Geophysical Research Abstracts
Vol. 14, EGU2012-8574, 2012
EGU General Assembly 2012

Quantifying distal dispersal and impact of volcanic ash from super-eruptions: an application to Campanian Ignimbrite

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Distal and ultra-distal volcanic ash dispersal during a super-eruption was reconstructed for the first time, providing insights into eruption dynamics and the impact of these gigantic events. A novel computational methodology was applied to the ash fallout of the Campanian Ignimbrite (CI), the most powerful volcanic eruption in Europe in the last 200 kyrs. The method uses a 3D time-dependent computational ash dispersion model, an ensemble of wind fields, and hundreds of thickness observations of the CI tephra deposit. Results reveal that 250-300 km^3 of fallout material was produced during the eruption, blanketing a region of $\sim$3.7 million km^2 with more than 5 mm of fine ash. The model also indicates that the column height was $\sim$37-40 km, and the eruption lasted 2-4 days. The eruption would have caused a volcanic winter within the coldest and driest Heinrich event. Fluorine-bearing leachate from the volcanic ash and acid rain would have further affected food sources and severely impacted Late Middle Paleolithic groups in Southern and Eastern Europe.