As the globe warms, keep an eye on storms

Global warming may raise sea levels more dramatically than most climatologists expect, a new study of the ice buried within Greenland's glacier suggests. Current predictions overlook the influence of storms on Arctic snowfall, which influences ocean levels, the study's authors contend.

Global sea levels are already on the rise (SN: 12/10/94, p.388) and will continue to climb to dangerous heights as temperatures warm, causing glaciers to melt into the oceans, many climate forecasters agree. In their calculations, however, scientists generally assume that as the mercury climbs, more water will evaporate from the oceans and some of it will get locked up in Arctic ice, thus offsetting slightly the predicted ocean level increase.

Indeed, snowfall in Greenland will increase 4 percent with every 1° C boost in temperature, researchers from the Geneva-based Intergovernmental Panel on Climate Change (IPCC) predicted in 1990.

Wishful thinking, assert Wanda R. Kapsner of Pennsylvania State University in University Park and her colleagues in the Jan. 5 NATURE. Less snow will probably accumulate than the IPCC anticipates, so "it may be prudent to plan for somewhat larger future sea-level rises than that of the IPCC 'best-estimate' case," they report.

Kapsner and her colleagues determined the relationship between Arctic snowfalls and temperatures as far back as 18,000 years by analyzing cores from Greenland's ice cap. They dated the ice by looking at seasonal changes in the snow and estimated temperature fluctuations by examining the ice's oxygen isotopes, says coauthor Richard P. Alley, also of Penn State.

As expected, the team found that more snow fell during warmer periods. However, during times without marked changes in temperature, such as nowadays, a 1° C increase in temperature coincides with just a 1 percent hike in snowfall. Only during brief periods of dramatic warming, such as occurred when the ice age ended, did 12 to 13 percent more snow accumulate per 1° C rise.

Researchers expect global warming to cause gradual temperature changes — and temperature-related snow accumulations — more similar to those seen during periods of stable weather patterns than at the end of an ice age, Alley says. Therefore, the IPCC prediction for how much water will remain in the frozen Arctic, instead of in the oceans, is inflated.

Moreover, Alley argues, during the unstable times, "there's tremendously more change in snowfall than you can account for by temperature."

The culprit is storms, Kapsner and her coworkers contend. "We find that atmospheric circulation [storms], not temperature, seems to have been the primary control on snow accumulation in central Greenland over the past 18,000 years." To predict snowfall, researchers must look at the location, number, strength, and duration of storms, Alley says.

During very cold weather, such as the ice age, storms avoided Greenland, Alley says. They came back and dumped snow when the weather heated up. "Storms like to run where there's a steep temperature gradient," so they travel along the frozen edges of an ocean or country, he explains. How global warming will alter storm patterns remains unclear, he adds.

Other studies have pointed to the importance of storms in estimating sea rise, but they have not had the extensive data collected by Kapsner's group, says David H. Bromwich of Ohio State University in Columbus.

Predicting the behavior of storms "is a much more challenging problem" than forecasting temperature, but it's equally important, Bromwich asserts.

Gases that lead to global warming will influence the frequency, intensity, and location of storms, he adds.

— *T. Adler*

Menstrual cycles may affect cancer risk

Several reproductive factors have been linked to increased risk of breast cancer — from early menses and late menopause to childlessness and late age at first pregnancy. A new study would add yet another: menstrual cycles that are typically either shorter or longer than average.

Five years ago, epidemiologist Elizabeth A. Whelan, then at the National Institute of Environmental Health Sciences (NIEHS) in Research Triangle Park, N.C., began mailing questionnaires to nearly 1,000 early entrants in the ongoing Menstruation and Reproductive History Study (MRHS).

This project had recruited most of its nearly 4,000 volunteers between 1934 and 1939 or 1960 and 1964. The women reported not only such information as age at first menstrual cycle, but also the dates of menstrual bleeding, hormone use, and medical conditions (including pregnancies).

Although epidemiological studies have linked lifetime estrogen exposures to breast cancer — with higher exposures increasing risk — Whelan and many others suspect that hormones in general (including estrogen and progesterone), and their peaks during an ovulatory cycle, collectively affect cancer risk.

For instance, breast cells divide more rapidly during the last 14 or so days of each menstrual cycle — the lower-estrogen, luteal phase. Because cells become more susceptible to damage when they divide, a factor that could increase their vulnerability to cancer-fostering changes, Whelan suspected shorter cycles might elevate breast cancer risk. Her reason? Even among women who remain fertile for the same number of years, those with short cycles undergo more luteal phases.

In the just-released Dec. 15, 1994 AMERICAN JOURNAL OF EPIDEMIOLOGY, she and her coworkers report that, compared to women with menstrual cycles lasting 26 to 29 days during the most stable period of their reproductive lives (age 25 to 29), those with shorter cycles face roughly twice the risk of breast cancer. This trend held even after accounting for such potentially confounding variables as age, family history of breast cancer, weight, and reproductive factors that boost the risk of breast malignancies.

Her team also found a near doubling of breast cancer risk in women whose cycles exceeded the average length. "Our first thought was that this was just a chance observation," says coauthor Dale P. Sandler of NIEHS, because long cycles would reduce the time a woman spends in the potentially high-risk, luteal phases.

But "we're now willing to stick our necks out and say that this [trend] looks like something real," Sandler says, because cycles in the 25- to 29-year-old group that her team focused on are the ones "least affected" by possibly confounding influences.

Whelan, now at the National Institute of Occupational Safety and Health in Cincinnati, concludes that women with extremes in cycle length probably possess "some hormonal disturbance that not only gives them a wacky cycle . . . but also increases their risk of breast cancer." If true, however, entirely different disturbances probably contribute to the cancer risk of long versus short cycles, she says.

Breast cancer researcher Dimitrios Trichopoulos of the Harvard School of Public Health in Boston describes the new study as "very well done" and perhaps "more important than three-quarters of the ones I authored." But from a research perspective, he suspects it's "a dead end." Why? It leads one to conclude "only what we already know — that hormones are important for breast cancer."

— *J. Raloff*