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'The controls of particle size and chemistry on the leaching potential of volcanic ash: implications for ash deposition into proximal and distal water sources.'

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Major sources of ash and aerosol particles into the Earth's atmosphere are explosive volcanic eruptions, with much of the finer extruded material eventually being deposited into water sources. Previous research suggests that volcanic ash can have either beneficial or detrimental consequences for aquatic ecosystems post deposition, due to the leaching of a wide range of chemical elements into the water. Therefore, better understanding of how volcanogenic particles interact with water is imperative. Here we present a new study exploring the effect of particle size - a variable which changes naturally with proximity to an eruptive source - on the leaching potential of volcanic ash. Pristine ash samples from the 2021 eruptions of La Sourfrière (Saint Vincent), and Cumbre Vieja (La Palma), are separated into one un-sieved and two dry sieved fractions: large (500 - 2000μm) and small (63 - 250μm). They are then agitated on a rocker for a period of 0.5 to 74h following combination with de-ionised water. Scanning Electron Microscopy (SEM), Energy Dispersive X-ray Spectroscopy (EDS) and Laser Diffraction Particle Size Analysis are all used to track the geochemical and morphological evolution of the ash particles before, during and after the leaching experiments. Temporal chemical evolution of the leachate is quantified using an Inductively Coupled Plasma Mass Spectrometry (ICP-MS) method developed for this research. Our preliminary results suggest that the leaching of smaller particle size fractions occurs both faster and potentially more intensely than larger fractions; we hypothesise that this is due their greater surface area to volume ratio. With distance from an eruptive source, median ash particle sizes are known to decrease, thus these results could have implications for risk quantification of ash falls into waters both distal and proximal to eruptions. This increases insight into the potential risks and benefits of volcanic dust input into aquatic systems following eruptions.