Are we cooling down, after all?

by Ed Berg

There has been a flurry of articles in the press recently about the climate in the North Pacific starting to cool down. Is there any basis for this? And what happened to "global warming?" In the 1980's and 1990's we have grown quite fond of warmer summers and milder winters in southern Alaska. Are we about to lose our "Banana Belt" status?

There is indeed cause for concern, if you are overstocked with shorts and sandals. Here is what's new: climatologists have recently compiled a 100-year record of North Pacific sea surface temperatures. This record shows a strong 20-30 year warm and cool cycle, which has been dubbed the "Pacific Decadal Oscillation" or PDO. Our present warm cycle began in 1977. There was a warm cycle from 1926 to 1946, and a cool cycle from 1947 to 1976.

Kenai and Homer, being coastal communities, track these sea surface temperatures very closely, with correlations of 75% and 82%, respectively. In 1998 and 1999 the PDO took a down turn, as did Kenai and Homer temperatures, especially in 1999. Last year was cold in early months (e.g., February), and cold in late months. So, it comes down to this: have we turned a corner in this 20-30 year cycle, and are we now two years into the cool phase? If we knew the basic mechanics of ocean currents and water temperatures, we could give a clear yes or no to this question. We do know that ocean temperatures have a profound effect on weather, but at this point we don't understand what makes ocean currents (and temperatures) change from year to year. Satellite imagery, however, now produces remarkable temperature "photographs" of the oceans, which can be tracked from year to year.

We may not know the mechanism of temperature change, but can we make some reasonable predictions, based on past performance? I think we can, to the same degree that stock market analysts make predictions about stock prices. There are two approaches to predicting stock prices: one approach looks at the "fundamentals"—is the company financially solid, with good management, good credit, a good position on the industry, etc.? The other approach ("technical analysis") ignores the fundamentals and simply looks at the trend of the stock price. Is the stock going up or going down? The technical analysts try to buy on the way up and sell just as the price turns and starts to go down.

With long-term climate prediction we don't know the "fundamentals," so we have to fall back on "technical analysis," which is basically a matter of judging the trend (either by eye or with statistical aids). When I look at the 100-year PDO graph I see a strong 20-30 year cycle, and I see that we are now 23 years past the 1977 upturn. To me, "OVERDUE!" is flashing in yellow lights (at least) on this graph—it's time for a downturn. A skeptic, however, can look at the same graph, and say "Nope, we've got ten more years of warm weather left." So, it will take a few more years to see if the downturn is real.

I also see a lot of short term "noise" on the PDO graph—temperature ups and downs in 2-3 year periods. These are El Niño/La Niña warm and cool cycles, which are caused by warm and cold ocean temperatures off the west coast of South America. The long-term PDO cycle is like an El Niño/La Niña stretched out over 20-30 years: the PDO is the bass note and El Niño/La Niña is the treble, one might say.

There is a practical side of the PDO vs. El Niño/La Niña time scale, if you depend on commercial fishing in any way. Salmon returns appear to follow the PDO, just like annual temperatures on the Kenai. Alaska salmon returns were at historic highs in most of the 1977-1997 period. One could well argue that the recent weak returns in Bristol Bay are a strong indication that we are into a PDO cool phase, and that salmon returns in Alaska will be generally down for the next 20-30 years.

From the 1977 PDO warming, biologists have learned that sea surface temperatures changes can have a major effect on many marine organisms (a "regime shift," so to speak). In the years following 1977 some populations (or at least their harvest) increased: Gulf of Alaska halibut and flounder; central and western Alaska chinook, chum, coho, pink, and sockeye; eastern Bering Sea herring, rock sole and flathead sole. Other species decreased: Gulf of Alaska shrimp, and recruitment of eastern Bering Sea yellowfin sole, turbot, plaice and perch.

The temperature effect on fish may be more through their food chains than direct physiological effects. For example, warm years increase surface streamflows (like the Kenai River) which enhances juvenile salmon survival, as well as near-shore mixed layer conditions for phytoplankton and zooplankton. Warm years can also affect wind patterns and change the upwelling of nutrients,

Since the PDO took a major dive in 1999, it is quite possible that some of the above-mentioned fisheries may soon reverse themselves. Federal marine biologists Paul Anderson and John Piatt have recently described the crash of Kodiak shrimp after water temperatures rose in 1977 from 0-2℃ to 4℃ (and the subsequent rise of salmon, pollock and flatfish). Water temperatures are now falling, and the biologists predict the return of Kodiak shrimp, and also of capeline, a fatty forage fish utilized by seabirds and marine mammals.

There is a lot of information on the Internet about the PDO and its ecological implications:

Last week PDO founders Steven Hare (North Pacific Halibut Commission) and Nathan Mantua (University of Washington) put an important review paper on their website http://www.iphc.washington.edu/Staff/hare/html/papers/EI/abst_ei.html, which provided much of the information above.

Recent news articles are available at http://www.iphc.washington.edu/Staff/hare/html/pdo/pdopress.html.

A dramatic color movie of satellite pictures of Pacific Ocean temperatures can be viewed at http://topex-www.jpl.nasa.gov/elnino_mov/index.html.

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