GEOETHICAL IMPLICATIONS FOR GEOARCHAEOLOGY: THE LAACHER SEE AND AD 536 CASE STUDIES

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1. Archaeology and geoethics – how are they related?

Geoarchaeology has been defined as ‘the application of the geosciences to solve research problems in archaeology’ (Pollard 1999:7). Archaeological research in turn is, among many other topics, concerned with the impact of past environmental change and natural hazards on past human societies. Following the proposed Geoethical Promise (Matteucci et al. 2014), geologists must engage with the public and policymakers on matters of human-environment relations.

What are the implications of the Geoethical Promise for archaeologists? Against the background of two case studies of the distal/ultra-distal impacts of volcanic eruptions on Stone and Iron Age societies respectively, we suggest that such engagement is perhaps best achieved through museum outreach (Fig.1 W).

2. Case 1: The Laacher See eruption

Key eruption parameters:

<table>
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<tr>
<th>Age</th>
<th>M</th>
<th>I</th>
<th>VEI</th>
<th>D</th>
<th>VRC</th>
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<tbody>
<tr>
<td>13ka BP</td>
<td>≥6.2</td>
<td>≥11.5</td>
<td>~6</td>
<td>≥3.1</td>
<td>7</td>
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Key post-eruptive societal effects:

Large tracts of land in north-central Europe were depopulated: communities as far away as southern Scandinavia were affected via respiratory health impacts and increased tooth wear (Riede 2016). Volcanic activity in the Eifel correlates with periods of climatic warming (Nowell et al. 2006), and renewed activity of the above magnitude in the Eifel would likely have severe infrastructural, economic and likely geopolitical consequences (Fig.2A-C; Donovan & Oppenheimer in press).

3. Case 2: The ‘AD 536 Event’

Numerous recent studies have revealed a prolonged Northern Hemisphere cold period in the decades following the year AD 536, in part caused by volcanic eruptions (Bunten et al. 2016; Toohey et al. 2016). Archaeological research in northern Europe reveals significant demographic, political and societal impacts with a lasting cultural legacy – it is here the origins of the Nordic mythology’s end of the world lie (Fig.3A-B; Price & Gräslund 2016; Nordvig & Riede 2016). Similarly conjoined eruption events would also today likely lead to major societal challenges (cf. Lund & Benediktsson 2011).

4. Ethical engagement with the future

In line with the Geoethical Promise, those studying past environmental events and their societal impacts – geologists and archaeologists alike – arguably have an obligation to reach out with their knowledge – and short of environmental activism, they can do so via museum dissemination (Riede 2014; Riede et al. 2016).

References:

[Insert references here]

Fig.1. Visitor numbers for all museums of natural and cultural history in Denmark for the years 2010-2015. © Statistics Denmark. Elsewhere in Europe (e.g. Austria), these differences are similarly high (see http://www.eumus.eu/)

Fig.2A. The tephra fallout distribution of the Laacher See eruption in the proximal (<50km), medial (50-500km), distal (500-1000km) and ultra-distal (>1000km) hazard zones (cf. Thorarinsson 1979). Archaeological data suggests major impacts up to at least 500km from the vent. B. Major European power plants in the hazard zones, data courtesy of ESRI. C. Contemporary European population density, data courtesy of ESRI.

Fig.3A. Simulated temperature anomalies for AD 536 in Europe. From Toohey et al. (2016). B. In northern Europe, this period is characterised by intense religious and geopolitical upheavals reflected in the archaeological record: gold hoards, change in symbolism and fervent building activity.