

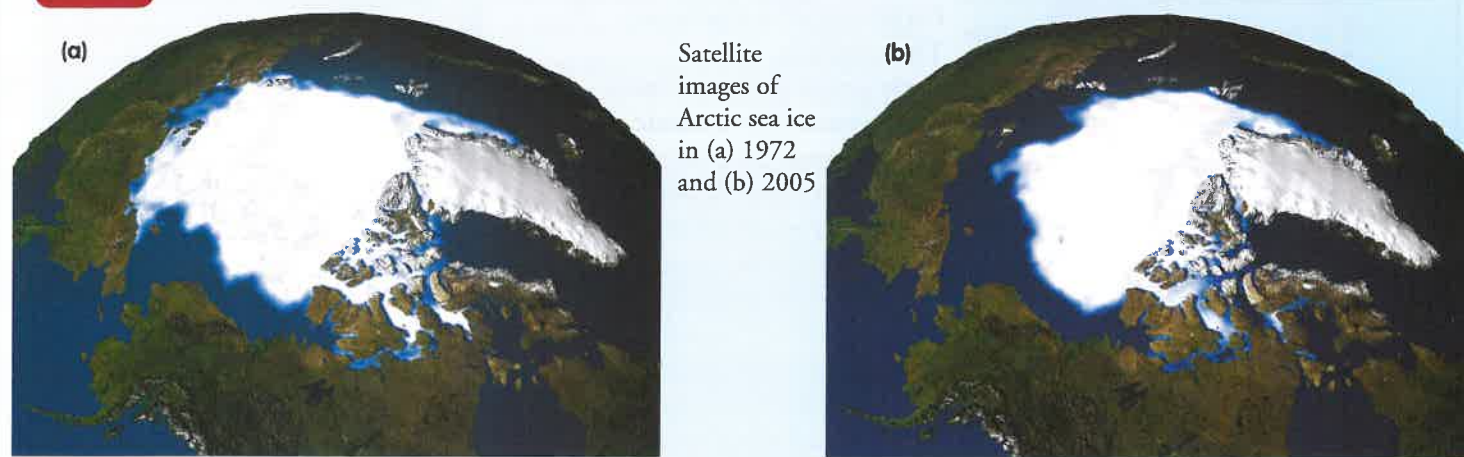
# 4.3 Our globe is warming

Climate change is not unusual for the Earth, as indicated in previous spreads in this chapter. The Earth has been warming and cooling over millions of years. In recent years, however, it has been warming at a rate demonstrated to be faster than at any other time in its geological history. Some scientists argue this is still part of a natural cyclical pattern; others suggest it may be permanent and potentially disastrous.

One of the advantages of advanced space flight is that we are able to obtain images of features of the Earth previously beyond our reach. These two NASA images, taken 36 years apart, show significant changes

in ice coverage in the Arctic Circle. As a study of the ice ages reveals, 36 years is less than the blink of an eye as far as the geological history of the Earth is concerned.

FIGURE 1

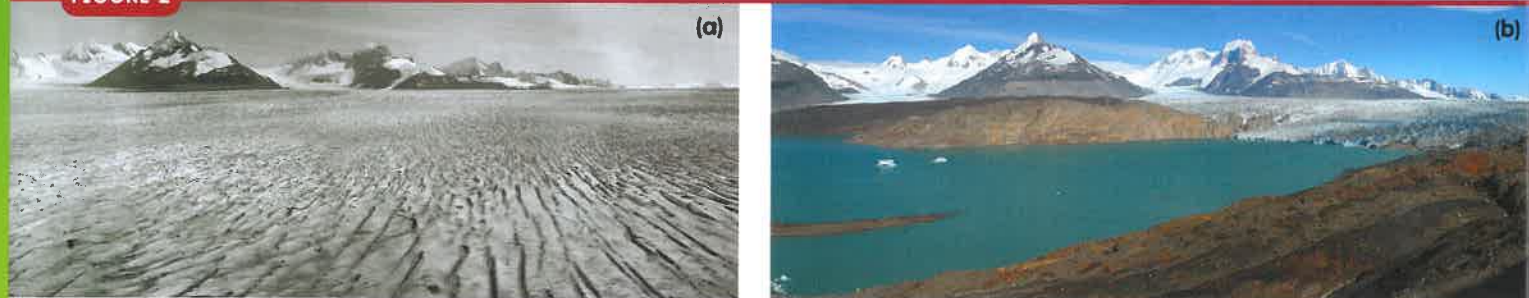


## Rising temperatures

Statistics indicate that the world is getting hotter. The mean (average) temperature at the surface rose about 0.6°C over the twentieth century. This is demonstrated, many claim, by melting glaciers and polar ice, melting snow cover in the northern hemisphere, rising water levels in some regions, and drying rivers and lakes. Some flora and fauna (e.g. crops that require certain temperatures, or fish that can survive only in waters of a certain temperature) are also being adversely affected.

Ten of the hottest years since climate records began in the 1850s were between 1990 and 2008, with 1998 the hottest year on record. Sea levels have risen 10 to 20 centimetres over the past century; this is affecting many low-lying regions such as Papua New Guinea's Carteret Islands, which are slowly being inundated by the sea. They and other low-lying island groups, such as the Marshall Islands and Kiribati in the Pacific and the Maldives in the Indian Ocean, may eventually be entirely submerged.

FIGURE 2



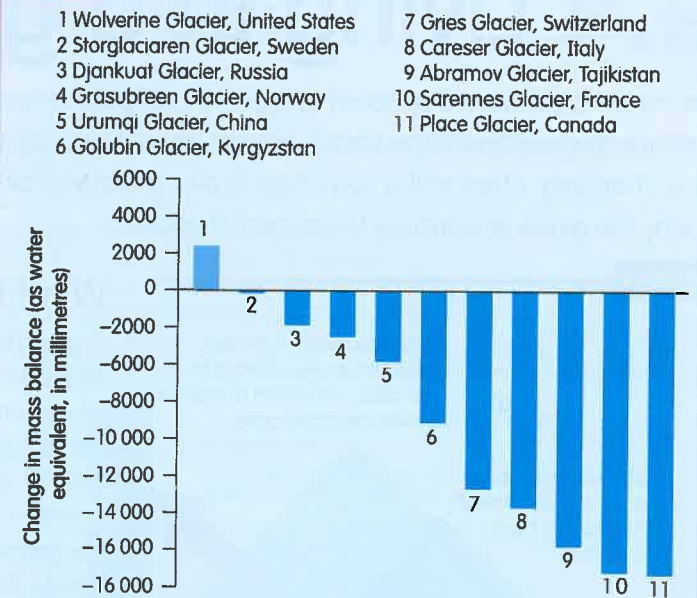
These photographs of the Upsala Glacier in South America were taken in (a) 1928 and (b) 2004. Although scientists put forward different theories as to why glaciers advance and retreat, many today believe that dramatic change such as this is due to the Earth's rising temperature.

## Melting glaciers

The graph at right (figure 3) provides information about the growth and melting of glaciers over a 20-year period last century. It compares glacier size in 1970 with that in 1990. A bar above the line represents an increase in the mass of ice in the glacier, and a bar below represents a reduction through melting. The taller the bar, the greater the change.

There is no question that our Earth is warming. What causes scientists to argue is why this is happening. Some place the blame totally on human activity — its increasing production of **greenhouse gases**, which you will read more about in the next spread. Others argue that natural factors are more responsible — volcanic eruptions around the world (and their discharge of greenhouse gases), the natural decay of **organic** matter (e.g. vegetation), which produces methane (a greenhouse gas), and changing weather patterns such as El Niño.

FIGURE 3



Annual fluctuation in ice mass for selected glaciers, 1970 to 1990

**greenhouse gases** gases such as carbon dioxide, methane, ozone or nitrous oxide emitted into the atmosphere that contribute to the greenhouse effect by absorbing infra-red radiation

**organic** derived from living organisms; not man-made

## Activities

### REMEMBER

- (a) What does the expression 'our globe is warming' mean?  
(b) What evidence is there on this page to suggest that this might be happening?
- What are the advantages of satellite images in learning more about our globe?

### THINK

- (a) Geological time spans millions of years. What problems does this pose for those trying to reach firm conclusions about climate change when considering data that spans only a century or even less?  
(b) Given your answer to (a), does that mean that short-term data or evidence should be ignored? Explain.
- Examine the bar graph (figure 3) depicting data on some glacier masses between 1970 and 1990.  
(a) What seems to have been the trend for these glaciers?  
(b) If data on the Upsala Glacier (figure 2) had been included, on which side of the zero line would the bar have been plotted?
- Make a mind map to show the possible advantages and disadvantages of global warming.

### COMMUNICATE

- See if you can find out more about the Wolverine Glacier to explain why it might be 'the exception to the rule' in the table on glacier change. Discuss as a class what might be causing this difference, and what cautions this might suggest for drawing conclusions about the data. Listen respectfully to one another's opinions.
- Use the NASA images of the Arctic Circle (figure 1) to create a map of the area in 1972. On an overlay map, show changes in the ice coverage by 2005.  
(a) Use your completed maps to explain the extent of change in the ice sheets. Refer to names of countries and seas in the area, using an atlas to find these if necessary.  
(b) What effects do you think the changes would have on the physical and human environments in the area?

### INQUIRE

- In small groups, research other evidence on the internet related to the claim that our globe is warming. Where possible, use ICT tools and techniques to assist your investigation and to document your thoughts and findings. Use a combination of visual and written information in presenting your report to the class. This may include presenting an oral report using overheads, giving a PowerPoint display or an annotated visual display, or distributing a desktop-published document.