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Raw material types of groundstones from Çatalhöyük Neolithic site in Turkey

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Introduction

Çatalhöyük Neolithic 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 center in the world at 7000BC 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 (Mellaard, 1975). So it has importance for the understanding of the development of Mediterranean societies. An international team, lead by Dr. Ian Hodder, from the University of Cambridge has been continuing excavations at the site in order to shed more light on the origin of site and its social and economic development (Catal News 6, 2000).

The surroundings of the Çatalhöyük site are drained by the Çarşamba River and its tributaries. The river forms meandering channels in the widespread alluvial deposits in Konya plain leaving some small remnant hills. The mountain slopes rises slowly at long distances away from the site. The Çatalhöyük site is divided into east and west mounds which are easily recognizable from distance since they rise from a low lying topographic surface.

During the excavations a lot of stone material and artefacts are collected, especially at the west 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 investigate the provenance of the Çatalhöyük groundstones. Their petrographical properties are compared with the rock samples collected from the area surrounding the site in order to find their possible sources.

Geological Framework

Konya basin is a closed lacustrine basin surrounded by high mountains at the west, south and the east. It is separated from Tuz lake drainage area by a pass only 50 m. high at the north. It has a tectonic origin and appeared during Miocene times during the uplift of Taurus Mountains composing the southern drainage area of the basin. Rivers like the Çarşamba river, originate from a lake, flows downslope towards the Konya Plain. The sediment fill of the Konya plain is lime rich marls, enriched in clastic material importaed by rivers from the Taurus Mountains, and by slope processes from the limestone and volcanic reliefs. At present, the Konya Plain is a flat lying palaeolake bottom (Fig. 2), with the altitude of around 1000 m. Surrounding heights reach up to 1500 m. like Bozdağ (a limestone palaeorelief). Two stratovolcanoes, Karadağ and Karacadağ, are higher than 2000 m.

The oldest rocks in the area are slightly recrytallized limestones of Mesozoic age and ophiolithic rocks structurally overlying them. Calc-alkaline volcanic rocks of differing compositions and ages are more common and some of them are erosional remnants of volcanic necks. Karadağ Volcano of Pleistocene age is the major volcanic feature nearest to Çatalhöyük site. Karacadağ volcano has Pliocene age and is mainly andesitic. Near Karapinar, Upper Pleistocene strombolian basaltic cones and maar form a plateau. Most of the area is covered by limestones of Miocene age that expose at the northern slope of the Taurus Mountains forming the southern boundary of the Konya Plain (Karabiyikoğlu and Kuzucuoğlu, 1998).

Methods of Study

Geological investigations were carried out in a wide area around the Çatalhöyük site in order to collect samples from possible source rocks in the field. Samples were collected from igneous rocks and limestone outcrops. The Çarşamba river gravels were also sampled from the exposures of river deposits such as alluvial fans, stream ter-

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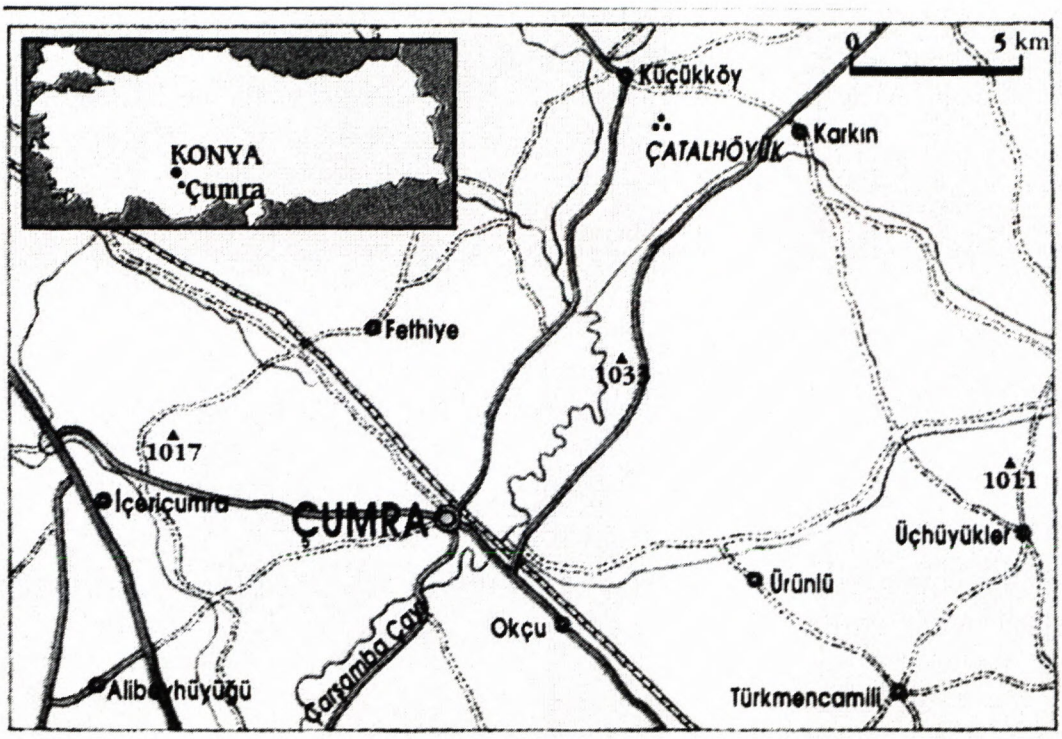

Fig. 1 Location map of the Çatalhöyük archaeological site

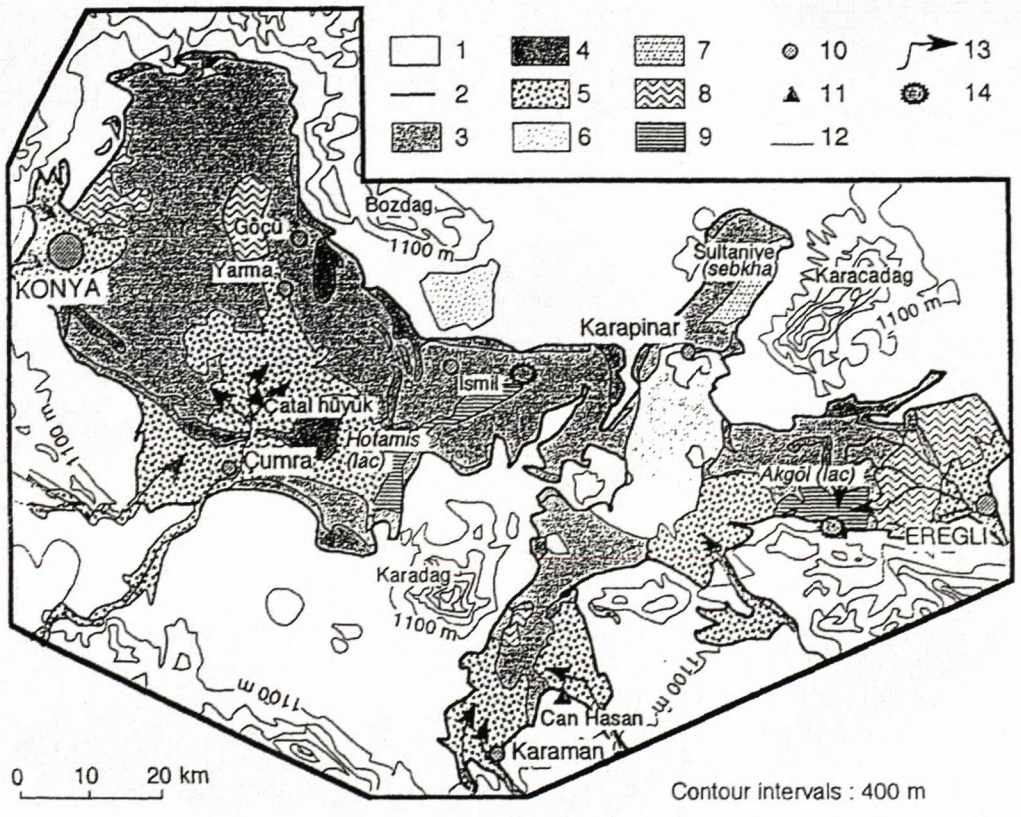

Fig. 2 Regional geologic map of the study area. 1. Prequaternary and Pleistocene limestones and volcanics, 2. Limit of the palaeolake Konya bottom, 3. Pleistocene palaeolake Konya, 4. Sand and gravel shore deposits, 5. Coarse material alluvial fans, 6. Dune systems, 7. Sabkha, 8. Marshes, 9. Lakes, 10. Towns and villages, 11. Neolithic site, 12. 400 m contour intervals, 13. Main river imput to the plain, 14. Swallow hole (Adapted from de Meester, 1970; and Roberts, 1983)

races and channel beds in order to detect the possible varieties of rock types transported by the river from far distances.

In addition to field samples 34 groundstones from the excavation site were selected for petrographic investigations in order to compare their petrographic characteristics for the provenance analysis. The thin sections of 49 samples were prepared and examined with a polarizing microscope to study their mineralogical compositions, textures and alteration products.

Results

The studied groundstones can be classified into volcanic, sedimentary and metamorphic rock types based on petrographic analysis. In comparison with the field samples correlations are done for provenance studies.

Among the volcanic varieties three subgroups are recognized as:

1) hornblende-andezite and hornblende-biotite andesite,
2) pyroxene basalt, and
3) dacite and dacitic andesite.

The groundstones of the first subgroup can be correlated with the field samples collected from Karadağ-Kaletepe location. They exhibit porphyritic texture with hornblende and plagioclase as the common phenocrysts. Hornblende crystals show brown and green pleochroism and they have opaque rims. Plagioclase crystals show zoning and twinning. In the groundmass plagioclase microliths are common and may be aligned. Calcitization and argillization are detected in plagioclase phenocrysts.

The groundstones of the second subgroup includes pyroxene and are defined as basalt or basaltic andesite. They have porphyritic texture with plagioclase and pyroxene phenocrysts. These minerals are also abundant in the groundmass as microliths. No matching is observed between these groundstones and field samples collected from volcanic outcrops.

In the third subgroup there is only one groundstone which is petrographically similar to those field samples obtained from Karadağ-Necktepe location at the faulted contact of volcanics with limestone. The volcanic rock is defined as dacitic andesite with quartz, hornblende and plagioclase phenocrysts. It is intensely altered to clay, hematite and calcite which is also typical for the groundstone belonging to this petrographic subgroup.

Groundstones from sedimentary raw material are also present in the Çatalhöyük site. They are white colored, massive looking micritic limestones which have similar petrographic features with the field samples collected at two locations. Chert is another variety of sedimentary groundstones. In the field , at two locations at the alluvial plain chert is also collected which is correlated with the groundstone. In the sediments of Çarşamba River gravels of siltstone, sandstone and conglomerate are present. However, no groundstones with equivalent pertographic characteristics of such gravels are identified.

Only nine of the groundstone samples belong to metamorphic group. Their raw material is low- grade metamorhic rocks which contains greenstones, metagranites and metasandstone and marble. No exposures of metamorphic rocks are present in close vicinity of the site. These type of groundstones are most probably collected from river sediments.

In conclusion, the groundstones from the Çatalhöyük Neolithic site have mainly volcanic sources of andesitic-basaltic nature. They may be locally collected from nearby outcrops close to the site. On the other hand, sedimentary and metamorphic varieties are less common, and are suggested to be obtained from the fluvial deposits of the Çarşamba river. They are very probably transported by the river from the Taurus mountainous.

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