1. Introduction

The eruption of Mount Churchill, Alaska, was one of the largest volcanic events in the Northern Hemisphere in the later first millennium AD. Ash from the eruption was dispersed eastwards, forming a visible lobe (WRAe) covering >250,000 km² in Alaska and NW Canada, and a cryptotephra horizon (AD860B) as far as Greenland and NW Europe (Fig. 1). The considerable ash fallout is thought to have impacted ecosystems and human populations, possibly leading to the displacement of Athapaskan-speaking peoples from the Yukon to the American South-West. But did the event have wider climate and societal repercussions? The tephra provides a precise isochron with which to examine the eruption's impact.

1.1. Introduction

1.1.1. Volcanic Impacts

- Local impacts: Ecosystem damage as a result of ash fall and acid rain
- Climate impacts: Reduced radiative balance as a result of aerosols
- Societal impacts: Indirect effects of climate change and acidic deposition on subsistence economy and health

1.1.2. Distal Impact

On the basis of the N51-2011 ice core chronology, the Mount Churchill eruption can now be dated to the winter of 852-3 (M. Sigl, pers. comm.). Could the Mount Churchill eruption have therefore been responsible for summer snow and frosts in AD 855 and the harsh winter of 855-6, recorded in the Irish Annals? WRAe/AD860B tephra in Greenland ice cores is associated with a modest sulphate deposition at the time of the event (Fig. 2). Palaeohydrological records from the Atlantic seaboard reveal a decline in farming in Ireland in 10th century time-transgressive (Fig. 5). Despite its close timing to the event, this decline cannot be attributed to the Mount Churchill eruption.

3. Evaluation

- No palaeoenvironmental evidence that the eruption had any lasting impact on climatic conditions in the N. Atlantic region.

- Despite its large magnitude, modest aerosols emissions, the high altitude of the event and its occurrence in winter will have diminished the eruption's climate impact.

- Despite its close temporal correlation with extreme weather events and a downturn in farming in Ireland, the eruption is unlikely to have impacted climate or society at an extra-regional level.

- Palaeoenvironmental proxy records from sedimentary archives may lack the temporal resolution to identify short-lived volcanic impacts.

- But not all large volcanic eruptions are climatically effective, and caution must be exercised to avoid mistaking correlation with causation.

Acknowledgments

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References