and Conclusion

The studied groundstones and field samples are classified into volcanic, sedimentary and metamorphic rock types based on petrographic analysis. In each rock type subgroups were also identified. The groundstones of the first subgroup can be correlated with the field samples collected from Karadag-Kaletepe location (Table 2). The groundstones of the second subgroup are correlated with the field samples collected from Karadag location. For the third subgroup there is no matching groundstone. Groundstones of sedimentary raw material have similar petrographic features with the field samples collected from certain locations. Only a few of the groundstone samples belong to metamorphic group without any match with the studied field outcrops.

The geological formations are proposed for the raw materials based on their petrographic characteristics and geological observations (Table 2).

Table 1. Description of the Samples Studied

Analysis No	Sample/Unit	Sample No	Area/Location	Material	Description	Attributed Level
1	2519	Stn/S3	North 97	Groundstone	Metamorphic	VI-V
2	3049	Stn/S3	North 98	Groundstone	Volcanic	VII- VI
3	1092-1	Stn/S4	Mell 96	Groundstone	Sedimentary	VII
4	3115-2	Stn/S8	Mell 98	Groundstone	Sedimentary	VIII
5	3314	Stn/S8	Mell 98	Groundstone	Sedimentary	VIII
6	4121	Sample 2	South 99	Groundstone	Sedimentary	VIII
7	5308	Sample 28	South 99	Groundstone	Sedimentary	prelevel XII/C
8	4186	Sample 11	South 99	Groundstone	Metamorphic	VIII
9	4194	Sample 25	South 99	Groundstone	Metamorphic	
10	4246	Sample 13	South 99	Groundstone	Metamorphic	VII
11	3501x5		Bach 98	Groundstone	Volcanic	VI?
12	2910	Stn/S22	West 98	Groundstone	Volcanic	
13	6010	Sample 17	Kopal 99	Groundstone	Metamorphic	
14		Sample 1	Karadad/Kaletepe	Outcrop	Volcanic	
15		Sample 2	Karadad/ Kaletepe	Outcrop	Volcanic	
16		Sample 3	Karadad/ Kaletepe	Outcrop	Volcanic	
17		Sample 4	Karadad/ Necktepe	Outcrop	Volcanic	
18		Sample 7	Karadad/ Necktepe	Outcrop	Sedimentary	
19		Sample 1	Kanal taksim mahalli	Outcrop	Sedimentary	
20		Sample 2	Kanal taksim mahalli	Outcrop	Sedimentary	Fosillifeous
21		Sample 1	Belkuyu	Outcrope/stone	Sedimentary	

Table 2. Provenance Analysis of Groundstones

Field Outcrop	Rock Type .	Matching Groundstones
I. Volcanic Sources/Pleistocene Age		
Karadad/Kaletepe	Ho-andesite, Ho-Bi-andesite	3049, 3501, 1242
Karadad	Px-basalt	2910, 3501x5, 3506
Karadad/Necktepe	Dacitic andesite	*No match*
II. Sedimentary Sources/Possible Geological Formation-Age		
Kaletepe/Necktepe7, K.T.Mahalli	Lake limestone-marl/Karahisarlý Lst-Neogene	3115-2, 3314, 5308, F160
Dineksaray, Belkuyu	Radiolarian Chert/Ophiolithic melange-Cretaceous age	1092-1, 6010
Dineksaray	Conglomerate,Sandstone, Siltstone/alluvial deposits of Çarşamba River/Quaternary	3315-1, 4121, 4796
III. Metamorphic Sources/Possible Geologic Formation-Age		
No match	Recrstallized limestone/Taurus Belt -Permian age	6010
No match	Metadiabase/Hatip Melange at the south of Konya plain	4194
No match	Quartz-mica schist/metagranite of basement rocks-Precambrian age	4186, 4246, 2518, 1015
No match	Meta-sandstone/?	1344, 3743

Ho: Hornblende Bi: biotite Px: Pyroxene

These findings are also supported by major and trace element analyses.

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