higher than the value obtained with the National Physical Laboratory source, indicating that some error can be attributed to the electronics alone, apart from the servo and beam tube. Additional realignment tests were made at the conclusion of the investigation, and the results are included in Table 1.

L. ESSEN
J. V. L. PARRY

National Physical Laboratory,
Teddington, Middlesex,
England.

J. H. HOLLOWAY
W. A. MAINBERGER

The National Company, Inc.,
Malden, Massachusetts,
U.S.A.

F. H. REDER
G. M. R. WINKLER

U.S. Army Signal Engineering Labs.,
Fort Monmouth, U.S.A.
June 5.

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The Annual Pole Tide

THE annual variation in latitude[1] causes a disturbance in the gravitational potential with an amplitude :

$$U = a^2 \Omega^2 m \sin\theta \cos\theta = 880 \sin\theta\cos\theta \text{ cm.}^2 \text{ sec.}^{-2}$$

where a is the radius and Ω the angular velocity of the Earth, and where m is the angular displacement of the pole along the meridian of a station located at co-latitude θ. For the annual term, Jeffreys[1] obtained $m \approx 0{\cdot}084'' = 4{\cdot}07 \times 10^{-7}$ radians, and the numerical value 880 follows from this. In comparison, the equilibrium tide S_a associated with the annual variation of the heliocentric distance has a potential[2] :

$$472(\tfrac{1}{3} - \cos^2\theta)\text{cm.}^2 \text{ sec.}^{-2}$$

The mean square values, $\int_0^{\pi/2} U^2 \sin\theta \, d\theta$, are equal to (321 cm.² sec.⁻²)² for the 'pole tide', and (141 cm.² sec.⁻²)² for the S_a, so that the pole tide is larger. Yet it appears to have been overlooked. This simply means that there is a larger effect from a movement, north or south, by 10 ft. than from a variation by 2 per cent of the Sun's distance.

The annual oceanic pole tide has an amplitude :

$$(1 + k - h)U/g = 0{\cdot}62 \sin\theta\cos\theta \text{ cm.}$$

where $k = 0{\cdot}29$, $h = 0{\cdot}59$ are the Love numbers. This is negligibly small compared to the observed tide, which has amplitude of the order of 10 cm. and is due largely to meteorological factors[3].

The disturbance in gravity due to the bodily pole tide has an amplitude :

$$\Delta g = 2(1 - \tfrac{3}{2}k + h)U/a = 3{\cdot}2 \sin\theta\cos\theta \text{ microgal.}$$

which will be difficult to observe. There is barely a possibility[4] of observing the difference in time kept by a pendulum clock (frequency $\sim \sqrt{g}$) and a quartz crystal clock. This time-difference has an amplitude :

$$\tfrac{1}{2}(\Delta g/g)(T/2\pi) = 0{\cdot}01 \text{ sec.} \sin\theta\cos\theta$$

for $T = 1$ year. The corresponding error in time-keeping for the semi-annual tide is 0·006 sec. at the equator, according to Jeffreys[5].

Thus the annual disturbance in the gravitational potential resulting from the Earth's wobble is small indeed, and worthy of note only because it exceeds the annual solar tide which is included in all text-books on the subject.

WALTER MUNK
RICHARD HAUBRICH

Institute of Geophysics,
University of California,
Los Angeles, California,
and the Scripps Institution of Oceanography,
California. May 12.

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Relative Intensities of the Oxygen Lines at 5577 A. and 6300 A. in the Night Sky

A PATROL spectrograph on loan from the U.S. International Geophysical Year Committee through the Air Force Cambridge Research Center has been operating at Invercargill since August 13, 1957. This spectrograph scans a 165° strip of sky along the spectral line, the strip of sky in this case lying along the geomagnetic meridian. With exposures of the order of four to five hours on the night sky, using film with Kodak 103*a*–*F*(3) emulsion, the spectrograph has recorded the red and green lines of atomic oxygen (6300 A. and 5577 A. of OI). A preliminary analysis of 220 spectra has been carried out for the period August 13–December 31, 1957.

On some nights the 6300 A. line is considerably more intense than the 5577 A. line and on other nights the reverse is true. On many occasions it was observed that the brightness of these lines varied considerably across the sky. The relative intensity was determined by visual inspection of the film. The spectra were divided into three groups : (1) 6300 A. more intense than 5577 A., (2) 6300 A. and 5577 A. of approximately equal intensity, and (3) 6300 A. less intense than 5577 A. Each spectrum was divided into two regions, corresponding to the northern and southern sky, which were treated separately.

The relative intensity of these lines has been correlated with the magnetic K-indices from Amberley and Macquarie Island, these being the nearest magnetic observatories to the north and south of Invercargill respectively. The K-indices were averaged over the period of exposure of each spectrum.

When the relative intensity is correlated with the Macquarie Island K-index, it is found that for K equal to 0 or 1, the 5577 A. line has a high probability of being more intense than the 6300 A. line. When K equals 4 or greater, there is a high probability of the 6300 A. line being the dominant line. The heavy curves in Fig. 1 show the probability of the 5577 A. line (marked G) and the 6300 A. line (marked R) being the dominant line in the southern sky, plotted as a function of the Macquarie Island K-index. The thin curves give similar information about the spectra of the northern sky. It can be seen that there is a consistent tendency for the red to be the dominant line more often in the southern sky than in the northern sky.