GEOPHYSICS

Earthquake from Explosion

Molten rock, deep inside the earth, built up tremendous pressures and changed form with enough explosive force to cause the Alaskan earthquake—By Barbara Tufty

➤ AN EXPLOSION caused by superheated rock 12 to 30 miles underground may have caused the devastating Good Friday Alaskan earthquake, a Government geophysicist claims.

Molten rock inside the earth's mantle, so hot it is pliable, he said, changed form with enough explosive force to break the earth's crust.

Douglas Elvers of the Fredericksburg Magnetic Observatory, Corbin, Va., which is part of the U.S. Coast and Geodetic Survey, told SCIENCE SERVICE that a scientific team is surveying the Good Friday earthquake area. The earthquake epicenter broke the earth's crust below Prince William Sound in the Gulf of Alaska.

The earth's crust is a relatively thin, rigid layer of rock which covers the earth. This crust varies in thickness from three to 40 or more miles, geologists estimate, with the thickest parts lying beneath the continents. Beneath this crust lies the mantle, a 1,800-mile thick layer of hot plastic rock which surrounds the earth's core, an area about 2,160 miles thick.

Heated by radioactive elements and immense pressures, the molten rock in the mantle presses and strains against the earth's crust. This is a continuous action going on all over the world, Mr. Elvers explained, but at times there can be specific acceleration of the heat and pressure action. It is like having a fire begin to heat up and then burn very rapidly.

As molten rocks in the mantle expand outward toward the earth's crust, with temperatures as high as 2,200 degrees Fahrenheit, the crystalline structure of the rock changes as it moves into areas of less heat and less pressure nearer the earth's surface.

At a weak or brittle area in the crust, the molten rock may break through with explosive force, much like the way a balloon can break open at a weak or brittle spot in the rubber.

For millions of years, dense rock from the hot mantle has been intruding the earth's crust in an undersea area running parallel to the Aleutian Trench, said Mr. Elvers. The Trench, three and a half miles deep, arcs 2,000 miles under the North Pacific Ocean from Yakutat Bay in Alaska toward Russia.

A one-year study of the Alaskan area has been completed by Mr. Elvers, George Peter and Martin Yellin of the Survey by the ships Surveyor and Pioneer, as part of the Survey's extensive ocean analysis program. Details were presented by the geophysicists before the American Geophysical Union meeting in Washington, D. C.

One theory of earth origin which fits the present scheme of findings, said Mr. Elvers, is this: the earth originated as a collection of cold cosmic dust particles which were attracted together and were concentrated by the force of gravity.

Radioactive heating and tremendous internal pressures built up in this dust concentration, and produced the core of the earth covered by a plastic mantle. As the interior of the earth expands, this mantle presses against the crust, with sudden eruptions weakening spots where earthquakes are most prominent.

Only since the last five years has any array of instruments been portable and reliably sensitive enough to permit network surveying of the earth on a regional scale.

Seismic and strain measurements are basic to forecasting earthquakes, said Mr. Elvers. Magnetic and heat flow measurements can greatly complement the knowledge of earthquake developments. Even accurate gravity measurements can be valuable. By the Survey's correlation of various data by computer analysis, scientists will be able to tell better what causes the earthquakes.

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Wild Heerbrugg Instruments

ENGINEERING WONDER — The tallest U.S. monument, Gateway Arch, which commemorates westward expansion after the Louisiana Purchase, is nearing completion in St. Louis. Spanning 630 feet and 630 feet high, its initial measurements were so critical they had to be made at night when heat stresses on all sides were equal.

PHYSICS

Laser Beam Used to Find How Radio Aerials Work

➤ THE INTENSE TIGHT light beam of a laser is being used to find out how a radio antenna would work without actually building it. Drs. L. J. Cutrona and A. L. Ingalls of Conductron Corp., Ann Arbor, Mich., reported this new way to test the radiation pattern of antennas to the International Scientific Radio Union meeting in Washington, D. C.

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GEOPHYSICS

Volcano Warning System

➤ FUTURE WEATHER SATELLITES will spot and give warnings of volcanoes about to erupt, forest fires before they get out of control and desert locusts swarming across Africa and Asia.

These and other important applications of earth-circling satellites continuously surveying the atmosphere and ground were predicted in Washington, D. C., by Dr. S. Fred Singer, director of the National Weather Satellite Center.

Dr. Singer said he believes the most important use of future weather satellites will be in detecting the meandering of ocean currents by infrared sensors. He predicted that the oceans can be "farmed" scientifically, thus greatly increasing the world's food supply, when the positions of warm and cold ocean currents are known.

Dr. Singer outlined his views on satellites in a global weather system at the American Geophysical Union meeting.

He stressed that instruments on a satellite alone would be insufficient to get a good picture of the world's weather and the interaction of the oceans, atmosphere and solar effects. Ground-based and ocean-buoy instruments also are needed.

Readings taken by these surface instruments would be telemetered to a satellite, then sent back to earth once an orbit, Dr. Singer predicted. He said the number of such stations that could record useful information was limited mainly by the amount of money to be spent, and recommended covering the world with stations every few hundred miles.

No weather information is now available for most of the Southern Hemisphere, all of the oceans and all of the equatorial regions, he noted.

Information gathered by a weather satellite system, Dr. Singer said, could be doubled or tripled from the three billion bits per day now being gathered at a cost of about $25 million per year with little if any increase in cost. Infrared sensors placed near volcanoes, Dr. Singer stated, might give readings warning of impending eruptions that would be telemetered to a satellite.

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