

GEOPHYSICS

Radiation Belt Discovered

▶ ANOTHER RADIATION BELT surrounding the earth has been discovered by Russian scientists, in addition to the two radiation belts discovered by Dr. James A. Van Allen of the State University of Iowa.

Soviet rockets shot into space have detected a radiation band of charged particles about 34,000 miles away from the earth. Sensitive rocket instruments have recorded the belt as far out as 46,000 miles.

Russian scientists said the belt is formed when the weak "solar wind" meets the earth's magnetic field, trapping the low-energy particles of the solar wind. The trapped particles form a flux or band of weak energy electrons surrounding the earth. The solar wind is a permanent flow of charged particles given off by the sun.

The "new" radiation zone discovered by the Russians may actually be a remnant or "tail" of the outer Van Allen radiation

belt, the National Aeronautics and Space Administration said in Washington, D. C. The outer Van Allen belt extends out beyond 30,000 miles, which is near the new belt claimed by the Russians.

United States rockets have not detected this new energy band because instruments sensitive enough to record the low-energy particles have not yet been flown through it. U. S. instruments were responsible, however, for the discovery of the Van Allen radiation zones.

The Russian discovery is reported by I. S. Shklovskiy, V. I. Moroz and V. G. Kurt of the Shternberg State Astronomical Institute in Moscow, in a recent issue of the *Astronomicheskii Zhurnal*, abstracted by the United States Joint Publications Research Service.

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TECHNOLOGY

Gases Tell Water Supply

▶ GAS BUBBLES trapped in water can tell scientists whether a city has a sufficient water supply to quench its residents' thirst.

United States cities tapping underground reservoirs for their water can determine how much water they have by measuring the amount of certain dissolved gases in the water.

Dr. Ryuichi Sugisaki of Nagoya University, Japan, found that the underground water supply varied with the percentage of trapped gases. Rain water seeping into the ground has a higher percentage of trapped gases in winter than in the summer. The underground reservoirs, which absorb this water, reflects this annual difference by their changing gas content.

As long as the amount of dissolved

gases fluctuates normally according to the season, water must be continually filtering through the ground into the reservoir tapped by water wells. If the gas content stays relatively constant, little or no water is penetrating through, and the water supply becomes dangerously low.

Water-well samples should be taken many times during the year for accurate testing, Dr. Sugisaki reported in the *American Journal of Science*, 259:144, 1961.

The percentage of dissolved gases in the water soaking into the ground mirrors the changes in atmospheric temperature. The higher the temperature, the less gas is dissolved by water.

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TECHNOLOGY

Improved Time Standard

▶ A NEW STANDARD of accuracy for broadcasting time signals and constant frequency has been achieved at the U.S. Naval Observatory, the nation's official timekeeper. Time is kept with an accuracy of one part in ten billion.

A watch set to match this accuracy would lose less than one-hundredth of a second in three years.

The basis of the atomic clock is an oscillation produced by the cesium atom. The frequency was determined by the National Physical Laboratory, Teddington, England, and the U. S. Naval Observatory jointly.

The high precision broadcasts of time and frequency made possible by the new standard will allow more accurate tracking of artificial satellites and help improve naval communications and radio navigation.

Communications networks across oceans and continents will also be improved by such broadcasts.

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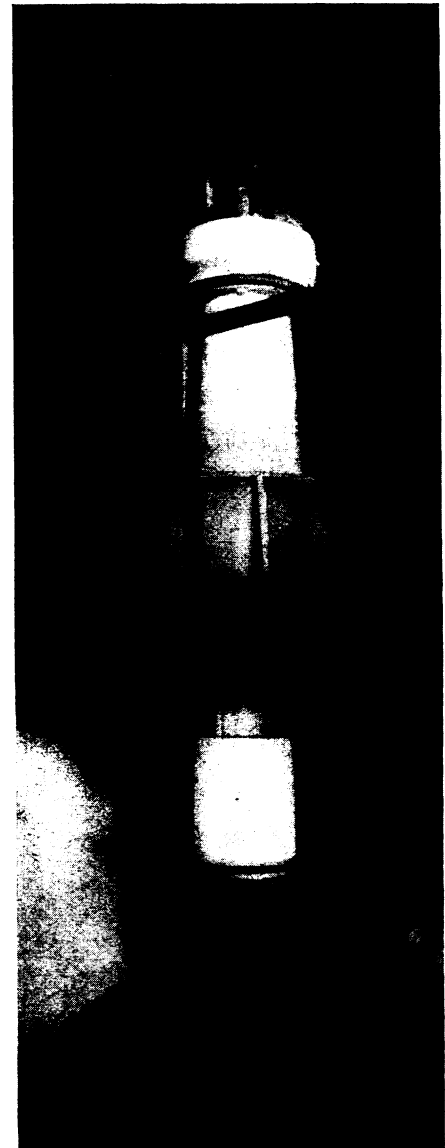
GEOPHYSICS

Earth Gradually Slows Then Speeds Up a Little

▶ FROM 1955 TO 1958 the earth slowed down, but since that time it has speeded up again.

However, the change of rotation speed was so slight that photographic zenith telescopes were needed to determine the time change, Dr. Wm. O. Markowitz of the U.S. Naval Observatory told the Philosophical Society of Washington.

He said the earth slowed down by one-thousandth of a second between 1955 and



ZENITH TELESCOPE—Used for determining standard time in the United States and the time change of the earth's rotation.

1958 and speeded up since then by three-tenths of a thousandth of a second.

Dr. Markowitz said he and Dr. R. Glenn Hall, also of the Naval Observatory, based their findings on comparison of atomic time with time based on the rotation of the earth. He said the changes in the earth's rotation speed occur gradually and not suddenly.

Observations of the moon for the past 300 years have shown that the rate of the earth's rotation varied. However, until the construction a very accurate atomic clock, by the National Physical Laboratory, Teddington, England, in 1955, it was not possible to determine if the changes in speed were sudden or gradual.

Cesium beam atomic oscillators were used to derive atomic time. The frequency of cesium used for the atomic clock is 9,192,631,770 cycles per second.

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