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# A possible origin of 26 s microseisms

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ABSTRACT

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The observations by Oliver and Holcomb of 26–27 s microseisms are compared with a rare occurrence of 12–13 s secondary microseisms, implying a swell period of 26 s. Moreover, at the time of each 26 s world-wide microseismic storm, atmospheric lows are centred on the Falklands continental shelf and it is suggested that primary microseisms are set in these shallow oceanic parts.

Microseisms with periods of 27 s were observed on June 6 1961 by Oliver (1962). They were recorded at several stations over the entire Earth. This case remained the only one published until Holcomb (1980) drew attention to a microseismic storm (8–10 June 1977) which had a period of 26 s and which was repeated one week later (15–19 June). It was also recorded globally on high-sensitivity seismographs HGLP, and Martel, with the help of Girardin, confirmed its existence on the WWNSS seismograms of the only European station used by Holcomb (at Kongsberg, Fig. 1).

When studying a Pacific storm, Bernard (1981) encountered on 19 November 1976 at Antofagasta microseisms with a 12.8 s period. Their analysis

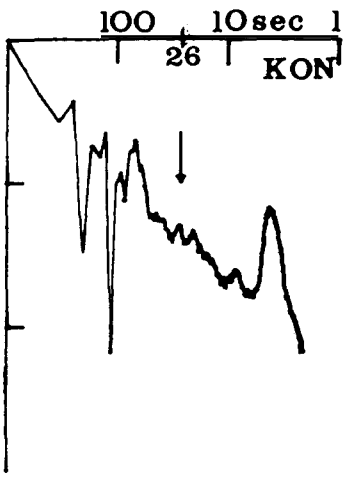


Fig. 1. Microseisms at Kongsberg, 8 June 1977. Log–log scale of the frequency, $f$, converted to period (s) and of the power spectrum smoothed by sliding averaging on intervals of $\Delta f/f = 0.2$.

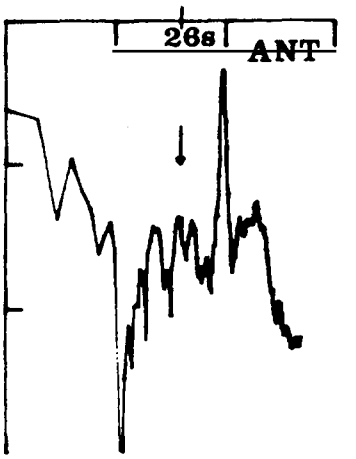


Fig. 2. Microseisms at Antofagasta, 19 November 1976 ($\Delta f/f = 0.4$).

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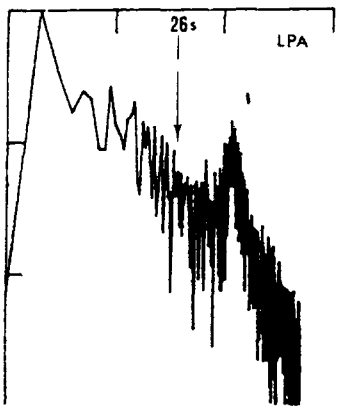


Fig. 3. Microseisms at La Plata, 8 June 1977 (unsmoothed spectrum).

(Fig. 2) gave a wide spectral band of 9–14 s and two points at 20 and 27 s, undoubtedly corresponding to the "primary" microseisms assumed to have the same period as the swell and to originate in shallow waters. ANT microseisms therefore reveal a 27 s swell not visually observed owing to its great period and small height. A parallel with the above phenomenon is therefore obvious.

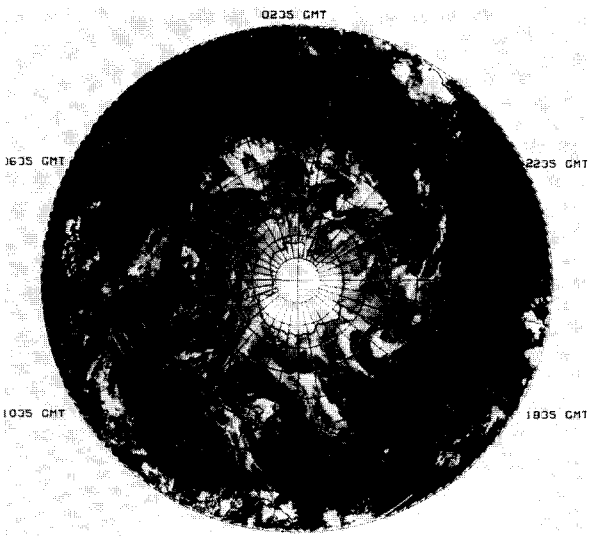


Fig. 4. Southern hemisphere seen from satellite, 8 June 1977. (From Environmental Satellite Imagery, NOAA, Washington, monthly issue.)

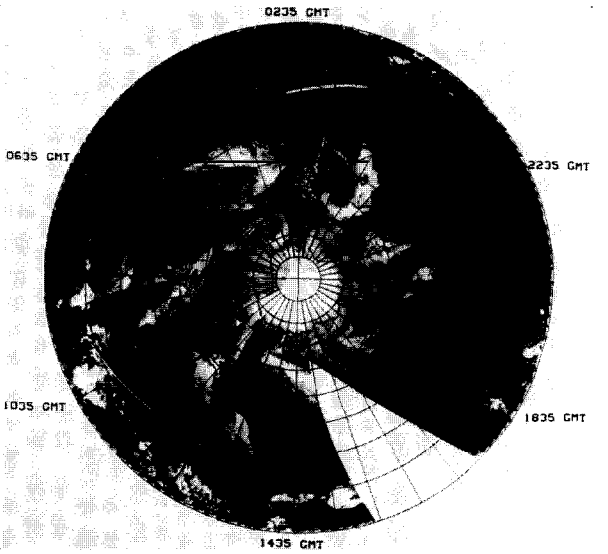


Fig. 5. View of Southern hemisphere, 17 June 1977 (From Environmental Satellite Imagery, NOAA, Washington, monthly issue.)

For 8 June 1977, we also have La Plata seismograms, the analysis of which (Fig. 3) shows a conspicuous storm centred on 8.5 s, a smaller point at 14.3 s, and a group between 24 and 28 s: a likely interpretation suggests a 28 s swell giving rise somewhere to 14 and 28 s microseisms superposed on the 8.5 s greater storm (also observed at Kongsberg).

A meteorological origin of the latter has been searched for on the Satellite Imagery of the Southern Hemisphere and the spiral characteristic of cyclonic disturbances appears at the given date between Argentina and the Falklands (50°S, 60°W). Another low is to be seen at the same place on 17 June (Figs. 4 and 5).

This region offers two particular shapes: (a) a very large continental shelf making it possible for primary microseisms to arise. In the past, similar cases on a lesser scale occurred when atmospheric lows travelled in the Gulf of Lion or south of Sicily and provoked microseisms of unusually long periods registered at the St Michel Observatory and Algiers (Bernard, 1953) A doubling of the microseismic period in Catania was also visible when the low responsible passed over the Tunisian

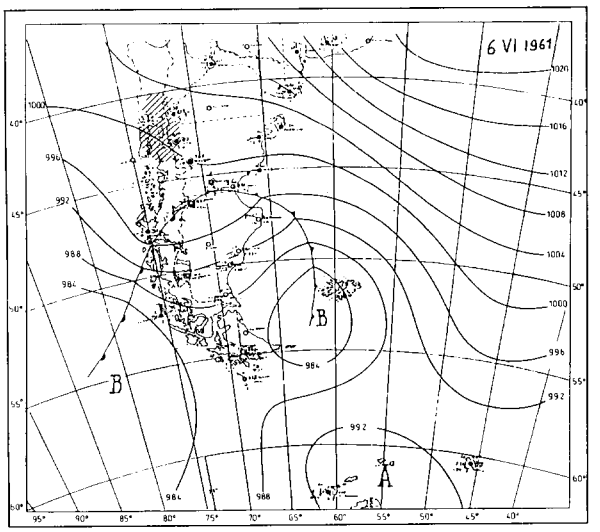


Fig. 6. Isobaric chart for 6 June 1961 at 12 h T.U.

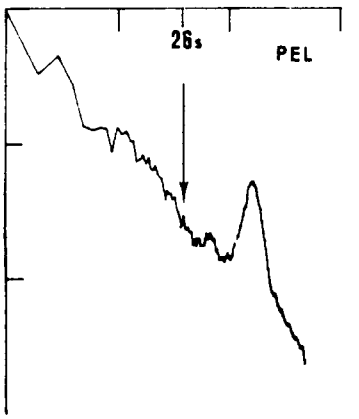


Fig. 7. Microseisms at Peldehue, 3 June 1978 ($\Delta f/f = 0.2$).

shelf (Caloi, 1950). (b) On the other hand, the Patagonian coast has a circular shape, the centre of which is situated west of the Falklands: a focusing of the swell is therefore conceivable just on the shallow continental shelf.

In view of these facts, the meteorological bulletin at the time of Oliver's 1961 observation was searched for: the Carta del Tempo of the Servicio Meteorologico Nacional of Buenos Aires supported our hypothesis: a 984 mb low was centred 53°S, 62°W (Fig. 6). Two days earlier, a more intense trough of 956 mb was further to the east (50°S, 50°W) but it soon disappeared and its wave effect approaching the coast had perhaps grown stronger by the 6 June disturbance.

Holcomb (1980) also reports that a permanent noise of 26 s exists in his records. Indeed, we find it perceptible independently of the 6 s microseisms as a very slight point on a Peldehue (Chile) seismogram of 3 June 1978 (Fig. 7), chosen at random. It would therefore be interesting to observe microseismic disturbances with periods of 20–30 s more frequently and compare their variations with the meteorological conditions.

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