Velocity of the Seismic Waves *Lg* and *Rg* across Australia

AN examination has been made of *Lg* and *Rg* phases recorded over continental paths in Australia. The results which are here presented show some striking agreements with the earlier work of Ewing and Press[1] for North America and of Båth[2] for Eurasia.

The "International Seismological Summary" lists seven Australian earthquakes well recorded overseas, namely, the two Western Australian ones of August 16, 1929, and April 29, 1941, and the five Central Australian ones of December 20, 1937, April 17, 1938, March 26, 1939, May 4, 1941, and June 27, 1941. The epicentres and origin times of these earthquakes were revised using the method of Jeffreys and Bullen[3]; (the shock of March 26, 1939, has previously been discussed[4]).

The Riverview Observatory records of these seven earthquakes and of the Adelaide earthquake[5] of March 1, 1954, were those examined; the records were from Weichert instruments in the case of the first seven, and Galitzin instruments in the last case. The *Lg* phase was found to be recorded in the case of all earthquakes except that of August 16, 1929, a marginal earthquake off the north-west coast. The *Rg* phase was clear only for those of May 4, 1941, and March 1, 1954. (The *Lg* and *Rg* phases were identified in all instances without prior calculation of their expected arrival times.)

The mean *Lg* group velocity was $3\cdot50 \pm 0\cdot08$ km./sec. for seven observations from the vertical component instruments, and $3\cdot50 \pm 0\cdot06$ km./sec. for thirteen observations from the horizontal component instruments. In most cases the *Lg* phase was predominant on the records and its start had been given as an impetus onset in the *Riverview Seismological Bulletin*. Its initial period was 3–6 sec. The mean *Rg* group velocity was $3\cdot03 \pm 0\cdot07$ for three observations.

Press and Ewing, using about forty earthquakes, have given the mean group velocities of *Lg* and *Rg* over North American paths as $3\cdot51 \pm 0\cdot07$ and $3\cdot05 \pm 0\cdot07$ km./sec. respectively. For Eurasia, using about four hundred earthquakes, Båth has found at least two distinct *Lg* group velocities, namely, $3\cdot54 \pm 0\cdot07$ km./sec. and $3\cdot37 \pm 0\cdot04$ km./sec. Båth also found a mean *Rg* group velocity of $3\cdot07 \pm 0\cdot10$ km./sec.

The Australian data do not indicate strongly any separation of the *Lg* phase; only the earthquake of June 27, 1941, showed an *Lg* velocity, namely, 3·38 km./sec., which differed from the mean by more than the standard error. The combined mean Australian *Lg* velocity is $3\cdot50 \pm 0\cdot07$ km./sec., in striking agreement with the North American and Eurasian results. The importance of the present results is that they indicate that *Lg* and *Rg* velocities of order 3·50 and 3·05 km./sec. respectively are fairly world wide.

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[3] *Bur. Centr. Seis. Trav. Sci.*. No. 11 (1935).

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An Attempt to detect Linearly Polarized Radio Emmision from the Galaxy

SEVERAL authors[1,2] have suggested that synchrotron radiation by relativistic electrons in galactic magnetic fields may be responsible for part of the galactic background radiation at radio-frequencies. Radiation so produced is linearly polarized in a direction perpendicular to the magnetic field. The actual polarization observed from an extended region is likely to be reduced due to a number of mechanisms[3,4] which will be discussed elsewhere, but a small percentage might remain. Razin[5] has described an attempt to measure this polarization by a method based on the suggestion that the Faraday effect in interstellar space would make the angular position of the plane of polarization strongly dependent upon frequency. By switching between a wide and a narrow receiver band-width, a change of output was noted which was interpreted as implying the presence of up to 4 per cent of linear polarization in some directions. On present evidence, the magnitude of the galactic magnetic field and of the electron density in interstellar space[4] are thought insufficient for this dependence on frequency to lead to a reliable method of measurement, and a different procedure has been adopted. In the present method, a receiver band-width of 4 Mc./s. has been used, and although in certain circumstances the wider band-width might lead to a reduction of the polarization observed, the sensitivity is much improved, particularly when observing in directions away from the galactic plane.

A 7·5-m. paraboloidal reflector mounted as a transit instrument was used, at a frequency of 159·5 Mc./s.; at the focus, two dipole and reflector systems were mounted with their planes at right angles. This assembly was motor-driven about the axis of symmetry of the aerial system at a speed of one revolution in 27 min. The dipoles were connected to a phase-switching receiver[6] which gives an output proportional to the time average of the product of their voltages. For linearly polarized radiation incident along the axis of the system, correlated voltages appear in the dipoles and an output is produced; randomly polarized radiation along the axis produces uncorrelated voltages and gives no output. As the dipoles rotate, a sinusoidal record is produced, and from the amplitude and phase of this record the magnitude and position angle of any linearly polarized component may be determined. For this type of aerial system, intense randomly polarized radiation from directions off the axis of the aerial does, however, give a small response. Hence when the system is used to examine the galactic background radiation, a spurious apparent polarization may be produced. The magnitude of this effect has been estimated using the sun as source, and the observed effects agree with those estimated.

In order to overcome this difficulty, use has been made of the rotation of the plane of polarization by the Faraday effect in the terrestrial ionosphere, and the initial observations have been made at a declination of 22° N. where the line of sight is parallel to the geomagnetic field. Observations were made throughout the month of February 1957, and the progressive displacement of the solar time of observation of any particular point in the sky results in the observations being made through a progressively varying amount of ionization. This change of total ionization along