

February 10, 2004

Impacts of climate change on glaciers around the world

Patagonian glaciers in South America

The Patagonian ice-fields of Chile and Argentina, the largest non-Antarctic ice masses in the Southern Hemisphere, are melting faster than any other glaciers on Earth. They have lost 42 cubic kilometres of ice every year over the past seven years, which is equivalent to the volume of ten thousand large football stadiums. Today, they account for nearly 10 per cent of global sea-level change caused by mountain glaciers, according to a new study by *NASA* and Chile's *Centro de Estudios Científicos* (1), and the rate at which they are melting is accelerating.

The latest report of the Intergovernmental Panel on Climate Change (IPCC), a body under the United Nations made up of more than 2500 scientists from around the globe, predicts a sea-level rise of 15 to 99 centimetres this century. It is currently estimated that about half of the world's population lives in coastal zones, which means that sea level rise will have an enormous impact. (2) In Bangladesh alone, 17 million people would be under threat if the sea were to rise by just 1.5 metres. (3)

What is causing the ice to melt so fast? The answer is climate change, caused in part by increased air temperatures and decreased precipitation over time. Still, those factors alone are not sufficient to explain how rapidly the ice is thinning. The rest of the story appears to lie primarily in the unique, dynamic response of the region's glaciers to climate change. The Patagonian ice-fields are dominated by so-called 'calving' glaciers. Such glaciers discharge icebergs into the ocean or lakes and have different dynamics from glaciers that end on land and melt at their front ends. Calving glaciers are more affected by climate change once pushed out of equilibrium, making this area particularly sensitive.

The Northern Patagonian ice-field in Chile and the Southern Patagonian ice-field in Chile and Argentina, cover 13,000 and 4,200 square kilometres (5,019 and 1,622 square miles), respectively. The region, which spans the Andes mountain range, is sparsely inhabited, and rough terrain and poor weather restricts ground access for scientists. Precipitation in the region ranges from two to eleven metres (6.6 to 36 feet) of water equivalent per year, equivalent to up to 30 metres (98.4 feet) of snow a year. The ice-fields discharge ice and meltwater to the ocean on the west side and to lakes on the east side, via rapidly flowing glaciers. The fronts of most of these glaciers have been retreating over the past half-century or more.

(1) www.nasa.gov/home/hqnews/2003/oct/HQ_03336_So_Amer_glaciers.html
www.cecs.cl/

(2) <http://www.ipcc.ch/press/sp-cop6.htm>

(3) "Mass Balance of the Cryosphere", Cambridge University Press, January 2004.

Unfortunately, the Patagonian ice-field's fate is not unique. Globally, the effects of climate change are being felt in a variety of ways and scientists predict more regular, and more intense, impacts. Climate change presents a threat to most natural systems. The natural systems threatened include glaciers, coral reefs, mangroves, arctic ecosystems, alpine ecosystems, prairie wetlands, native grasslands, and biodiversity 'hotspots'. Climate change will increase existing risks of species extinction and biodiversity loss in ecosystems at every latitude across all regions. It is not only causing an impact on nature, it also has devastating implications for human lives.

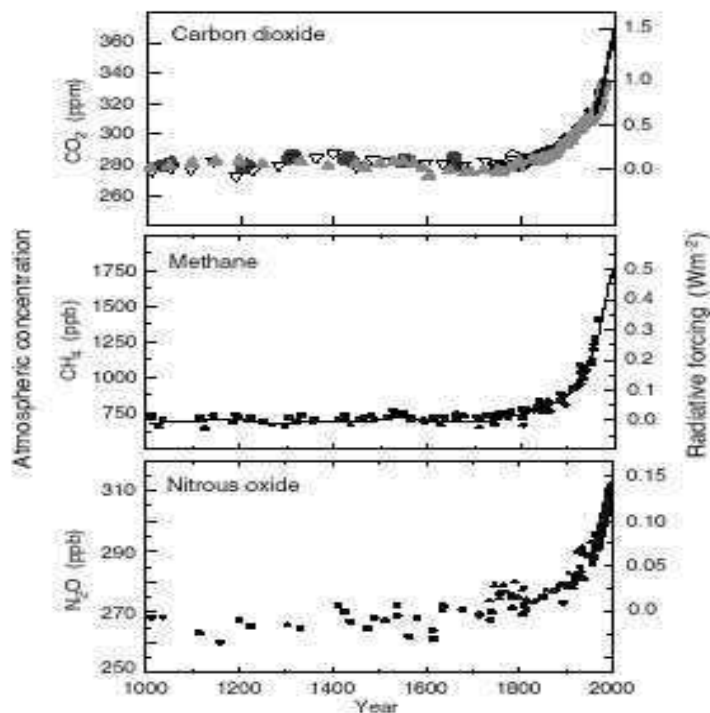
What causes climate change?

Climate change is directly linked to our fossil energy consumption. Global warming of the Earth is the result of increasing greenhouse gas emissions. The principal cause is carbon dioxide (CO_2), which is released when fossil fuels such as coal, oil and gas are burned.

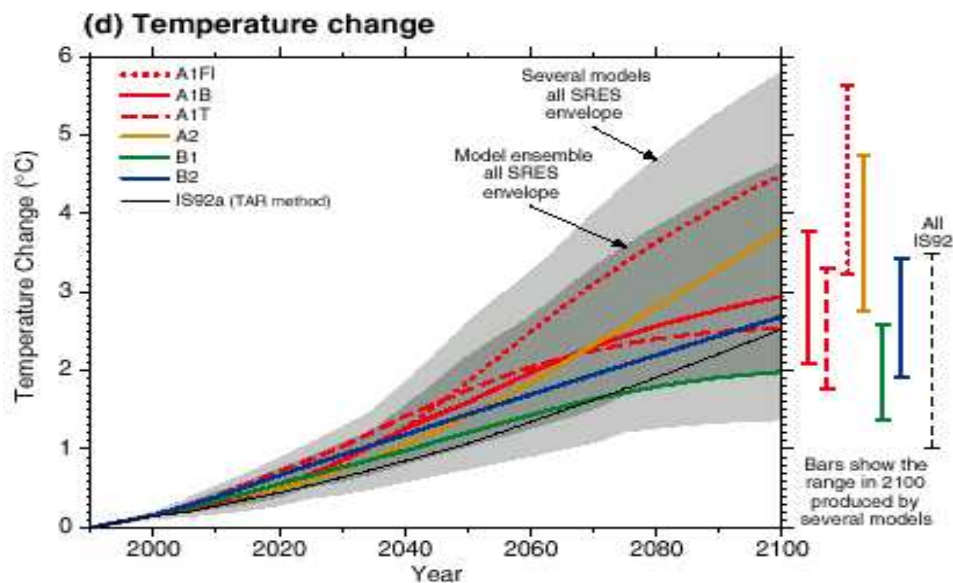
In 2001, a revised report by the IPCC found new and stronger evidence that most of the observed warming over the past 50 years can be attributed to human activities, and that about three quarters of the anthropogenic (human created) emissions of CO_2 during the past 20 years are due to fossil fuel burning.

Indicators of the human influence on the atmosphere during the Industrial Era

(a) Global atmospheric concentrations of three well mixed greenhouse gases



The IPCC also reported that the average global temperature was projected to rise to between 1.4 and 5.8 degrees Celsius over the next 100 years. This is a large increase on the projections in their previous report, made in 1995, which estimated the increase in temperature to be between 1 and 3.5 degrees. In 1992, another United Nations committee concluded a two degree increase would produce substantial damage to or loss of many natural ecosystems, lead to a spread of diseases such as malaria and cause substantial damage to agriculture in developing countries.



Glacial impacts globally

Throughout the world, glaciers are disappearing because of global warming, not only in the tropics but also in temperate zones. Below follow some examples of recent research and predictions.

Mount Kilimanjaro:

The ice-cap of Mount Kilimanjaro is disappearing rapidly due to melting snow and ice and is expected to disappear entirely within ten to 20 years. When it disappears, people who depend on it for water will face significant problems during the dry season. In February 2001 American geologist, professor Lonnie Thompson of Ohio State University's Byrd Polar Research Center, published research which showed that more than 80 per cent of the ice cap's volume had disappeared since 1912, when for the first time 12 square kilometres of snow, ice and glaciers on the slopes of Mount Kilimanjaro were mapped out. His research also shows that 33 per cent of the ice mass has vanished since 1989. According to recent estimates, the remaining ice-cap, which is approximately two square kilometers, will melt over the next 10-20 years. A unique African panorama will have disappeared forever.

Mount Kenya:

The Lewis glacier, the largest of Mount Kenya, has shrunk 40 per cent since 1963.

Himalaya:

Ice drillings in the two kilometres wide Dasuopu glacier near Xixabangma-peak in Tibet show that the last ten years of the 20th century have been the warmest of the past ten thousand years. Despite a severe winter, the Dokriani Barnak glacier in India shrank 20 metres in 1998, and the Gangorti glacier retreated some 30 metres. Scientists predict that, at this pace, all glaciers in the central and east Himalayas will have disappeared by 2035.

Andes (Peru):

The Quelccaya ice cap, with a diameter of 154 metres, has shrunk 20 per cent since 1963.

Spanish Pyrenees:

Half the glaciers that existed in 1980 have disappeared.

Alaska (United States):

The Bering glacier is 5,170 square kilometres. It is the largest glacier in North America and is 800 metres thick in some places. Over the last century, the mouth of this glacier has reduced by 130 square kilometres. Aerial photos show that it has also become 130 metres thinner over the last 50 years.

For further information:

www.greenpeace.org

www.greenpeace.org/features/details?features_id=21871 Further Greenpeace materials on glacial retreat, including pictures.

www.geo.unizh.ch/wgms: summary of the status of world glaciers

www.earthobservatory.nasa.gov: NASA images of glaciers

www.climatehotmap.org: effects of climate change

www.ipcc.ch

www.nasa.gov/home/index.html. Main NASA website

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