

Icelandic glaciers

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Abstract – *Some 11% of Iceland is covered by glaciers. They contain 3,600 km³ of water, equivalent to a 35-m-thick ice layer spread evenly over the whole country; if melted, it would raise global sea level by 1 cm. This is Iceland's greatest water storage, corresponding to the precipitation of 20 years. Dynamic in nature, these glaciers are responsive to climate fluctuations and affect their environment profoundly. Also, they lie over active volcanoes; these induce jökulhlaups that can threaten areas of habitation. The country's glaciers feed its largest rivers and currently provide at least one-third of its total runoff. Since a general glacier recession set in at the end of the 19th century, the largest icecap, Vatnajökull, has decreased by about 10% in volume (300 km³), contributing 1 mm to the concurrent rise in sea level. During the last ten years, ice losses have accelerated, thereby detracting 2.7% (84 km³) from the total icecap volume. Typically, radiation provides two-thirds of the melt energy, turbulent fluxes one-third. However, transitory volcanic eruptions and continuous geothermal activity at the bed of Vatnajökull added some 5.5 km³ to surface melting during the 1990s, with one particular volcanic eruption melting 4.0 km³. In all of Iceland's major icecaps, surges account for a significant portion of total mass transport through the principal outlet glaciers, playing an important role in outlet dynamics and hydrology. Taking the 20th century as a whole, surges contributed at least 10% to the total ice transport to ablation areas of Vatnajökull. Plausible future climate scenarios, coupled with models of mass balance and ice dynamics, suggest that the main icecaps will lose 25% to 35% of their present volume within half a century, leaving only small glaciers on the highest peaks after 150–200 years. Glacier meltwater runoff will peak after 50 years, then decline to present-day values by 100 years from now. When the glaciers have disappeared, the entire river discharge will come directly from precipitation.*