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SILICEOUS SINTER AND THE EARLY MAORI

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Abstract

Drill-point material in early coastal sites in the Coromandel, Auckland and Northland areas, previously termed chert, has now been identified as siliceous sinter. Formation of sinter is explained, and a method of sourcing described. An application to archaeology is related.

Adzes, 'knives' and drills appear to have been the three main tools with which the early Maori, at least, manipulated his environment. The non-overlapping functions of these tools necessitated the use of rocks with different and suitable properties.

In the northern part of the North Island a great percentage of these three materials, in sites which are either C14 dated as pre-1450 A.D., or have artifact assemblages and economic evidence similar to such sites, are often identifiable to source, or source area.

The adze material in these sites has been identified as originating from Tahanga Hill, Opito (Shaw 1963, Moore 1975, Best 1975). The 'knives', or obsidian flakes, have long been traced to Mayor Island (Green, 1959, n.d., 1962: 13). It is the third material, from which drill-points were made, that will be discussed below.

Recent work (Best 1975) has indicated that a large proportion of the drill-points found on early sites in the area under discussion are manufactured from siliceous sinter. A major occurrence of this rock is in the Kuaotunu Peninsula area of Coromandel, resulting in all three materials being available within a 60 kilometre stretch of coastline.

Prior to this work all fine-grained siliceous rock found in archaeological sites has tended to be subsumed under the blanket term 'chert'. Indeed, many geologists do not make finer distinctions within this category. This is understandable when it is realised that both can be formed by similar processes of silica deposition from hot fluids;

cherts being exclusively sub-marine in origin. Sinter however is formed at surface as a result of intense geothermal activity over a considerable period of time.

The importance of this rock to the archaeologist is that sourcing, by a relatively simple method, appears possible.

Siliceous Sinter

The rock is commonly very hard, highly coloured and cryptocrystalline, with a well developed sub-conchoidal fracture. It can often be distinguished from other siliceous deposits by a cortex displaying the irregular build-up characteristic of geothermal deposition, by internal horizontal layering, and by the presence of fossil plant material and pollen.

Siliceous sinters are surficial discharge deposits from hot aqueous geothermal fluids, which deposit abundant silica due to high evaporation rates at the surface and subsequent insolubility of the silica (Fig. 1). Trapped within the sinter as it deposits are small pockets of geothermal fluid - these are fluid inclusions - and the geochemistry of these small 'pockets' of fluid is controlled by hot water-wall rock interactions subsurface. It appears that discrete areas of sinter are geochemically unique, due to differing physicochemical conditions of geothermal systems in space and time, but are also relatively homogeneous. The nature of the wall rocks at depth, and such factors as temperature and solution pH will all affect the alkali ratios of the resulting discharged fluid. It is in the geochemical parameters of this fluid, preserved in the often submicroscopic inclusions, that the possibilities for sourcing lie.

Since individual systems may be in the order of 10 km^2 (e.g., Wairakei), several different systems may operate in the same general area. Each of these may have different fluid compositions owing to the factors described above. Theoretically fluid compositions vary little in one system, and it should be possible to establish unique ranges of ratio values for unique systems.

Method

The samples are rigorously cleaned by grinding to remove clays and cortex, are crushed to fragments of about 5 gm in weight, boiled in concentrated hydrochloric acid to remove oxides and sulfides, and then rigorously washed in tap, distilled, and doubly de-ionized water. The sample is then ground with doubly de-ionized water to - 200#. The resulting slurry is centrifuged or allowed to settle out, and the filtrate determined by Flame Emission spectrophotometry for Na, K, Ca, Mg, Li, Rb and Cs concentrations, in parts per million, blanks being used to control for contamination. Since absolute values of these elements depend on (1) sample size, and (2) fluid density, ratios are used for comparison of samples.

Archaeological application

A certain amount of success has been achieved with attempts at sourcing. Drill-point material from the Mt Camel site at Houhora has been identified as siliceous sinter, and Sodium/Potassium ratios compared with those of the only known occurrence of workable sinter north of Auckland, at Maungaturoto and Ngawha Springs, and with sinter from sites and sources on the Coromandel Peninsula.

Results indicate that the Mt Camel samples fall within the range of the Coromandel sinters, especially that of Waitaia Ridge, Kuaotunu, but are dissimilar to the Northland sources. In addition, site specific ratios seem to occur in samples from the Coromandel archaeological deposits, indicating different sources within the area.

Since the above tests were run a new deposit of sinter, possibly quarried (D. Simmons, per. comm.), has been recorded on Gt Mercury Island.

It must be stated that both theory and method are in process of development. However the technique has been used successfully on fluid inclusions in quartz, working in parts per billion.

Siliceous sinter, then, has been shown to occur in early archaeological sites in the Coromandel and North Auckland areas at least, along with basalt from Tahanga Hill and obsidian from Mayor Island. Like these, sinter can apparently also be sourced. Indications are that, in the Coromandel area, many identifiable sources exist, enabling extremely sharp detail in movements of rock or people to be discerned.

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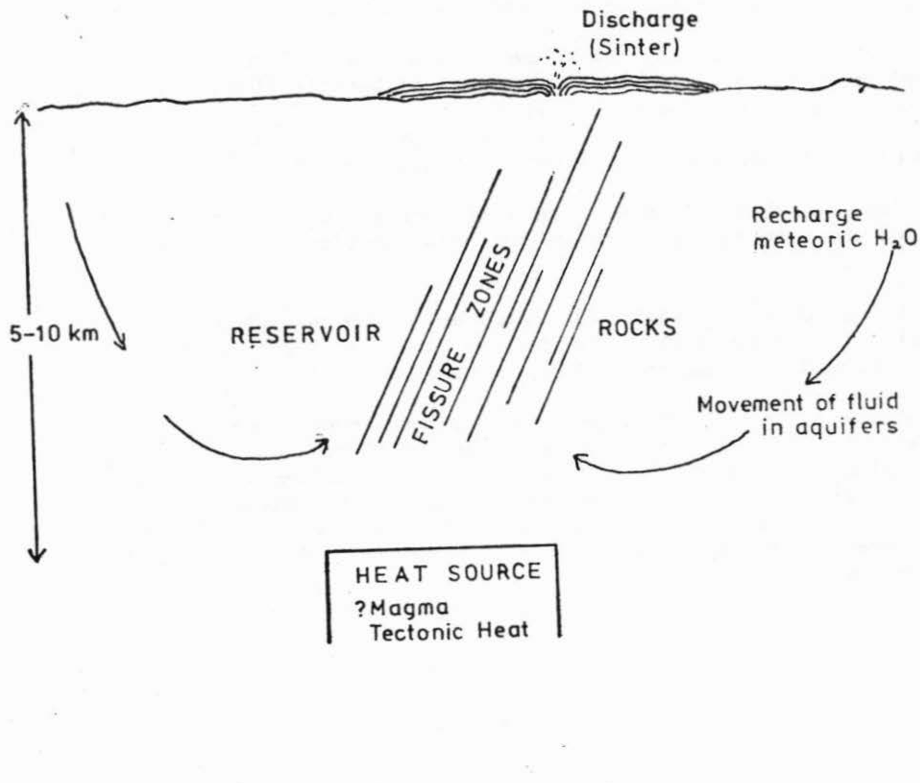

FIG. I. Generalised Geothermal System.