



Insulation effects of Icelandic dust and volcanic aerosols on snow and ice

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In the Arctic region, Iceland is an important source of dust due to ash production from volcanic eruptions. In addition dust is resuspended from the surface into the atmosphere as several dust storms occur each year. During volcanic eruptions and dust storms, material is deposited on the glaciers where it influences their energy balance. The effects of deposited volcanic ash on ice and snow melt were examined using laboratory and outdoor experiments. These experiments were made during the snow melt period using two different ash grain sizes (1 $[\mu\text{m}]$ and 3.5 $[\mu\text{m}]$) from the Eyjafjallajökull 2010 eruption, collected on the glacier. Different amounts of ash were deposited on snow or ice after which the snow properties and melt were measured. The results show that a thin ash layer increases the snow and ice melt but an ash layer exceeding a certain critical thickness caused insulation. Ash with 1 $[\mu\text{m}]$ in grain size insulated the ice below at a thickness of 9-15 mm. For the 3.5 $[\mu\text{m}]$ grain size the insulation thickness is 13 mm. The maximum melt occurred at a thickness of 1 mm for the 1 $[\mu\text{m}]$ and only 1-2 mm for 3.5 $[\mu\text{m}]$ ash. A map of dust concentrations on Vatnajökull that represents the dust deposition during the summer of 2013 is presented with concentrations ranging from 0.2 up to 16.6 g m⁻².