

Sea-air explanation

Since the early 1940's, the earth's climate has been gradually cooling. This trend has been blamed on air pollution, solar variations, volcanic dust and a number of other factors that have been found to influence climate (SN: 11/15/69, p. 458).

But few theories, says Jerome Namias of the National Oceanic and Atmospheric Administration, have given proper consideration to large-scale, long-term interactions between sea and air. "In the quest for causes of climatic fluctuations," he says, "scientists may be overlooking the most important factor by ignoring this interaction."

In the Nov. 13 *SCIENCE*, Namias describes how such an interaction may have been affecting weather in the United States.

During the last decade, winter temperatures in the eastern two-thirds of the nation have been abnormally low, averaging 1 to 4 degrees F. below the mean for 1931 to 1960. At the same time, winter temperatures west of the Continental Divide have been higher than usual, with an average increase of about 2 degrees F. in the Northwest.

These temperature anomalies, says Namias, can be explained by the prevailing flow patterns of winds in the troposphere—the lower 6 to 10 miles of the atmosphere, in which most weather occurs. The normal west-to-east wind flow for the time-period in question, as indicated by wind-flow data at the 700-millibar pressure level (about 10,000 feet), is distorted by an unusually large northward bulge over the western United States and a southward dip in the East. An abnormal proportion of cold Arctic air, he explains, was thus picked up and carried into the eastern half of the country.

The culprit responsible for this distortion in the wind flow pattern, according to Namias, is the Pacific Ocean. During the same decade that the eastern United States was abnormally cool, he says, the sea surface over much of the North Pacific has been abnormally warm. This warming, whatever its cause, he proposes, would have caused disturbances in the wintertime atmosphere over the North Pacific, probably by exciting an increase in cyclonic activity. The vorticity of the winds would be transported aloft, he continues, and would distort the existing wave patterns.

Regional disturbances such as these, says Namias, could lead to global climatic fluctuations.

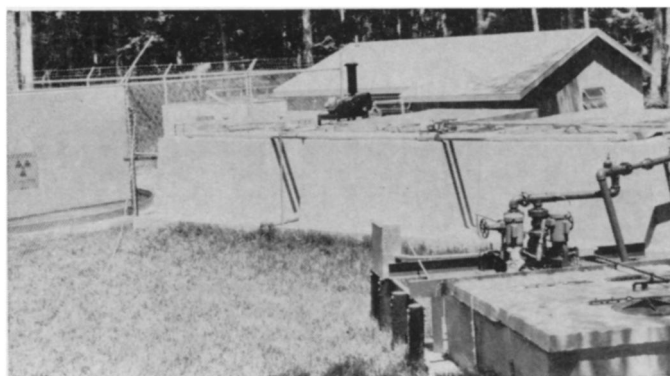
Namias concludes that "it seems unlikely that increased air pollution, variation in volcanic activity, or human

intervention was the cause of the decadal temperature fluctuation over the United States," and that it may be shortsighted, therefore, to attribute climatic changes elsewhere to these causes.

But another meteorologist, Dr. J. Murray Mitchell, also of NOAA, cautions that although Namias' explanation of climatic trends makes sense, and air-sea interactions could have a major influence on the earth's climate, the theory does not exclude the possibility that other factors, such as volcanic dust in the atmosphere, may be operating concurrently.

TRIED AND TRUE TECHNOLOGIES

Slow slogging on sewage



Nuclear sewage treatment in Florida: Little potential, says FWQA.

Energy Systems Inc.

Of all pollution-abatement procedures, sewage treatment has by far received the largest share of Federal attention and funds. A central feature of President Nixon's pollution-control package proposed to Congress earlier this year was a \$10 billion program for sewage treatment (SN: 1/31, p. 122), and funds appropriated for the purpose under earlier programs hit a record \$1 billion for the current fiscal year.

And although construction of sewers and treatment plants has lagged behind the new needs created by a growing urban population, the corner is beginning to be turned now, says Ralph C. Palange, head of the Federal Water Quality Administration's sewage construction grants program.

At least that is the case for meeting the water quality standards jointly adopted by FWQA and the individual states. In order to meet the higher goal of tertiary treatment for all sewage and separation of storm and sanitary sewers nationwide, some \$35 billion would be required over the next few years, says Sen. Edmund Muskie (D-Me.), chairman of the Senate's air and water pollution subcommittee and advocate of this goal.

Sewage treatment goals apparently have to be met by patient slogging and use of tried and true techniques, rather than through technological breakthroughs. For example, a Florida firm

"Our job now," says Dr. Mitchell, "is to determine not what phenomena are operating, but which are more important in influencing the climate." This can only be done, he says, when mathematical models of the atmosphere are formulated and the problem can be presented to electronic computers. Researchers at NOAA's Geophysical Fluid Dynamics Laboratory at Princeton are now gearing up to do this (SN: 5/30, p. 533), and in a few years, Dr. Mitchell estimates, scientists will be able to tell how important each factor is in determining climatic changes. □

has made large claims for a tertiary treatment scheme which would use gamma rays from radioactive cobalt to sterilize wastes and break down organic molecules to make them more filterable. But the firm will not release many of the details of the process, and Robert Crowe of FWQA's process research and development branch says an FWQA-Atomic Energy Commission report not yet published will indicate little if any potential for the gamma-ray treatment.

Instead, says Crowe, refinement and scaling-up of standard chemical and physical techniques such as activated charcoal filtration for removal of organics (such as pesticides) and chemical precipitation of phosphates represent the only major new developments.

He concedes, however, that sterilization of sewage sludge (mainly fecal matter) and piping it to farms for use as a fertilizer (SN: 2/28, p. 223) still has a major potential; FWQA is now planning demonstration grants for sewage-fertilizer projects, he says.

Whatever happens in sewage treatment technology, the large infusions of money still appear to be the only sure answer. Many cities, for example, have joint storm sewer-sanitary sewer systems; when heavy rainfall comes there is only one way to avoid overflows of untreated sewage into waterways. That is to have the expensive separate systems. □