

Polar

Observations and new research showed that climate change continued to accelerate, with global consequences. Combined with increasing development pressures, this gives a new sense of urgency to improving international cooperation and governance in the Polar Regions.



Antarctic Ice. Source: Ben Holt Sr/NASA

MELTING ICE

Studies from 2006 provided new information about the rates at which warming temperatures are causing the earth's great storehouses of ice to melt and break apart. There are still uncertainties about what will happen with ice sheets in the long term and how quickly global sea levels will rise.

The volume of the Antarctic ice sheet shrank at an annual rate of 152 ± 80 cubic kilometres between 2002 and 2005, according to the first mass balance estimate of the entire ice sheet (Velicogna and Wahr 2006). This

would have produced enough meltwater to account for 13 per cent of the sea level rise observed during that period. The volume of the Greenland ice sheet shrank at an annual rate of 101 ± 16 cubic kilometres between 2003 and 2005, according to estimates derived from the same satellite-based methodology (Luthcke and others 2006). Both the Antarctic and the Greenland ice sheets are gaining mass in some areas from increased snowfall while losing ice in other areas from melting and iceberg calving. The rate of ice loss is increasing because glaciers in Greenland and Antarctica are flowing faster (Kerr 2006). For example, Greenland's fastest glacier, Kangerdlugssuaq, increased its speed from 6 km per year in 2000 to 13 km per year in 2005 (Rignot and Kanagaratnam 2006).

Arctic sea ice cover in September 2006 averaged 590 million hectares, the second lowest of the 29 year record of satellite measurements (NSIDC 2006). This continues the pattern of sharply decreasing Arctic sea ice cover, which is now shrinking at the rate of 8.6 per cent per decade. If this rate continues the Arctic Ocean will be ice-free in summer by 2060. Changing Arctic sea ice conditions are opening shipping routes, leading to disputes over borders and jurisdiction, including the waters of the Northwest Passage (Box 1) (Figure 1).

Figure 1: Arctic shipping



As the amount of ice in the Arctic shrinks, sea routes will open up to increased traffic.

Source: UNEP/GRID-Arendal

The ecological impacts of these changing ice conditions include threats to animals such as the polar bear and changes in fish stocks and marine mammals, with economic and social consequences for Arctic residents (ACIA 2005).

INTERNATIONAL COOPERATION AND GOVERNANCE IN A CHANGING WORLD

These changing ice conditions, along with an increase in commercial fishing, Antarctic economic activity, and Arctic oil and gas development are producing additional challenges for international cooperation and governance (Box 2).

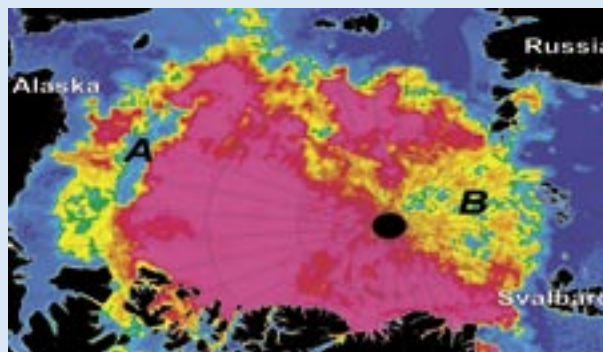
Both the Arctic and the Antarctic have formal means for nations to share information and cooperate on man-

Box 1: Holes in the year-round ice

In late summer 2006 two large areas of open water appeared in regions of the Arctic Ocean that are normally frozen all year round (See Figure). One of these openings, in the Beaufort Sea north of Alaska (A), was a large polynya (a lake-like region of open water surrounded by ice) larger than Ireland. Another unusual open ice area was registered on the European side of the Arctic Ocean (B), a region of fragmented ice and open water the size of the British Isles. At its maximum in late August, a ship could have passed from Svalbard or northern Russia through what is normally pack ice to reach the North Pole without difficulty.

Open water and ice break-up of this magnitude in what is normally permanently-frozen ice have not been observed before. Neither of these unusual events can be directly attributed to climate change and the specific causes are not clear. Unusual wind patterns, thinner ice, and warmer waters rising to the surface may be involved.

Sources: ESA 2006, NSIDC 2006



The image, from 24 August 2006, was produced from microwave radiometer measurements from NASA's Aqua satellite. Pink indicates solid ice cover; yellow, green and orange indicate broken ice; and blue indicates open water.

Source: Polar View/DTU (Leif Toudal Pedersen)

agement and conservation. But they have developed very different cooperative mechanisms. The Antarctic is governed by an international multilateral regime, the Antarctic Treaty System, whose core is the 1959 Antarctic Treaty, currently including 45 state parties. There is no such international regime for the Arctic, but in 1996 the Arctic Council was established as a forum for cooperation, made up of the eight nations around the Arctic Ocean and six Indigenous Peoples' Organizations.

In addition to these regional mechanisms, many multilateral environmental agreements (MEAs) play important roles in polar cooperation and governance. A case in point is the story of stratospheric ozone (**Box 3**). This example shows that nations can agree to take strong actions to solve environmental problems. It also shows the importance of international cooperation in research and monitoring of ecosystems and their interactions with human activities and in measuring the effectiveness of instruments such as the Montreal Protocol.

2006 saw significant advances in polar science cooperation, in the preparations for the International Polar Year (IPY) 2007-2008. This burst of research, education, and outreach aims to improve understanding and awareness of major issues facing the Polar Regions and the world, especially climate change (IPY 2006).

The Antarctic

In 2006 representatives of the Antarctic Treaty states committed themselves to improve the effectiveness of the Antarctic Treaty System and to increase coordination among its components. As part of the Edinburgh Declaration of the 29th Antarctic Treaty Consultative Meeting (ATCM) held in June, it was recommended that nations champion the importance of the Polar Regions in international forums and that there be increased collaboration with the Arctic Council (ATCM 2006). These

Box 2: The changing Arctic: Responding to global demands for oil and gas

With increasing global demand for secure energy supplies, there is competition for rights related to large-scale Arctic projects on land and in the seas. There are many uncertainties related to market forces and political factors, as disputes arise over boundaries, shipping routes, and ownership of sea bed resources. All of this is taking place in the context of rapid environmental change, and ecological and societal impacts are becoming increasingly difficult to predict.

Some events of 2006:

- Construction continued on the first European export facility for liquefied natural gas, Snøhvit, in the Barents Sea north of Hammerfest, Norway. Export is scheduled to begin in late 2007, sending 70 shipments per year to Europe and the US.
- A public hearing into the construction of the Mackenzie Valley Pipeline began. This proposed 1 200 kilometre natural gas pipeline system would connect northern Canadian onshore gas fields with North American markets.
- In March, one million litres of crude oil spilled onto the Alaskan tundra, the largest leak in the history of Alaska's Arctic production. In August, BP temporarily halted production in Prudhoe Bay following another much smaller leak.
- In September, the Russian Ministry of Natural Resources suspended the permits of the developers of the Sakhalin oil and gas project in the Russian Far East, citing non-compliance with environmental regulations. The estimated US\$22 billion project includes offshore drilling platforms and pipelines. Opponents say the project threatens fish and the last population of western grey whales. Onshore infrastructure includes two 800 kilometre pipelines that cross more than 1 000 watercourses and swamps as well as seismic faults, roads, and railways.
- Gazprom, the Russian state-controlled oil company, announced in October that it will be the sole developer of the giant Shtokman gas field in the Barents Sea, 500 kilometres north of the port city of Murmansk. At the same time the Russian government declared that it was dropping plans to ship liquefied natural gas to the US, in favour of a pipeline to European markets.

Sources: BP 2006, JSC Gazprom 2006, MGP 2006, Roach 2006, Sakhalin Energy 2006a, Sakhalin Energy 2006b, Statoil 2006

recommendations come at a time when the 'Question of Antarctica' has been removed as a regular agenda item before the UN General Assembly (**Box 4**).

At the 2006 ATCM, New Zealand introduced a working paper proposing stronger links between the ATCM and the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), a separate decision-making body. The Antarctic Treaty Consultative parties agreed that there is a need for close synergy and cooperation, especially on Antarctic marine protected areas. CCAMLR stressed the importance of developing a strategic approach to marine protected areas and a harmonized regime to protect the Antarctic marine environment across the Antarctic Treaty System. CCAMLR has initiated a process called bioregionalism, seen as the first stage of a strategic approach to decide where marine protected areas are most appropriate.

The growth of tourism and bioprospecting (collecting biological material for commercial purposes) also has implications for international governance. A resolution was proposed at the 2006 ATCM to limit landings of large tourist vessels, but no consensus was reached; discussion of the issue was deferred until the 2007 ATCM. Three information papers on the topic of bioprospecting were tabled by France, Argentina, and UNEP. However, no substantive discussion took place; parties were urged to continue providing updates on their activities in this field. The meeting considered a third emerging issue: the risk of an increase in alien species of plants, animals, and microbes colonizing the region.

The Arctic

In the Arctic, accelerating changes in sea ice and glaciers, along with the growing pressure to develop

Box 3: Ozone hole reaches record size

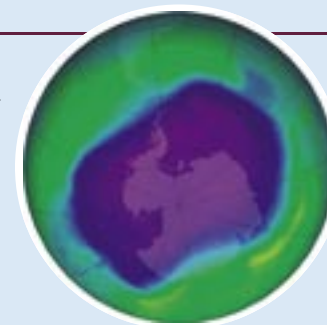
The thinning of the protective ozone layer in the earth's atmosphere was discovered by Antarctic researchers in the early 1980s. The 1987 Montreal Protocol has been successful in reducing global emissions of substances that deplete the ozone layer, such as chlorofluorocarbons.

Despite the progress made, in September 2006 the ozone hole over the Antarctic was the largest on record. This was partly due to particularly cold temperatures in the stratosphere, but also due to the stability of these chemicals—it takes about 40 years for ozone-depleting substances to break down. The ozone layer is expected to recover, but it is now predicted to return to its pre-1980s condition around 2060-2070, more than 70 years after the international community agreed to take action and 15 years later than earlier predictions. This illustrates both the effectiveness of coordinated international action on global environmental issues and the need to take action quickly on issues like climate change where improvements happen slowly and changes to the atmosphere have far-reaching global effects.

Sources: NASA 2006, WMO/UNEP 2006

Antarctic ozone hole
24 September 2006.

Source: NASA



the Arctic's vast oil and gas and other resources, raise questions about the adequacy of current governance regimes, especially for the marine environment. Can Arctic countries, within existing international mechanisms, strike the difficult balance between promoting economic development and securing vulnerable Arctic environments? In 2006 this topic was examined through several forums and initiatives (Arctic Centre 2006, UNEP/GRID-Arendal 2006a and 2006b, SCPAR 2006a, Huebert and Yeager 2006). Two sets of issues were under discussion: first, how existing treaties relevant to the Arctic can be made more effective and comprehensive in their coverage of Arctic issues and second, the pros and cons of establishing a binding legal regime for the Arctic marine environment.

In August, at its biennial conference in Kiruna, Sweden, the Conference of Parliamentarians of the Arctic Region called on governments in the Arctic and institutions of the European Union to "initiate, as a matter of urgency, an audit of existing legal regimes that impact the Arctic and to continue the discussion about strengthening or adding to them where necessary" (SCPAR 2006a). The Parliamentarians also proposed that the United Nations should review UN treaties relevant to the Arctic as soon as possible. The recommendation to audit existing legal regimes was presented to the Arctic Council ministerial meeting in Salekhard, Russia in October (SCPAR 2006b).

In September, in Lahti, Finland, the Nordic Council (the forum for parliamentary cooperation among Nordic countries) recommended that their Council of Ministers should consolidate legal research pertaining to Arctic waters and, together with the Arctic Council, aim to create a comprehensive legal system for the Arctic (UNEP/GRID-Arendal 2006b).

Measures proposed and discussed in 2006 for improving the effectiveness of international governance in the Arctic included:

1. Strengthen the Arctic Council to give it more decision-making power.
2. Develop a new Arctic marine treaty, a framework convention, or a regional agreement through the Law of the Sea.
3. Strengthen the Arctic focus and coordination of MEA implementation through joint planning, common reporting, and more extensive stakeholder involvement and outreach.
4. Strengthen and develop new mechanisms to address Arctic priorities such as global regulation of new persistent organic pollutants and mercury.

The work of the Arctic Council currently includes activities related to MEA implementation, especially with respect to pollution (Arctic Council 2006, Huebert and Yeager 2006, Stokke 2006, UNEP/GRID-Arendal 2006b). However there is no consensus among the Arctic states on any expansion of its role, especially in dealing with climate change. Some member states favour a more active policy and decision-oriented role, while others see the Council as restricted to sharing information and cooperating on projects. The Arctic Council has been particularly successful in producing comprehensive Arctic assessments on climate (ACIA 2005), human development (AHDR 2004), and pollution issues (AMAP 2002); it is now working on assessments of Arctic marine shipping and of oil and gas development. At the biennial ministerial Council meeting in October, ministers requested the Council to begin work on an assessment of Arctic biodiversity (Arctic Council 2006).



Representatives of indigenous peoples and organizations at the October Arctic Council ministerial meeting in Salekhard, Russian Federation

Source: Clive Tesar/Indigenous Peoples' Secretariat of the Arctic Council

ILLEGAL, UNREPORTED AND UNREGULATED FISHING

Illegal, unreported and unregulated (IUU) fishing is a global concern—reducing the resilience of marine ecosystems and making them more vulnerable to environmental change in a time of accelerating loss of marine biodiversity and fisheries resources (Worm and others 2006, Berkes and others 2006). While marine ecosystems become more vulnerable, commercial fisheries are expanding in both Polar regions.

Management regimes exist for both regions. In the Antarctic, fisheries are regulated by the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). The dominant fisheries are for krill (with a catch of about 127 000 tonnes for the 2005/06 season) and toothfish (about 14 000 tonnes) (CCAMLR 2006). Arctic fisheries policies are governed by national and regional bodies according to the jurisdictions of the Arctic Ocean, the North Atlantic and Pacific Oceans, and the northern seas. But the management regimes are weakened by inadequate tools for enforcement and because fishing and damage to habitat and marine life occurs outside of their reporting systems or jurisdictions.

In the Antarctic, IUU fishing is not just a threat to fish and krill stocks but also to albatrosses and petrels, which get caught on long-line fishing hooks (Gandini and Frere 2006). Policy responses have included setting up a catch documentation scheme and improved reporting and inspection measures, but the effectiveness of these measures is compromised by issues of jurisdiction. For example, southern bluefin tuna are harvested within the CCAMLR area, authorized by the Commission for the Conservation of Southern Bluefin Tuna rather than by the

Box 4: The 'Question of Antarctica'

The 'Question of Antarctica' was brought before the UN General Assembly in 15 of the years since 1983. This arose from the concerns of many developing countries about management of Antarctica, regarding issues such as the fragility of the Antarctic and its importance in the global biosphere; the ability of Antarctic Treaty parties to manage Antarctica on behalf of the global community; contested Antarctic territorial claims; the 'two-tiered' character of the Antarctic Treaty in which Consultative Parties make policy decisions and non-Consultative Parties play a lesser role; and development of a mineral regime, seen by developing countries as an instrument to secure mineral resources solely for Antarctic Treaty parties. In response to these concerns, Malaysia led an argument at the General Assembly that Antarctica should be designated as a Common Heritage of Mankind.

Recently the debate over Antarctica has been tempered by reforms, including the abandonment of the mineral regime in 1989, adoption of the Protocol on Environmental Protection in 1991, and an expansion of the Antarctic Treaty membership from 12 original signatories to 45 countries today. In 2005, at Malaysia's request, the 'Question of Antarctica' was removed from the agenda of the General Assembly's 2008 session and replaced with a direction to keep a watchful eye on the situation. This is likely a signal that Antarctic Treaty states have made progress on the concerns expressed in the 1980s. Some suggest that it may be a step backward in global governance: a global concern as important as Antarctica will no longer be discussed periodically in a global forum.

Sources: Joyner 1998, UN (various years)



Seabird by-catch is a problem associated with illegal, unreported and unregulated fishing.

Source: Graham Robertson/Australian Antarctic Division

CCAMLR (Hemmings 2006). In November, the CCAMLR adopted a significant measure requiring members to take steps against nationals suspected of involvement in IUU activities at any stage of the fisheries supply chain. This is the first time any regional fisheries management organization has adopted such a comprehensive and binding mechanism in the fight against IUU fishing (EC 2006).

IUU fishing is also a problem for Northeast Arctic cod and was the focus of the 11th Conference of North Atlantic Fisheries Ministers in June. The Northeast Arctic cod is threatened by IUU fishing in the Barents Sea: an estimated 137 000 tonnes were fished illegally in 2005, equal to 30 per cent of the total legal fishery for this important fish stock. Governments agreed at the conference on the need for international measures to tackle IUU fishing (FKD 2006a). In November the North East Atlantic Fisheries Commission followed through by adopting binding rules, entering into force in May 2007, including the denial of entry at ports to vessels involved with IUU fishing or transport—effectively prohibiting the landing of illegally-caught fish in the European Union, Russia, Iceland, the Faeroe Islands, Greenland, and Norway (FKD 2006b).

CONCLUSIONS

A host of new issues and challenges are emerging in the Arctic due to pressures from climate change and ongoing development. Currently there are good mechanisms sharing information, producing comprehensive assessments, and cooperating on science. However, the time has arrived to consider the needs and options for improving international governance, especially in the Arctic marine environment.

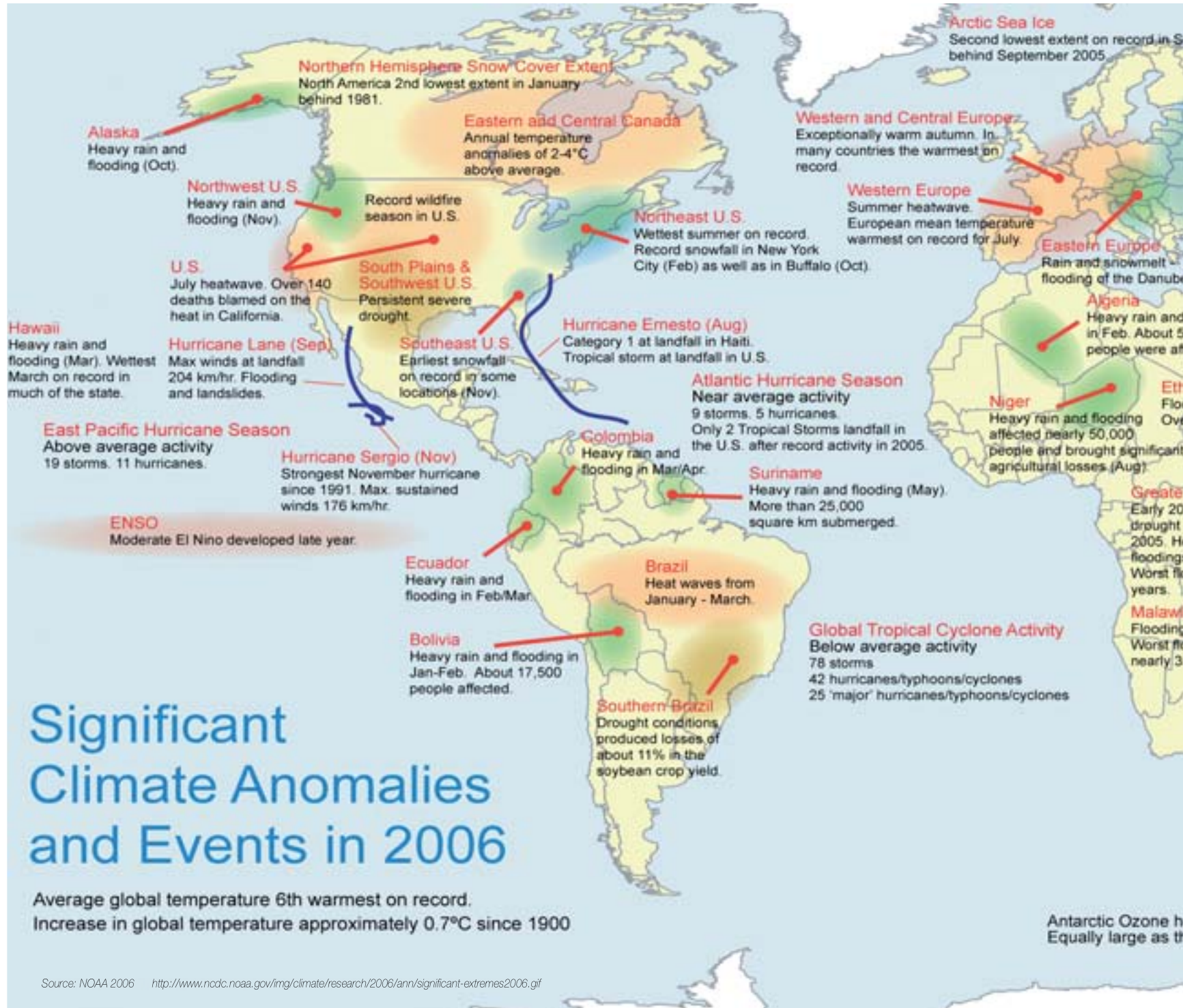
Although Antarctica has strong protection through an international protocol designating it as a 'natural reserve, devoted to peace and science', the management regime for this protocol needs support to ensure that expanding commercial activities do not undermine this ideal.

There was progress in both regions in 2006 in addressing illegal, unreported and unregulated fishing, including the adoption of binding rules and improvements in surveillance and enforcement through regional fisheries management organizations. In the context of a growing commercial fishing industry in the Polar Regions, continued emphasis on resolution of IUU issues is critical.

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2006 Ongoing trends



2007 Ongoing trends

In the tropical Pacific—the section of the ocean between 23 degrees North and 23 degrees South—trade winds blow from east to west. The winds push sun-warmed surface water away from the South American coast that then accumulates in a deep pool of warm water east of Indonesia. Along

the South American coast, cold water from the deep rises to the surface like a conveyor, replacing the warm water. As a result, tropical waters in the eastern Pacific are usually cooler than those of the western Pacific.

But every few years, the trade winds grow weak and warm water is no longer pushed west. The

western Pacific cools, while the eastern Pacific warms. This distinctive reversal in the Pacific's temperature pattern is called El Niño. The last strong El Niño occurred in 1998 while 2002/3 saw a moderate event that puzzled researchers with its unpredictability (NASA 2006a, NASA 2003).

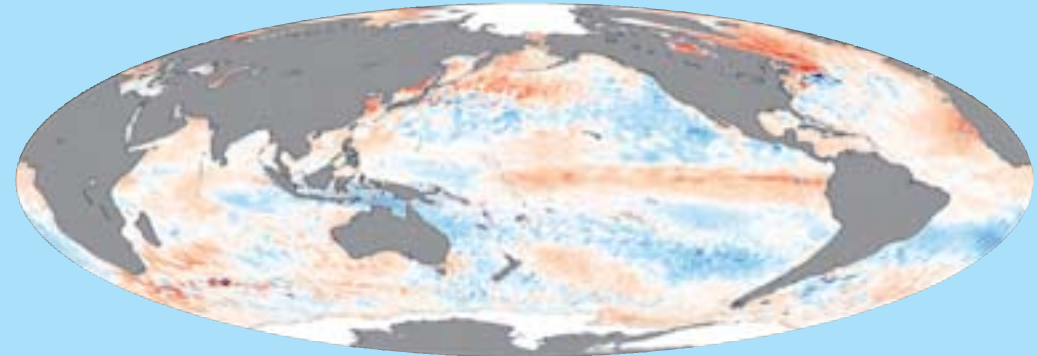
El Niño Chills the Western Pacific Ocean

Satellite measurements of sea surface temperatures in the tropical Pacific revealed a clear El Niño pattern in November 2006 as seen in the image to the right. Warmer-than-average sea surface temperatures, shown in red, stretch away from the South American coast, while cooler surface temperatures, shown in blue, concentrate around Indonesia and Australia (NASA 2006a).

November 2006



At the end of 2006, East Africa suffered unusually heavy rainfall. Floods swept across the region, affecting up to 1.5 million people in Somalia, Ethiopia, Kenya, and parts of surrounding countries. At the same time, Indonesia and Australia fought back widespread fires, fueled in part by unusually dry conditions. Parts of Australia have been experiencing a



severe drought since 2002 and the cumulative effect of the current El Niño weather is enhancing the dry spell.

These changes in the atmosphere and the ocean set off a string of unusual weather patterns around the globe that move from east to west over a period of 9 to 24 months. Besides the drought in Australia and Indonesia and the high rainfall in East Africa, the El Niño is

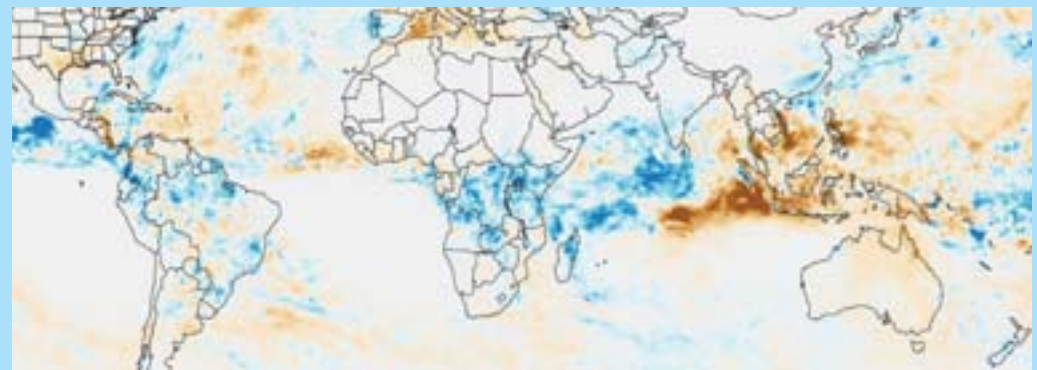
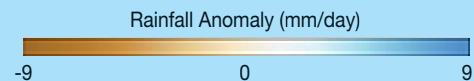
expected to eventually bring a low hurricane season to the Atlantic and heavy rainfall to the west coasts of the Americas (IRI 2006).

With the warming trends currently underway, and the last moderate-to-strong El Niño producing the global record-breaking weather of 1998, 2007 will likely be a year of very high temperatures.

El Niño and Rainfall

Measurements taken by the Tropical Rainfall Measuring Mission satellite provide data for the image of the Indian Ocean region. Areas of dark brown over Indonesia and Southeast Asia show that these regions received much less rain than normal during November 2006, while blue over East Africa reveals higher-than-average rainfall totals. Australia is light brown, indicating shortages of a few millimeters per day (NASA 2006b).

November 2006



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