

Glaciers in Canada

Are they disappearing?

Lately there has been a lot of talk about the disappearance of glaciers and the ensuing shortage of water. Yes, most of the glaciers are receding, but it's not the first time by any means. Researchers from the University of Calgary and the University of Western Ontario have shown that glaciers in the Lake Louise area and at the Athabaska Icefields have receded far above their present limits in the past. Before we get to this research, we should consider the conditions that cause glaciers to advance and retreat. Obviously, climate warming will cause melt-back of the toe of a glacier (retreat). The cause for advance is primarily increased snowfall at the top of a glacier (the accretion zone). The pressure of the new glacial ice at the top of the glacier will cause the glacier to start flowing downhill more rapidly than the toe is melting; hence, the advance. Cooler temperatures without the increase in snowfall will probably not halt the retreat. It is possible to have a retreat with cool temperatures and low precipitation, and it is possible to have an advance with warm temperatures and heavy snowfall. It has been recorded in the literature that waxing and waning of glaciers all over the world is a common occurrence and that any reference to this being an abnormal thing, due to Global Warming depends on selectively gathered "evidence". This has been remarkably well illustrated in New Zealand in 2004 with the rapid advance of glaciers in the South Island with the only climatic change being very heavy precipitation.

Central Africa's Mount Kilimanjaro volcano has often been quoted as losing its white cap because of Global Warming. While this may well be related to the "steady ebb and flow of glaciers..." it has also been related to precipitation changes in the area, as discussed above.

Most people pointing to glacier retreat at the toe fail to realize that a glacier is a living thing, that has to be fed in order to stay alive, or even grow.

Now to the science:

1. *Reasoner and Powell* from the U of C studied the lake bottom deposits at Lake O'Hara and Opabin Lake, just across the BC border from Lake Louise. "The varying type and quantity of pollen and conifer needles entombed in the lake-bottom mud provide a detailed record of alpine climate change. Cores of this mud make it possible to reconstruct the climate history of the past 10,000 years." The dating of the sediments was done by using C^{14} ratios.

“Following the end of the last major glacial advance, 11,000 years ago, the climate in the Rockies began to warm. Ice left Lake O’Hara about 10,000 years ago. Shrubs and alpine tundra plants lined its shores but there were no trees. By 8,500 years ago, the area looked similar to today: the Opabin Glacier had retreated to the high slopes, shrubs and grasses surrounded Opabin Lake (265 meters above Lake O’Hara), and coniferous forest was well established around Lake O’Hara”.

For 5,500 years the climate in the Lake O’Hara region was warmer than it is today. *Between 8,500 and 3,000 years ago, the timberline lay well above Opabin Lake and the Opabin Glacier may have disappeared altogether.* The climate cooled again 3,000 years ago and the Opabin Glacier grew again. Approximately 150 years ago, at the end of the Little Ice Age, temperatures began to increase and the Opabin Glacier began to recede once again and is continuing to recede at the present time.

2. *B.H. Luckman* from the University of Western Ontario has published research papers on the analysis of wood fragments discovered to be coming out from beneath the tongue of the Athabaska Glacier. These fragments were from two species of trees, *Pinus* and *Abies*, both erect species. The *Abies* species fragment appears to have come from a tree some 150 to 250 years old before being killed and buried by the glacier. C¹⁴ dating indicates that the age of the wood fragments range from slightly older than 5,000 to over 8,000 years. This information indicates that from *5,000 to 8,000 years ago mature trees were growing in an area now underneath the Athabaska Glacier.* This information ties reasonably well with that from the Lake O’Hara region. Obviously the glacier has advanced, retreated, advanced and is currently retreating the same as the Opabin Glacier.

The writer’s own experience from fairly extensive travel in the Monashee, Selkirk, Purcell and Cariboo ranges confirms that glaciers have retreated and advanced a number of times and that the present retreat is not an unusual event. Not infrequently more than one lateral or even terminal moraine is preserved below a glacier. If the final advance is not as large as some of the previous advances, remnants of the previous moraines will be preserved. Up to three previous lateral moraines preserved below a glacier have been observed by the writer.

All of this demonstrates that there has been a steady ebb and flow of glaciers in the Cordillera and that it is foolish to adopt a “sky is falling” attitude. The previous advances and retreats of the glaciers took place long before the advent of diesel trucks.

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