

Recent Developments in Obsidian Hydration Dating

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ABSTRACT. This paper presents recent experimental results from the obsidian hydration dating research programme conducted at the Centre for Archaeological Research (CAR), Auckland University. Two elements of the essential hydration rate component are examined. First, the influence of potentially significant environmental variables other than ambient temperature is explored. Our results demonstrate that environmental variables other than temperature may have a significant influence on hydration rate, though for many archaeological situations their influence is insignificant. Second, an alternative approach to estimating the exponential mean temperatures necessary for dating is presented. It is based on modelling the soil surface energy balance. A comparison with other prediction methods shows it to be a preferable approach. Finally, the results of a blind dating applications are presented. These show that the dating method can produce results which are both sensible and useful.

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Obsidian hydration dating (OHD) involves converting a measured hydration rim thickness into a “date” based upon an estimated hydration rate. As the rate at which obsidian hydrates depends on the ambient temperature and glass chemistry (Ambrose, 1976; Friedman & Smith, 1960), accurate temperature control and an understanding of the glass reaction are fundamental to producing accurate obsidian hydration dates. This applies equally whether the OHD is produced using an independently calibrated hydration rate (a hydration rate calibrated via a primary dating technique such as a dated historic context or ^{14}C) or an intrinsic hydration rate (a hydration rate calculated on the basis of glass chemistry) (Jones *et al.*, 1997).

The purpose of this paper is to present recent results clarifying hydration rate estimation, by evaluating the influence of the hydration environment and modelling the ambient temperature regime.

Hydration rates

Hydration rates are influenced by the conditions under which the chemical conversion of obsidian into perlite takes place. Thus the rates are influenced by the environment within which the artefact is stored, and the chemical composition of the obsidian itself. Research to date has suggested that the two most important controls on hydration velocity are the storage temperature and glass chemistry (Ambrose, 1976; Friedman & Long, 1976; Michels *et al.*, 1983; Stevenson *et al.*, 1989). To verify these results a series of induced hydration experiments were conducted during 1996. One of the main questions examined in these induction experiments was “What influence do environmental variables other than temperature have on hydration rates?”. This is of considerable importance to the application of obsidian hydration dating as there are