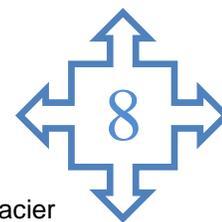


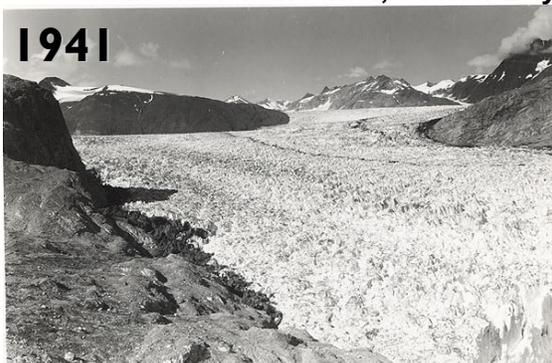
Thinking About Climate Change

Observations of Rapidly Retreating Glaciers



The Muir Glacier was named for John Muir, a famous naturalist and explorer who first visited the Glacier Bay area of Alaska in 1879. On his visit, the glacier was regularly calving (breaking off) large icebergs and the end of the glacier was over 200 feet in height above the ocean. The pictures below show the Muir Glacier in 1941 and 2004 from the same camera location. Scientists measure changes in the size of glaciers over time to determine their stability and climate effects. The graph below shows changes in mass balance of glaciers in seven areas around the world. Mass balance is the difference between the amount of accumulation of snow and ice on a glacier called sublimation, resulting in a positive mass balance and melting of snow and ice called ablation, a negative mass balance. Changes in temperature and the amount of snowfall affects the mass of the glacier and these changes can affect the behavior of the glacier.

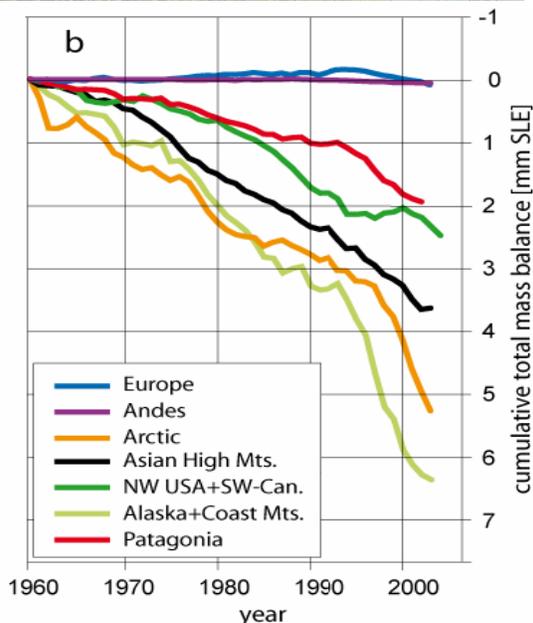
Muir Glacier and Inlet, Glacier Bay National Park and Preserve, Alaska



1. What differences do you see in the two pictures of the Muir Glacier? _____

2. How many years of change does the second photo represent? _____

The figure to the right depicts changes in total mass balance for several glaciers in **sea level equivalent (SLE)**. SLE is the change in global average sea level (mm) that would occur if a given amount of water or ice were added to or removed from the oceans. A positive SLE indicates sea level rises and negative a lowering of sea level.

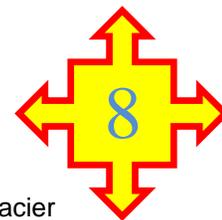


3. In the last 40 years which glacier area has contributed the most to changes in sea level? _____ How much? _____
4. What is the general trend of the glaciers behaviour between 1960 and 2003? _____
5. Most mountain glaciers are losing mass and have been receding in the last decade, which two have made no or even reduced sea level rise? _____

Graph source: Climate Change 2007-The Physical basis: Working Group 1, ed. S. Solomon, p.359.

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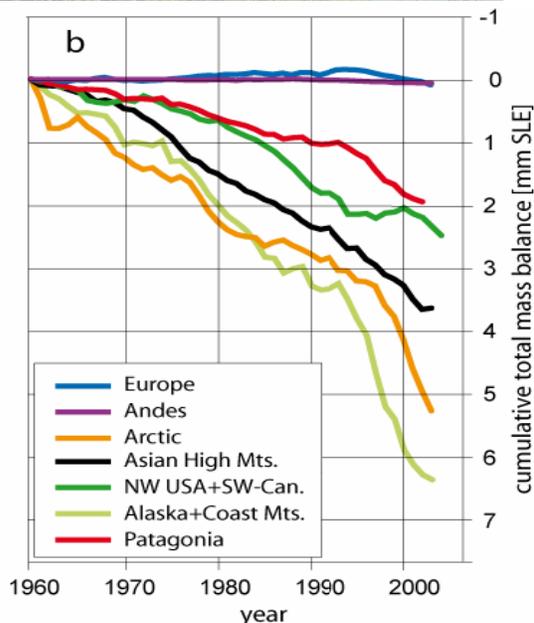
The Muir Glacier was named for John Muir, a famous naturalist and explorer who first visited the Glacier Bay area of Alaska in 1879. On his visit, the glacier was regularly calving (breaking off) large icebergs and the end of the glacier was over 200 feet in height above the ocean. The pictures below show the Muir Glacier in 1941 and 2004 from the same camera location. Scientists measure changes in the size of glaciers over time to determine their stability and climate effects. The graph below shows changes in mass balance of glaciers in seven areas around the world. Mass balance is the difference between the amount of accumulation of snow and ice on a glacier called sublimation, resulting in a positive mass balance and melting of snow and ice called ablation, a negative mass balance. Changes in temperature and the amount of snowfall affects the mass of the glacier and these changes can affect the behavior of the glacier.

Muir Glacier and Inlet, Glacier Bay National Park and Preserve, Alaska



1. What differences do you see in the two pictures of the Muir Glacier? **There is only one glacier in the photo from 2004 (the one on the right). It has receded up its valley. The glacier coming in on the left has receded out of view. Snow is no longer visible in the valley to the extreme far right in 2004.**
2. How many years of change does the second photo represent? **63 years.**

The figure to the right depicts changes in total mass balance for several glaciers in **sea level equivalent (SLE)**. SLE is the change in global average sea level (mm) that would occur if a given amount of water or ice were added to or removed from the oceans. A positive SLE indicates sea level rises and negative a lowering of sea level.



3. In the last 40 years which glacier area has contributed the most to changes in sea level? **Alaska**
How much? **6.2 mm**
4. What is the general trend of the glaciers behaviour between 1960 and 2003? **Sea level is rising from glacial melt.**
5. Most mountain glaciers are losing mass and have been receding in the last decade, which two have made no or even reduced sea level rise? **Europe and the Andes**

Graph source: Climate Change 2007-The Physical basis: Working Group 1, ed. S. Solomon, p.359.