METEOROLOGY

Longer Range Weather Forecasts

Weathermen are working to improve the 30-day forecasts. Their ultimate aim is to predict the weather at least 90 days in advance.

By ANN EWING

IN MAN'S NEVER-ENDING war with the weather, he has always wanted to know what next week's, next month's or next season's weather will be.

In times not too recently past, men looked for signs in the clouds, from which developed such proverbs as, "rain before seven, shine before eleven." Some have even depended on their aching corns to foretell the coming weather.

For longer range forecasts, men have examined the barks of trees, watched the timing of bird migrations or put their faith in woolly bear caterpillars as weather prophets.

Only in the past several decades have weathermen been able to say with some assurance what the elements have in store in the immediate future. Current weather forecasts for periods some 24 or 48 hours ahead for any particular locality are generally very accurate.

The predictions of weather five days in the future are the most accurate ever, and each year their reliability increases.

Weathermen are now working to improve the 30-day forecasts. Their ultimate aim is to predict the weather at least 90 days in advance.

Meteorologists believe that forecasting long-range weather is second in difficulty only to forecasting human behavior. For periods some 24 or 48 hours in the future, the many factors influencing the weather for any particular locality are quite well known and understood.

Long Range Forecasts

However, with increase in the future time for which forecasts are made, the difficulty of making them increases out of all proportion. For instance, although 24-hour predictions are very specific, the five-day forecasts give weather trends specifically in terms of temperatures and precipitation for state-wide or larger areas. A prediction issued on Wednesday, for instance, would not specify rain for a typical city on Sunday afternoon, but might call for precipitation over the weekend.

The regional five-day forecasts are issued by district forecasters, based on country-wide predictions made by the extended forecast section of the U. S. Weather Bureau's center in Suitland, Md. A high-speed electronic computer there does all of the routine calculations, once done laboriously by hand or by punched card machine.

The numerical weather predictions made by the electronic computer are then used as a basis for the nation-wide five-day forecasts issued by the Suitland center, and used by the regional offices for their outlooks.

Reason for the accuracy of the five-day forecasts is that meteorologists have some understanding of how planet-wide circulation patterns affect future weather. Because of this, they can put their knowledge into mathematical formulas stored in the computer. When the current weather, plus such climate information as average temperatures, are also put into the machine, the computer can calculate expected events.

So far, this can be done only on a state-wide or larger scale, except for temperatures, which can be given for 50 specific cities.

For 30-day forecasts, the necessary knowledge of how and why the world-wide circulation patterns change has yet to be spelled out in detail. Although the monthly outlooks, which are issued twice a month, are more often right than wrong, they are not as accurate as either those who issue them or those who use them would like. As with the five-day forecasts, however, they are becoming increasingly more reliable.

Meteorologists expect that, within the next five to ten years, they will have gained enough knowledge of atmospheric forces to make the 30-day predictions at least as accurate as the five-day ones are now. Some of this knowledge will result from experimenting with different mathematical techniques for predicting the weather, using computers for the calculations.

One ultimate aim of many meteorologists is to forecast the weather at least 90 days in advance. Jerome Namias, head of the U. S. Weather Bureau's extended forecast section, is now working on just such a program experimentally.

His research is aimed at developing a system for seasonal weather prediction. Mr. Namias, who pioneered the 30-day forecasts, said he had not been working on the extremely tough, 90-day problem long enough to know whether his methods will prove successful or not.

However, he said that some of his experimental results to date had been "encouraging," and he appears hopeful that the future will be even more promising.

Two Major Developments

The ability to predict the weather five, 30 or 90 days in the future with any reasonable expectation of being right is due in large part to two major developments of the last 25 years.

One was the introduction of the idea that surface weather is governed by high-altitude winds that move ceaselessly in a globe-girdling belt. The other was the ability to calculate the weather numerically, made possible by the use of high-speed computers.

Before the mid-30's, weather for a particular area was considered mainly a local event. Then the late Swedish meteorologist, Dr. Carl-Gustaf Rossby, proposed that weather predictions should be made after

MAPPING FUTURE WEATHER—Jerome Namias (right), head of the U. S. Weather Bureau's extended forecast section, examines one of the many maps currently issued to show weather across the United States and around the Northern Hemisphere several days in the future.

considering the present state of the atmosphere over the entire Northern Hemisphere and the history of its motions for the previous few months.

If the large-scale motions of the atmosphere were made visible by a vast number of free-floating balloons at about 20,000 feet above the surface, an observer on an earth-circling satellite would soon notice the balloons all drifted eastward relative to the earth.

Looking more closely, such an observer would see that the speed of this westerly current was not the same from pole to pole, but varied slowly with latitude. It would move fastest over the some 2,000 miles of the temperatures zones, or mid-latitudes, becoming much weaker or even reversing its direction over the poles and the equator.

The high-level river of air over the mid-latitudes does not flow in a straight path, but dips north and south as it moves, meandering in much the same way as a stream. Meteorologists call this great meandering current, which circles the earth, the planetary wave.

If the satellite observer viewed the myriad balloons floating in the earth's atmosphere even more carefully, he would find a constantly changing series of whirlpools and eddies embedded in the giant river of air.

Continually forming and disintegrating, these whirling air masses are depicted as high and low pressure areas on weather maps such as issued daily by the U. S. Weather Bureau. They also move from west to east, in a more or less regular way, at a speed slightly less than the planetary wave.

This regularity is what led first to the art of weather forecasting, then to the now-emerging science of weather prediction. By charting these flow patterns, meteorologists have learned to predict where high and low pressure areas will move in the future, based on their repeating patterns known from past motions.

Much more important, however, the atmosphere's regular motions show that air obeys the same laws as other fluids. Using many short-cuts, meteorologists are learning to apply these laws, some weather applications of which were perceived by the late Dr. Rossby, to the atmosphere.

Now, with the aid of computers, meteorologists hope to continue to improve their knowledge of atmospheric motions, leading to more accurate weather predictions for longer periods in the future.

Science News Letter, November 7, 1959

Do You Know

To assure decent housing to every American family by 1975, 35,000,000 *houses* must be built in the next 15 years—more than 2,250,000 a year.

Tobacco, next to money, is the item most handled in the U. S. every day, being sold in 1,400,000 retail outlets in a variety of forms.

Meats of all kinds and all vegetables except tomatoes, ripe pimentos, peppers and sauerkraut are *foods* low in acid.