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UNITED STATES NATIONAL COMMITTEE
INTERNATIONAL GEOPHYSICAL YEAR 1957-1958

OUTLINE OF INTERNATIONAL GEOPHYSICAL YEAR PROGRAM

During the International Geophysical Year, 1957 - 1958, the world's scientists will conduct the most comprehensive study of the earth ever undertaken. Intensive investigations throughout the world will be carried out in meteorology, latitude and longitude determinations, geomagnetism, gravity measurements, ionospheric physics, aurora and airglow, solar activity, cosmic rays, glaciology, oceanography, seismology, and rocket exploration of the upper atmosphere. Forty nations will participate: Argentina, Australia, Austria, Belgium, Brazil, Burma, Canada, Chile, Czechoslovakia, Denmark, Finland, France, East Germany, West Germany, Great Britain, Greece, Hungary, Iceland, India, Ireland, Israel, Italy, Japan, Mexico, Morocco, Netherlands, New Zealand, Norway, Pakistan, Peru, Philippines, Spain, Sweden, Switzerland, Thailand, Tunisia, Union of South Africa, USSR, United States, and Yugoslavia. Each country will plan and execute its own program, under a general plan developed by a coordinating international committee.

Our environment, particularly the atmosphere and the oceans, affects the daily lives of all individuals, the transactions of commerce and industry, the safe conduct of land, sea, and air travel and transportation, and the range and reliability of all radio communication and navigation systems. It is the intensive study of the large scale aspects of this environment which will be carried out during the IGY, from the middle of 1957 through 1958. Each of the fields in the program is characterized by its global nature and its relation to solar energy fluctuations and disturbances. Measurements must be made simultaneously so that the relationships between fields can be determined on the basis of world-wide coverage.

The U. S. National Committee for the International Geophysical Year, established by the National Academy of Sciences, is in charge of planning, directing, and executing the U. S. program. The Committee and its technical panels, which include many of the nation's leading geophysicists, have developed the U. S. program in cooperation with many universities, institutions, and agencies. Federal sponsorship and support for the program has been obtained by the Committee through the National Science Foundation, the government agency charged with responsibilities for federally-supported basic research.

One of the controlling fields in this research program is solar activity, for the sun dominates activities on our planet and is the major source of energy for the earth and for all life. Some solar effects strongly influence the upper atmosphere, the weather, and radio communications. Throughout the IGY continuous measurements will be made of changes in the radiative energy output of the sun over the whole range of wave-lengths or colors, not only visible light, but down to the invisible x-rays and up to the radio waves.

Solar flares will be studied and correlated with changes in cosmic rays, ionospheric and auroral disturbances, and meteorological phenomena.

Measurements of temperatures, pressures, humidities, and winds during IGY will provide information about weather patterns from which better forecasts can be made. Emphasis has been placed on high-altitude meteorological observations (up to 100,000 feet) along three lines of stations (10° E, 75° W and 140° E) extending from the North to the South Pole. These observations will be particularly useful in studies of the movements of air masses around the world.

Water, in liquid or solid form, covers some four-fifths of the earth's surface and is an important factor in the global heat budget. Problems having to do with the nature of oceanic currents, temperature, composition, sea level fluctuations, and total water content will be studied by IGY oceanographers. Emphasis will also be given to glacier studies, particularly in the Arctic and at such U. S. Antarctic stations as Little America, on the 400-mile front of the Ross Ice Shelf; the coastal stations at Vahsel Bay and Knox Coast; the Pole Station on the high South Polar plateau; and Byrd Station, located 80° South and 120° West on the Rockefeller Plateau.

The ionosphere, a region of rarified, ionized gas between 50 and 250 miles above the surface of the earth, is a complex region of the atmosphere, fluctuating in height and depth and varying in ionization. It is affected by solar activity, geomagnetic disturbances, the aurora, and perhaps by meteors. Predicting its effect on radio transmission is one of the major problems in ionospheric physics. Investigations planned by the U. S. involve the relatively unknown Arctic and Antarctic regions as well as along a pole-to-pole chain of stations near the 75 West meridian in the Equatorial Pacific.

Both aurora and airglow, known to affect radio communications, are optical phenomena of the upper atmosphere and appear as light emitted by atoms and molecules of the atmosphere at about 60 km and higher. The aurora, which is the terminus of the path of ionized particles from the sun and the only visible portion of that path, enables theoretical geophysicists to learn a great deal about this stream of particles, its path through space, its capture in the equatorial ring, and its subsequent bombardment of the atmosphere in the auroral zones about 23° from the magnetic poles. Spectroscopic, visual, and photographic observations of the aurora will show its distribution. Radar will provide a record of the ionization associated with the aurora.

In addition to geomagnetism's own specific uses in surveying, navigation, and exploration of minerals and petroleum, this field has broad and basic implications in the study of the ionosphere, radio wave propagation, aurora, cosmic rays, as well as other fields of science. U. S. scientists will explore the physical mechanism causing geomagnetic storms, which frequently cause strong aurora displays and radio blackouts, and also the ionospheric disturbances. The geomagnetic program consists of a series of experiments mainly designed to yield facts about rapid magnetic field fluctuations. The U. S. will establish stations in Alaska, Antarctica, and the Equatorial Pacific. In the United

States, there will be an east-west chain of five stations stretching about 1200 km across the western states, with a shorter north-south cross-chain of three stations.

There are clear connections between cosmic rays and solar activity and the earth's magnetic field and magnetic storms. Cosmic rays represent a powerful tool with which to investigate magnetic phenomena many thousands of miles from the earth. Studies of cosmic rays require simultaneous measurements widely made over the earth, including polar regions as well as temperate and equatorial zones; they also require parallel studies of solar activity, geomagnetism, aurora, and ionospheric physics.

New techniques permit direct measurement of the upper atmosphere by means of large, ground-launched rockets with an altitude range of about 200 miles. In addition, smaller rockets, launched from balloons and aircraft, will be used during IGY for measurements of atmospheric parameters up to approximately 60 miles. U. S. rocket studies will be coordinated with those of other nations, particularly at crucial times of unusual solar activity. Rockets will measure atmospheric pressure, temperature, and density; the earth's magnetic field, especially during auroral displays; night and day airglow; solar and ultraviolet lights and x-rays; auroral particles; ozone distribution; ionospheric charge densities; and cosmic radiation.

The U. S. scientists will make observations at three stations for two IGY programs in the field of positional astronomy: the determination of astronomical longitudes and latitudes and the photographic determination of the position of the moon.

The IGY provides the opportunity for seismological observations and measurements in remote areas. Seismic soundings will be used for measurement of the depth of ice in Antarctica and mapping of the buried rock surfaces. Geophysicists will study the earth's deeper structure, locations of earthquake rifts or zones of instability in the Antarctic continent, and various types of microseisms and their relation to meteorological conditions. This work will be coordinated with that of an international network for study of the earth's crust and of the deep interior. Seismic exploration in the beds of the Atlantic and Pacific Oceans will be continued and expanded.

The United States plans activities in the Arctic, Sub-Arctic, middle latitudes of the Northern and Southern Hemispheres (including the United States, Central America, South America, and adjacent parts of the Atlantic and Pacific Oceans), Equatorial Pacific, and Antarctic and Sub-Antarctic regions. During last winter the USS Atka surveyed the ice conditions in the Antarctic seas and coastal sites for a base. This fall another mission will install the Little America Station, at or near Little America, and carry supplies and equipment for inland stations. In addition to conducting studies in meteorology, ionospheric physics, aurora and airglow, gravity, geomagnetism, and cosmic rays, IGY scientists in Antarctica will undertake several transcontinental traverses to make glaciological and seismological observations to determine the extent of the ice and land masses.