

Tiros Providing Data On Weather Processes

By John Maddox
Staff Reporter

A number of pointers to an understanding of certain weather processes have already emerged from a cursory study of the 25,000 pictures of cloud formations provided by the Tiros satellite.

However, scientists of the Meteorological Satellite Section of the Weather Bureau indicated yesterday that information being won from the satellite is more important as research material than as a guide to practical meteorology, such as weather prediction.

Even in the latter field, however, some significant successes have already been achieved. Thus on two occasions it has been possible to locate the centers of cyclonic storms—in the northern Pacific and the Caribbean respectively — more accurately from the satellite pictures than could be done from the scanty meteorological observations obtainable in the areas concerned.

The processing of information from the satellite has now been made a matter of routine. This is in contrast to the first few days of the project, when, as one scientist said yesterday, "we were rushing around like chickens with their heads cut off."

Advance Decisions

Decisions about the time when the television cameras in the satellite will be turned on are made a day or two in advance. For each orbit of the satellite around the earth a choice has to be made on the interval of time when the cameras—which remain pointed toward a fixed direction in space—will have sunlit clouds within their field of view.

Instructions for turning on the magnetic tape equipment which stores a record of the pictures at specified times are sent to the satellite during its passage over one of the two "ground read-out stations" at Fort Monmouth, N. J., and Hawaii. Because of the limited range of radio contact between the ground equipment and the satellite there are four or five orbits every day when the satellite cannot be commanded.

Among the lines of inquiry already opened up by Weather Bureau scientists are the following:

- The relationship between cloud structures visible in the photographs and the more familiar patterns of air circulation usually defined in terms of meteorological observations from isolated ground stations is being worked out. Cyclonic circulations, as in depressions and hurricanes, are apparently easily recognizable on the

photographs by the vortex of cloud formation, as are the even banks of cloud associated with weather fronts.

- The movement of cyclonic storms from one day to another has been followed in some series of photographs. The eastward motion of one cyclone during four days in the Indian Ocean was distinguishable in this way. However, scientists say that the accuracy of the first satellite is not sufficient to detect the movement of slow-moving depressions. Also its orbit does not give as systematic coverage of the earth as would be done by a satellite moving from north to south.

- The possibility that understanding of the behavior of tornadoes may be gleaned from satellite photographs is suggested by a single photograph taken from the satellite four hours before a tornado hit in Oklahoma. Sigmund Fritz, head of the Meteorological Satellite Section, said yesterday that a square patch of cloud 100 miles across in an otherwise cloudless region of sky might be associated with the tornado.

- Some cyclonic cloud patterns appear to be embedded in lacy patterns of cloud containing suggestively regular circular patches of clear sky up to 100 miles across. Fritz said yesterday that this phenomenon seemed to be associated with an interruption of the normal decrease of temperature with increasing altitude in the atmosphere at a height of about 5000 feet. He pointed out that an analysis of cloud structures like these would throw light on the nature of vertical air movements in circumstances where the normal decrease of temperature was interrupted and that it might in the end provide a means of recognizing these unusual situations which would be of some practical importance, especially in areas of the world where surface meteorological stations are few and far between.

Practical Value Seen

The last possibility indicates the field in which weather observation satellites are first likely to be of practical value. The need of some means of obtaining meteorological information from parts of the world where conventional weather observation is inadequate—in the Pacific, for example—is held to be an essential step in the improvement of meteorological practice.

Already, however, the Meteorological Satellite Section is looking toward improvements of technique. One need is to devise a system which will fix the position of a cloud photograph more accurately in terms of latitude and longitude. Failing help from land features in the photographs, this cannot now be done to within 50 miles or so. With more accurate timing devices and satellites with less wobble it is hoped that positions can be determined to within 10 miles.

Later weather satellites will include devices to measure the radiation of heat from the surfaces of the earth and from clouds, and also the input of heat from the sun. The ideal weather satellite is held to be one that would keep its cameras pointing to the earth, but this appears to be some way off.

National Oceanic and Atmospheric Administration TIROS Satellites and Satellite Meteorology

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