# Between the ice and ocean: The rising tide

Contributed by Albert Bates
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Editor's note: This disturbing report by a climate-change authority elicited this response at Culture Change: "Oh F_ _ _!" The subject matter here is also the basis of the new NBC/Discovery Channel television special report narrated by Tom Brokaw, "Global Warming: What You Need to Know." The difference between Brokaw's approach and the following report is that NBC says there is a centuries-long process, such that there is time to get our act together; whereas, Bates points out that sea level rise of several feet can happen in one season - a sudden, catastrophic change. This article is being printed in the next issue of The Permaculture Activist magazine, Fall 2006.
- Jan Lundberg, July 16, 2006

Between the Ice and Ocean

In Jared Diamond’s Collapse: How Societies Choose to Fail or Succeed, there is an oft-quoted tale of the early Greenland settlers. For whatever religious or cultural reasons, they simply refused to adapt their European customs of food, habitation and land use to either the traditions of the well-adjusted and resourceful native populations or the necessities brought about by sudden climate change. Instead, they went extinct.

Ironically, the early Greenlanders went extinct because they could not tame their land to match their ways of living. They died and the ice prevailed. Today, it is the ice that is dying and the humans who are seeming to prevail. I say “seeming,” because the ice is not really going very far. It is becoming ocean. We might beat some ice. We won’t beat the ocean.

There is an unseen edge at the phase change that freshwater goes through on millennial timescales. Until now that edge hasn’t been particularly important to humans because it was invisible, and because its change was so, well, glacial. Both of those attributes are disappearing and our science is only just coming to grips with what that means. For the one billion humans and the many more wild creatures who inhabit coastal plains and shorelines, the importance of far-away ice, it seems, will be very significant indeed.

The Greenland ice sheet is two miles thick and about the expanse of Mexico. Deep in its core are memories of snowfalls a quarter million years ago, including the ice record of 20 sudden climate changes in the past 110,000 years. To say that Greenland holds the key to the climate of Europe is not an understatement. The freshwater resource entombed in Greenland’s snows, if loosed into the North Atlantic, could slow the deep ocean conveyor that regulates weather for much of the world.

The snows of Greenland have been compacted into ice so thick that its weight compresses the bedrock below, pushing it below sea level in some interior valleys. But that weight is now lifting.

Around the rim of snow is an isotherm that marks the zone where summer and winter have historically tussled: the thaw-mark scientists call the equilibrium line. What had been a narrow band in the 1970s is now at its broadest since recordkeeping began.

Satellite gravity measurements from 130 miles up in space show Greenland is melting. In 2005 it lost 52 cubic miles of ice to the ocean, triple the average 10 years ago. December is a time when Greenland usually adds ice, but last year, about the same time as the record 15th hurricane of the season was forming in the mid-Atlantic, Greenland’s ice was melting.

If you have ever sat quietly on a winter day and watched snow and ice melt, then many of these patterns will be familiar. It gets wetter on the surface, and that wetness makes it shine but is also more transparent, meaning the sun’s rays penetrate deeper. As accumulations thaw, they crack apart, and those cracks become conduits for meltwater. Below the surface, sometimes seen, often unseen, the water is making and enlarging channels for itself, pulled by gravity and pushed by the pressure of the ice behind. Air bubbles flow in this water like tiny sledgehammers, smashing new channels and enlarging older ones.

At summer tent camps in Greenland’s interior, ice-penetrating radar is mapping a maze of drainage crevices, tunnels and cracks below the surface that are completely invisible to the human eye. The process is not invisible to our senses of hearing and touch, though. As Greenland’s 12 glaciers thaw and their sweat dribbles into the sea, the bedrock sighs and stretches like someone arousing from a gentle sleep. Unburdened, it tries to stand up straight again.

We mere humans feel and hear this as Richter 5 earthquakes. In 2005 the total number of ice-quakes in Greenland was three times the average ten years earlier, with five times more in summer than in winter.

Half a world away, in the Antarctic, warm oceans are melting the offshore ice shelves that form a barrier between the continental ice sheets and seawater. A few decades ago the shelves extended 5,200 square miles further than they do today. As these shelves melt, the land sheets discharge more icebergs and then, diminished in depth and eroded from their own water underneath, melt faster. Meltwater that started as trickles in the hot sun forms broad unseen rivers that move the great sheets oceanward.

In the past, deep underground, these rivers could encounter such thick coastal shelves that they would refreeze, slowing the loss of ice. When the Larson B ice sheet broke apart and slid off West Antarctica in 2002, it added an area the size of Rhode Island to the Pacific Ocean. It also unplugged many hidden dams in the meltwater rivers extending up under the West Antarctic Ice Sheet. Since the Larsen collapse, the West Antarctic has a snowball’s chance in Hell of holding its shape.

The volume of icebergs leaving West Antarctica's coasts doubled between 1995 and 2005 and is expected to double again by 2015, to 100 cubic miles per year. Greenland’s ice mass is diminishing at nearly twice that rate.

If either Greenland’s glaciers or the West Antarctic Ice Sheet were to slide away completely, global seas would rise by 15 to 20 feet, re-sculpting coastlines worldwide. While worst-case estimates for sea level rise from august bodies such as the Intergovernmental Panel on Climate Change have suggested such increases might take a century, the meltwater roller skates under the West Antarctic sheet and the earthquakes caused by the unweighting of the Greenland land mass could precipitate giant masses of ice sliding into the ocean in the short span of a single summer.

The crash of gargantuan icebergs into the ocean on that scale could unleash a torrent of tsunamis traveling the earth at jet-aircraft speed. When the waves finally subsided, the oceans will not have receded. Sea level could remain elevated for 20,000 years. Perhaps longer. If the East Antarctic Ice Sheet were to melt as well, seas would rise as much as 200 feet.

If I were a town planner in Rotterdam, Tokyo, Cancun, Bangkok, New York or Miami I would not be working on waterfront parks and recreation. I would be thinking about very large and long dikes about now. Or maybe about moving low-lying populations to higher ground.

The kin-dom between ocean and ice is very old and very essential. It is yet another means by which Mother Nature sequestered carbon to soothe our fevered planet when it drifted too close to the sun. Ice at the poles reflects sunlight into space and that also keeps us cool. The effect of ice-chilled saltwater in propelling our deep ocean conveyors is well known. What is less known is what happens when it is no longer there. It seems quite likely we, or our children, are about to find out.

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Albert Bates has been director of the Global Village Institute for Appropriate Technology since 1984 and of the Ecovillage Training Center at The Farm community in Summertown, Tennessee, since 1994. He is author of several books on energy, environment, and history, including Climate in Crisis: The Greenhouse Effect and What You Can Do (1990). His new book, The Post-Petroleum Survival Guide and Cookbook: Recipes for Changing Times, will be out in September from New Society Publications.  Bates has been a speaker at both the New York and DC Petrocollapse Conferences.

Weblinks:

Permaculture Activist magazine's website: http://www.permacultureactivist.net/

The Farm: http://www.thefarm.org

Petrocollapse Conferences website: http://www.petrocollapse.org

To sign up for the Global Warming Crisis Council email listserve, email Wanda B, Raging Grannie:
wsb70 "at" comcast.net

To see the Pledge for Climate Protection, visit our Archive webpage:
http://www.culturechange.org/global_warming_pledge.html