METEOROLOGY

Flying High for Weather

Meteorologists seek data from ever higher altitudes and ever more distant places to give us more accurate predictions and longer range forecasts.

By WADSWORTH LIKELY

See Front Cover

➤ TO TELL us what tomorrow's and next month's weather will be, the weatherman is reaching ever higher into the sky and ever farther north into the Arctic and south to the tropics.

Some day, he may have to reach the sun for accurate weather forecasts. Before that he will have to look to the southern hemisphere and even the Antarctic.

Already the meteorologists are sending balloons 100,000 feet up into the thin air to find out the temperatures up there, the wind directions, the humidity and the atmospheric pressures. And information garnered from rocket flights 100 miles up may some day be integrated into the mass of information which is sifted before your daily weather forecast and the predictions for the month ahead are prepared.

The weather in your home town tomorrow will be the product of forces so vast and complicated, forces reaching so far out into space and so far around the face of the globe that it is amazing the Weather Bureau can predict it correctly more than 50% of the time. Yet, in some places, their forecasts hit it on the nose as high as 95% of the time.

If it rains tomorrow, that rain came from the waters of the Pacific or the Gulf Coast—only a thin strip along the Atlantic receives much Atlantic water on its umbrellas. It first had to be drawn up into the sky, in the form of gas-like water vapor by the heat of the sun. And then the tons of water had to be propelled through the air thousands of miles by the force of wind currents girdling the globe from 10,000 to 40,000 feet up, and perhaps higher.

Nuclei Particles Needed

Yet it would not rain, if enough salt or dust particles were not in the air so the water vapor could go through the steps of forming extremely tiny ice crystals and growing large enough to fall by their own weight out of the sky until they fall far enough down to melt into rain drops.

And the rain would only be a few drops unless the heat released when the ice crystals formed did not draw more water vapor into the cloud to provide more ice crystals to melt into more rain drops.

The weatherman must take water and salt from the Pacific or the Gulf, winds propelled by the cold of the Arctic and the heat of the tropics, dust swirling up from the deserts, he must take all these and a lot more and come up with a prediction of whether it will rain in your home town tomorrow.

He is not satisfied that he has enough information. That is why he is reaching out in all directions for more. Where he cannot yet secure more information, he is learning how best to use what he has.

How does the meteorologist get information from high in the sky? First, merely by looking. He looks at those very high clouds called noctilucent which travel from 200,000 to 300,000 feet up. There is still controversy over what these clouds are made of—it might be water droplets, or maybe dust carried high into the atmosphere. The weatherman observes the directions in which they travel and tries to estimate how fast they are going.

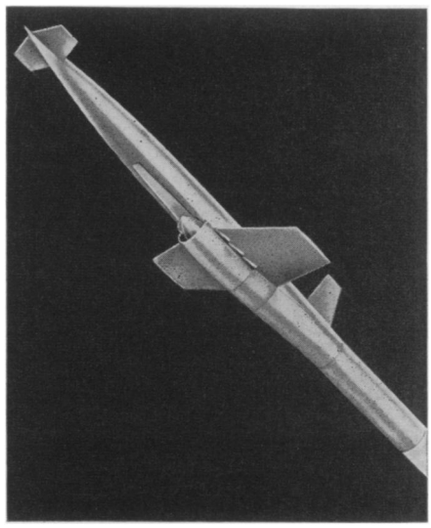
Meteor trails—from 150,000 to 500,000 feet—provide more hints about the movement of the upper atmosphere. They are affected by the wind currents just as are the smoke letters of sky writing.

Then he looks at the air glow and the aurora borealis to get some idea of temperature distributions. Some auroras can be observed for this purpose as high as 1,300,000 feet or 250 miles.

For further visual observations, he shoots things up into the sky—gun shells and, lately, rockets. The path of gun shells can give some indication of winds up to 100,000 feet. Smoke bombs set off in rockets and the vapor trails have given information on winds up to 260,000 feet or about 50 miles.

Observations of another kind are made with both sound and radar waves beamed into the air. They bounce and their echoes come back from the various barriers the components of the atmosphere set up. Indications of both temperature and wind direction can be secured in this way, as well as the composition of the atmosphere.

But the best method, of course, is to send the instruments up there to measure the temperature, wind speed, atmospheric pressure and relative humidity. This is usually done with balloons, but lately some of the rockets, fired higher into the sky than any other man-made thing has gone, have been carrying meteorological instruments more than 100 miles.



FUTURE MISSILE?—Guided missiles based on such research models may some day aid in getting upper-air weather data.

Long-Range Forecasts

Today's regular extended forecasts—for periods of up to 30 days—are dependent upon worldwide observations of conditions in the atmosphere from 10,000 to 40,000 feet up. Balloons equipped with instruments and radio transmitters automatically send back to the earthbound weatherman the data he needs to construct his charts of the upper skies. In Germany, meteorologists regularly use observations from even higher levels—55,000 feet.

Now balloons go up to 100,000 feet, but not enough of them to provide meteorologists with a complete picture of conditions that high. Without the complete picture of the movement of the winds and the temperatures over half the world, the information cannot be regularly used.

Even if weathermen had a good picture of the sky that far up they would not be able to use it right away. There is still a lot more to learn about atmospheric conditions closer to earth. But they are reaching upward all the time.

Two scientists, William W. Kellogg and Gerhard F. Schilling of the University of California at Los Angeles, have pieced together, from the fragmentary information available, a picture of what they think the prevailing circulation is up to 75 and 80 miles high.

Their picture shows that the entire circulation in these rarefied reaches of the sky reverses itself every six months, as winter becomes summer and vice versa. They find that from about 15 to 40 miles up, the air is moving upward over the summer pole and downward over the winter pole. If this is true it is bound to have an effect on the circulation of the air we feel on our faces here below.

They also find that the temperature varies—at some altitudes it is extremely hot and at others extremely cold.

Their calculations depend not alone on the observations they have been able to collect. Chemical and physical reactions can occur in the stuff that makes up the atmosphere. How this atmosphere is changed by the sun and the movement of the earth affects the weather.

Because this is so important, weathermen would like to see high flying balloons carry other instruments into the sky. There are natural radioactive tracer materials way up there—a Geiger counter could indicate their presence.

Sun's Effects Studied

And meteorologists are lifting their eyes even higher. They are studying the sun. The amount of heat we receive from the sun, whether our oceans or our land receive it, its effect on the components of the atmosphere, how much of it does not get through our atmosphere to us, how it affects the circulation of the air—all these are important to our knowledge of the weather.

What goes on within the sun itself is getting attention. Many scientists have suggested connections between sunspots and our weather.

In addition to moving upward, weathermen are moving north and south. The north has received more attention than the tropics, but it is the belief of Jerome Namias, chief of the Extended Forecast Section of the Weather Bureau, that more information, particularly about what goes on in the air 10,000 to 40,000 feet above the equator, is necessary to good long-range forecasting.

In the Arctic, the Air Force flies every other day to the North Pole and back to Alaska checking weather conditions. The Weather Bureau, in cooperation with Canada and our Air Force, has stations in the Arctic which send data to Washington.

The air, at least up to 40,000 feet, moves in a great circle around the northern hemisphere from west to east. As the atmosphere in the tropics heats up and that in the Arctic grows colder, pressure is put on this current which bends it in north-south wave patterns. This causes changes in our weather, allowing heat to come north and cold to spill out of the Arctic. If that did not happen, the tropics would grow hotter and the north pole colder and colder.

This method of nature to keep the weather in balance is the reason why observations of the weather both to the north and the south of us as well as high above us are important.

As the weathermen reach farther out for information, they continue to gain new knowledge of how our weather is formed. More accurate predictions thus made possible for ever longer periods of time into the future will affect almost everything we do.

Science News Letter, January 12, 1952

ANTHROPOLOGY

Asiatics Found America?

➤ VOYAGERS FROM Indonesia and Indochina may have "discovered" America by crossing the Pacific 700 years before Columbus and some 300 years before the Vikings.

This is the opinion of Dr. Gordon Ekholm, associate curator of anthropolgy of the American Museum of Natural History in New York. He bases his opinion on the existence of marks of the culture of southeast Asia in Mexico and Central America dating from about 700 A.D.

Columns and balustrades with a serpent motif, found at Chichen Itza in Mexico, he says, are almost identical with columns and balustrades found in Java. Types of thrones and the manner in which artists handled the lotus motif are similar too, he pointed out.

Dr. Ekholm is not sure how the southeast Asians got to what the archaeologists call "Middle America." He points out that voyages were made from India to Indonesia and Indochina in ships which could carry 200 people and stay out of sight of land for 60 days as far back as 400 A.D.

His findings, he says, indicate a "complex of traits" which have no antecedents in Middle America, but which are similar to traits found in southeast Asia. Dr. Ekholm believes that there must have been various contacts over a period of years after 700 A.D. The motifs, he thinks, have a sort of Buddhist or Hindu character about them.

Science News Letter, January 12, 1952

MEDICINE

Penicillin Saves Lockjaw Victims

➤ PENICILLIN CAN help save lives threatened by tetanus, or lockjaw, the deadly infection which can get into war wounds as well as those made by stepping on a nail.

The famous mold remedy can wipe out the tetanus infection in most cases within 24 hours after injections of it have been started, four Puerto Rican scientists report in the JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION (Dec. 22). The four are Drs. R. S. Diaz-Rivera, Emilio Ramirez, Eduardo R. Pons, Jr., and Mercedes V. Torregrosa, all of San Juan.

Antitoxin is needed to neutralize the toxin, or poison, produced by the tetanus germs, they point out. But penicillin helps save patients by stopping growth of more germs, thus preventing more toxin getting into the patient's body. Wound cleansing and sedatives were also used.

Science News Letter, January 12, 1952