METEOROLOGY-ASTRONOMY

Small Changes of Sun's Heat Control Weather on Earth

Revolution in Weather Forecasting Foreseen as Result Of Quarter Century Research by Smithsonian Secretary

See Front Cover

THE SUN when it radiates heat and light to the earth also broadcasts information that can be used to foretell the weather here on earth.

Dr. C. G. Abbot, secretary of the Smithsonian Institution, after more than two decades of solar observation, announced today through the medium of a scientific publication entitled "Weather Dominated by Solar Changes" that:

"Contrary to the prevailing view, the weather appears to be governed by variations in solar radiation."

His discovery seemingly presages a day when we shall be able to tell what the weather will be weeks, months and perhaps years in the future instead of just tomorrow as is now the case. Eventually the present method of forecasting from telegraphed weather data as performed twice daily by the U. S. Weather Bureau promises to become an auxiliary instead of a primary method of predicting weather.

Long-range weather forecasting, formerly the claim of charlatans and the dream of those of great faith and little knowledge, through Dr. Abbot's long program of research promises to become a scientific reality.

Dr. Abbot compared the temperatures as officially recorded at Washington, D. C. with the changes of intensities of the sun's radiation as found by daily measurements at the solar observing station of the Smithsonian located in Atacama desert on Mount Montezuma, Chile. Sometimes the solar radiation increases steadily for several days, at other times decreases similarly. Dr. Abbot finds that these opposing sorts of solar change produce opposite changes of weather, not only at Washington but at other United States stations.

Average changes of mean temperatures of five degrees Fahrenheit are found, Dr. Abbot reports, corresponding to solar changes averaging only eight-tenths of one per cent. Hence, he supposes that on many occasions temperature effects caused by solar changes may reach 10 degrees, and sometimes 15 and 20 degrees. This causes Dr. Abbot to claim:

Dr. Abbot's Claims

"Major changes in weather are due to short period changes in the sun."

"So revolutionary is this conclusion for meteorology," Dr. Abbot declares in his report, "that I hesitated to publish it until the unanimous approval of many competent critics encouraged me. I am further supported in this view by having found a similar relationship prevailing not only at Washington, but at Williston, N. D., and Yuma, Ariz., in all months of the year."

Thus the relation between the sun and the weather has been tested in the coldest and hottest localities of the country as well as the nation's capital.

Dr. Abbot's studies show that the meteorological effects of solar variation are produced indirectly. The sun's rays do not act directly on the earth's atmosphere. Moreover, some of the large effects occur on earth 10 to 12 days and sometimes 16 to 17 days after the solar cause ceases to operate.

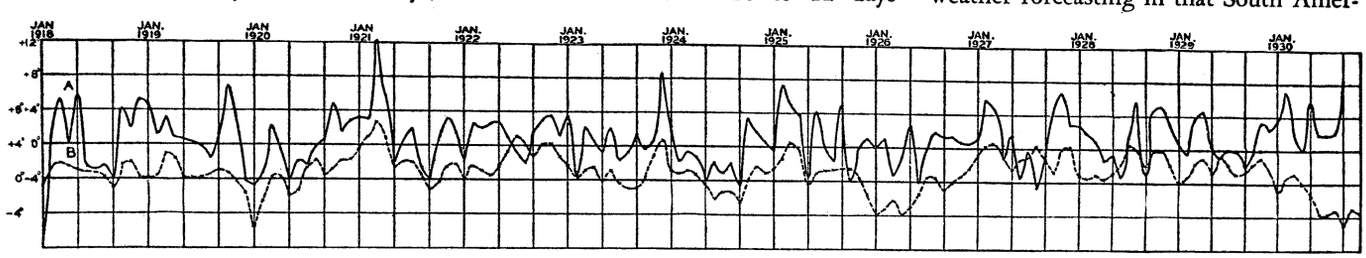
That the circulation of the atmosphere is changed by the sun's variations is Dr. Abbot's suggestion. The atmosphere absorbs a tenth of a quarter of the sun's radiation reaching earth, this tends to displace the centers of the great cyclonic whirls of the atmosphere, and as a consequence the wind direction at various places is changed. Since wind has much to do with temperature, this markedly alters the height of the thermometer. Dr. Abbot further suggests that the solar variations may be particularly effective at certain parts of the earth where weather is born and that the atmospheric wave drifting southeasterly from these centers are influenced to produce weather changes.

Long swings of variation in the sun's heat extending over many months were also discovered. These give promise of very long-range weather forecasting, for the seasons or even years in advance. These long-continuing changes in solar variation can be analyzed into five regularly recurring periodicities of cycles respectively of 68, 45, 25, 11 and 8 months which are submultiples of 11¼ and 33 years. This is interesting because these latter intervals have long been recognized as related to sunspots.

After discovering these five regular periodicities in the solar variation, Dr. Abbot then investigated long continuing temperature records for Washington, and discovered therein these same five regular periodicities. When he took these five periodicities and combined them into one curve he found that he had reproduced very closely the curve of actual Washington temperatures.

Experimental Forecasts Desired

Associated with Dr. Abbot in the early phases of his researches as applied to the weather was H. H. Clayton of Canton, Mass., who formerly directed the Chilean weather service and used the Smithsonian Institution's daily values of the solar constant in weather forecasting in that South Amer-



NATIONAL CAPITAL TEMPERATURES

Curve A gives the periodicities of Washington's mean monthly temperatures while curve B is a synthetic temperature curve as derived by Dr. Abbot by combining periods that he discovered in his solar radiation data.

ican country some ten years ago. Since then he has further developed forecasting methods based on the solar constant values and applied them to sections of the United States.

Dr. Abbot has not yet actually made weather forecasts but he is hopeful that meteorologists will begin to make experimental forecasts using the facts that he has discovered. Mr. Clayton is now forecasting on the basis of the solar constant and has a commercial service with many paying clients.

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AERONAUTICS

Congress Considers Measures For Trans-Oceanic Airship Lines

Favorable Action on Merchant Marine Bill Would Hasten Mail and Passenger Service Across Atlantic and Pacific

BIG airships are occupying attention in Congress this session.

One proposition under consideration, is that of a trans-oceanic mail and passenger service which would deliver letters from the United States to Europe in two and one-half or three days from our eastern coast and to China in five or six days from the west coast.

The measure is the McNary-Parker Airship Merchant Marine Bill. It would legalize enormous airships as common carriers and would authorize the Postmaster General to make mail-carrying contracts at rates not to exceed $20 per mile.

Hearings on this bill before the House Interstate and Foreign Commerce Committee have been concluded for this session.

Airship terminals in America, Europe, Hawaii and the Orient would be built by companies established by business men prominent in the Goodyear Tire and Rubber Company and they would be used interchangeably by dirigibles of the different nations.

The first trans-oceanic project will probably be over the Pacific to Honolulu, with one round trip made weekly. Later this service would be extended to Manila and Japan. Honolulu would be reached in 36 hours instead of six or seven days, and Manila in six days instead of three weeks. The proposed airships would carry about 20,000 pounds of mail each. The sponsors of the Airship Merchant Marine measure declare that one airship making one round trip weekly, could carry 75 per cent. of all first-class mail to the Orient.

But it will be a long time before the trans-oceanic airships carry any large proportion of overseas passengers, even when as many as four Zeppelins are built for this service. Only about 8 per cent. of first-class passengers now traveling abroad could be accommodated in four 80-passenger ships, it has been estimated.

Another proposition, on which the two houses of Congress have not yet agreed, is that of providing for a big metal-clad airship for the Army. Tentative plans call for a $4,500,000 metal-clad ship, 554 feet long and 120 feet in diameter, and capable of running at a speed of 100 miles per hour.

Such a ship could be expected to transport a 40,000 pound military load from Washington to Panama in 28 hours; replacement airplanes could be carried from Florida to Panama, and similar military operations performed. The Detroit Aircraft Corporation is anxious to build the ship.

Interesting in connection with the transporting by air of mail across the Atlantic was the Postoffice Department's advertisement for bids for such airplane service in November, 1930. Subsequently the advertisement was withdrawn, but it will be reissued sometime this year. The Postoffice Department has been informed that there are some companies anxious to bid on it.

The route specified was to Bermuda, the Azores, and thence across the ocean to France, and of once per week frequency. Maximum rates to be paid were $2 per mile for the specified load of not exceeding 300 pounds, and $1 per pound per thousand miles or pro rata thereof for greater or less mileage for mails in excess of the specified load.

The Goodyear Company is now building two enormous dirigibles for the Navy at the huge airship dock in Akron, Ohio. One ship, the "Akron," will probably be delivered in June of this year, and the other at the end of 1932.

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PLANT PATHOLOGY

Destructive Plant Disease Causes "Fever" in Leaves

ABNORMAL temperatures in sick plants, similar to fever in germ-afflicted animals, have been observed in the leaves of plants attacked by root rot, by Dr. Walter N. Ezekiel and Dr. J. J. Taubenhaus, Texas plant pathologists. They reported their finding before the fourth annual conference on root-rot investigations held at College Station, Texas. Their observations, made with the aid of both mercury thermometers and electrical temperature-measuring devices, showed that the leaves of afflicted plants were about three degrees warmer than those of healthy plants.

The disease that causes this "fever" symptom in plants is one of the most serious menaces to plant life now extant in this country, especially in the Southwest. There it has been especially harmful to cotton, though it attacks several hundreds of other species, including ornamental plants as well as agricultural crops. Its yearly damage in the state of Texas alone is estimated at $100,000,000.

Root rot is caused by a bacterium that is appropriately named *Phymatotrichum omnivorum,* for it does eat nearly everything. It lurks in the soil, so that once a field is infected it is next to impossible to eradicate it. Experiments have shown that it cannot stand acid soils, and it may eventually be possible to combat it by raising acid-tolerant crop plants and making the soil too acid for the bacteria yet not too acid for the crop.

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