A crack in the ice – Antartica shows the need for real action on climate change

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There was a line in the Intergovernmental Panel on Climate Change (IPCC)'s fourth report, published on 2 February 2007, that didn't get the attention it deserved: "Dynamic processes related to ice flow not included in present models but suggested by recent observations could increase the vulnerability of the ice sheets to warming, increasing future sea-level rise" [1]. The media picked up on the projected rise in sea levels of 18-59cm by the end of the century, but they didn't question the models' limitations.

Many climatologists fear the gradual melting of ice will be replaced by ice break-up, causing a sudden huge rise in sea level. Such a scenario increases the necessity of rescuing our climate. But there is a gulf between this urgent need and the negotiations on a post-Kyoto treaty, to be submitted to the UN conference in Poznan (Poland) this month, and Copenhagen in December 2009. The lives of millions of people, mainly in the South, are at stake.

Lakes of melted ice form on the surface of the polar icecaps in the summer months, driving cracks down through the ice, creating conduits. In Greenland recently, one such lake, 3km wide, emptied like a draining bathtub in just 90 minutes. So much water surging down to the bedrock of the ice sheet could contribute to massive icebergs breaking off and sliding into the sea – causing a sharp rise in sea level. It's the glaciologist's worst nightmare.

These "dynamic processes" have been observed for several years in the Arctic, where the Greenland ice sheet contains enough water to raise the oceans by 6m. But now the Antarctic is causing concern. Its glacial areas are made up of four elements: the east and west Antarctic ice sheets, the Antarctic peninsula and the ice shelves that float on the ocean.

If the eastern ice sheet were to disappear, the oceans would rise by no less than 50m [2]. Luckily, for now, it is stable. But ice is melting rapidly on the west coast of the peninsula, where the rise in temperature – three degrees in 50 years – is greater than anywhere else on the planet. In the northeast, the average summer temperature reaches 2.2°C, with an expected 0.5°C warming per decade.

The Antarctic peninsula and the west Antarctic ice sheet each contain enough water to raise sea level by 5m. Two things increase the danger. The mountain valleys of the peninsula are less narrow and winding than those of Greenland, meaning glaciers could slide more quickly into the sea [3]; and the speed of some ice flows has tripled in the past few years. But also, the bedrock beneath the west Antarctic ice sheet lies mainly below sea level, and in several places slopes downwards to the open sea [4]. Experts are worried that the circumpolar current, which is getting warmer and gradually approaching the coast, could cause the underwater anchor of the ice sheet to melt.

The danger is closer than we think, according to James Hansen, director of the Goddard Institute for Space Studies at the US space agency Nasa, and eight other experts who all put their names to an article on this subject in the journal *Science* [5].

Their conclusions follow paleoclimatic research. Sixty-five million years ago, Earth had almost no ice. The Antarctic became glaciated around 35 million years ago, when a combination of solar rays, the albedo [6], and the atmospheric concentration of greenhouse gases reached a tipping point, creating the conditions for cooling. Sea levels fell and precipitation, in the form of snow, increased at the poles. The authors say we are about to reach that same tipping point, but from the other direction (see In less than a century).

This warning must be taken seriously. The IPCC's estimate on ocean-level rise is, in fact, the least precise of its projections: from 1990-2006, sea level rose by 3.3mm a year, while the estimate was 2mm [7]. The difference – 60% – could be down to the difficulty in modelling the behaviour of glaciers.

If temperature rise were stabilised at 2°C above 1780 levels (end of the pre-industrial era), the models project a sea-level rise of between 0.4 and 1.4m in a few centuries. A differential of 60% would be enough to bring that up to between 0.6 and 2.2m. (These figures are probably an underestimate, since ice sheets break up in a non-linear way.) This changes the timescale completely: if Hansen and colleagues are correct, there's not a minute to lose. An irreversible catastrophe could take place within a few decades.

One metre of sea-level rise would endanger the lives of tens of millions of people. Ten million Egyptians, 30 million Bengalis and a quarter of Vietnam's population would have to leave their homes [8]; London and New York would be under threat. The IPCCpresident, Rajendra Pachauri, described a "frightening situation" and spoke of his hope that "the next report… will be able to provide much better information on the possibility of these two large bodies of ice [Greenland and the West Antarctic ice sheet] melting" [9]. Unfortunately, this report will not come out until 2013 – too late to influence this month's and next December's negotiations on a post-Kyoto strategy.

The IPCC's underestimate of sea-level rise is all the more unfortunate since its projections, approved by governments, form the basis of the climate-change negotiations begun in Bali in December 2007. What's worse, politicians always downplay these predictions.

According to the IPCC, limiting temperature rise to between 2% and 2.4% above pre-industrial levels would mean starting to reduce global greenhouse-gas emissions by 2015 at the latest, in order to bring them down to between 50% and 85% of 2000 levels by 2050. The "polluter pays" principle would mean developed countries making a huge effort: they would have to reduce their emissions by 25-40% by 2020 and by 80-95% by 2050. And developing countries will need to reduce their emissions far below their present (business as usual) levels.

Even though these recommendations are less restrictive than those of Hansen and his team, they are still ignored by governments. Jean-Pascal van Ypersele, professor of climatology at the Catholic University of Louvain (Belgium) and a member of the IPCC, notes that G8 members often pronounce themselves in favour of a 50% reduction in emissions… while being careful not to mention the 85% at the top end of the range [10]. The G8 also keep quiet about the specific targets developed countries need to aim for, given their major responsibility for climate change.

You find this attitude everywhere. The energy climate package put forward by the European Commission for 2013-20 turns out to be incompatible with the decision taken by the Council of Ministers in 1996 to limit temperature rise to a maximum 2°C above 1780 levels. And Barack Obama's energy climate plan may foresee an 80% reduction in US emissions by 2050, but his target for 2020 is merely to get back to the 1990 emissions level [11].

While scientists' concerns grow, those in power increase their rhetoric but limit their targets to the

most conservative predictions. The North relies on “flexible mechanisms” in an attempt to limit its effort to voluntary reductions. This was the policy put forward by Nicholas Stern, former chief economist at the World Bank. In his 2006r eport to the British government, he said: “The lesson here is to avoid doing too much too fast” because “great uncertainty remains as to the costs of very deep reductions… of 60-80% or more… from industrial processes, aviation and a number of areas.” [12]. The worry is that climate negotiations, if they lead anywhere, will lead to targets determined by profit, rather than the protection of people and the safety of the planet.

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Box: In less than a century

Up to now it was thought that the atmospheric concentration of greenhouse gases should not exceed 450-500 parts per million (ppm) carbon dioxide equivalent (CO_2eq), including 360-400 ppm carbon dioxide (CO_2) (1). That is double the concentration that existed before the industrial revolution. But studying ice-sheet formation has led James Hansen and his colleagues to assert that stabilisation at this level would eventually lead to a world without ice. When the Antarctic ice cap was formed, (…)

P.S.

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[-http://mondediplo.com/2008/12/19antartica]

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Footnotes

[1] “The Physical Science Basis”, the Working Group 1 (WG1) contribution to the IPCC Fourth Assessment Report, 2007, Summary for Policymakers.

[2] IPCC WG1 Report, chapter 1, 2007.

[3] “Escalating Ice Loss Found in Antarctica”, Washington Post, 14 January 2008.

[4] [[“New Concerns of the Stability of the West Atlantic Ice Sheet”, *Environment Times,* United Nations Environment Programme, 2004.

[5] “Target Atmospheric CO_2: Where Should Humanity Aim?” www.arxiv.org/abs/0804.1126/.

[6] The albedo of a surface is the extent to which it reflects energy from the sun. Its value is between 0 and 1. The more reflective a surface, the higher its albedo.

[7] Article in *Science*, quoted in *Le Monde*, 2 February 2007.

[8] Norman Myers, “Environmental Refugees in a Globally Warmed World”, *Bioscience*, vol. 43, N° 11, Washington DC, December 1993.

[9] “UN Climate Chief to Visit Antarctica”, ABC News, 8 January 2008.

[10] See his homepage.

[11] “Barack Obama’s Plan to Make America a Global Energy Leader”.

[12] Nicholas Stern, “Stern Review on the Economics of Climate Change”, 2006 (report requested by Gordon Brown, then Chancellor of the Exchequer)