Modern seismic equipment used in the "Project Anna 70" by IPE Hamburg

by

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Summary

The combined reflexion and refraction seismic method, used by the IPE for seismic measurements at sea, is described.

The reflexion seismic work is done with a streamer developed by ourselves of 600 m length, which is connected to a P 11 - seismic recorder manufactured by South-Western-Industrial-Electronic, Houston.

For refraction seismic measurements we use four telemetric buoys with telerepeating device, which are anchored on the profile, and enables measurements at max. distances of 200 km from the vessel.

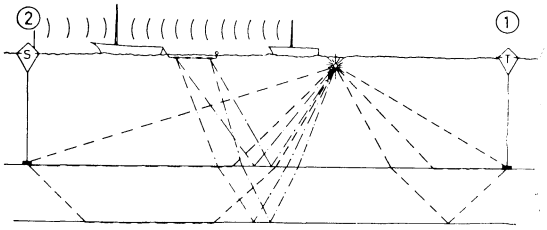

FIG. 1. — Schematic description of measuring method : Synchronous performance of reflexion and refraction seismic

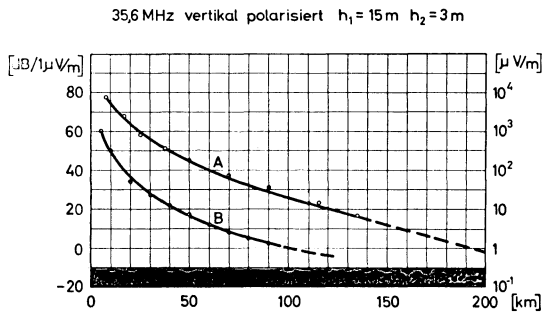

FIG. 2. — Field pattern for radio wave propagation over sea.
A : measured with a Rf-output of 55 watts (Mediterranean Sea 1969).
B : the same Rf-power was put into the antenna, but the radiating characteristics where deformed (Baltic Sea 1969).
The black field shows the sensivity of the receiver by using a $\lambda/2$ dipol antenna for 20 dB quieting.

The telerepeating device in the telemetric buoys allows us to change the gain of the hydrofon-amplifiers in steps. Thus it is possible to make use of the full scale of the dynamic range of the FM-Multiplex-Equipment (MARS, 66) [KEBE, 1971].

An electronic device transmits the information of the amplification of the hydrofon-amplifiers direct to the seismic traces, so that we are able to analyse the amplitudes of the seismic arrivals.

In november 1970 a group of French and German scientists returned from an investigation cruise into the western part of the Mediterranean Sea. The project was called « Anna 1970 » and is described in the paper of Dr. LEENHARDT.

Rapp. Comm. int. Mer Médit., **21**, 11, pp. 945-947, 4 fig. (1973).

While R. RUDLOFF (IPE) discusses in his paper the position of our seismic profiles and the preliminary results, I shall give you a description of the method of our combined reflexion and refraction seismic measurements.

In figure 1* the principle is shown. Both equipments, for reflexion and for refraction methods, are installed on the left vessel drawing the self-built streamer for steep slope reflexion measurements.

The arrivals are registered on the 24 traces of the reflexion-seismic-equipment of the SIE type P 11.

For our refraction measurements we used telemetric buoys with telerepeating devices, which are anchored on the profile. The maximum distance between the buoys and the vessel is mainly given by the range of the telemetric transmitters in the buoys.

The transmitters of our buoys are working with radio-frequencies between 35 Mc and 36 Mc. Their RF-power output of 60 Watts allows distances of up to 200 km from the vessel.

In figure 2* you see the field pattern for radio-wave propagation over sea. Curve B was received in 1969 on the Baltic Sea, when the radiating characteristics of the antenna on the buoy were deformed. The upper curve was measured in the Mediterranean Sea, when the antenna worked well.

Now a few words about data collection and transmission. The seismic arrivals picked up by hydrofon are first passed on by cable to a preamplifier in the buoys. The telerepeating device of our system allows us to change the gain of this amplifier in steps. Thus, it is possible to use the full scale of the dynamic range of the FM-Multiplex-Equipment the amplifier is connected to.

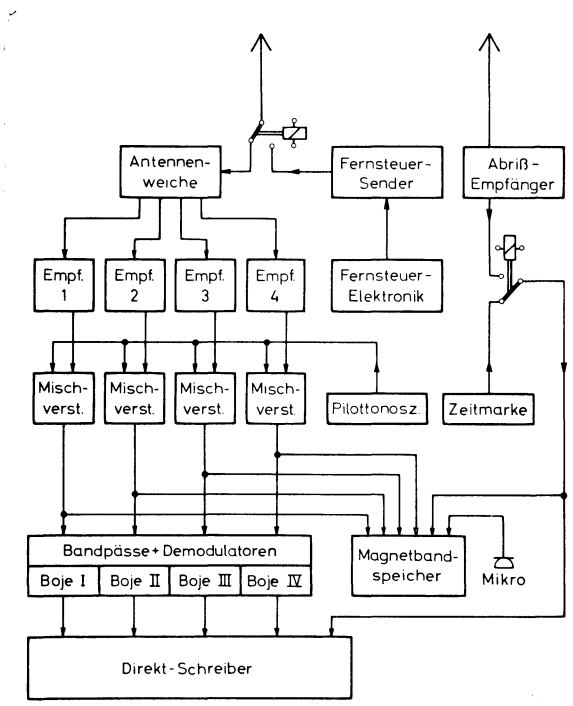

FIG. 3. — Bloc-diagram of the receiving and recording equipment of the telemetric system.

The two channel FM-Multiplex-Equipment we use is the well known MARS 66 made by Lennarts-Elektronik, Tübingen. The frequency-multiplexed signal from this unit is connected to the telemetric transmitter in the buoy. An electronic device gives the information of the amplification of the hydrofon-amplifier directly to the seismic traces. So we are able to analyse the amplitudes of our refraction seismograms.

In figure 3* the bloc-diagram of our receiving and recording equipment, which is installed on the vessel is shown. The received FM-Multiplex signals from the four buoys are fitted to a mixing-amplifier-conversion gain. Here the quartz-stabilised pilot frequency is added for compensation of wow and flutter of the tape recorder, which is used for data collection.

After passing the bandpass filter the signals are also demodulated and switched to a direct recorder for simultaneous representation of the seismic traces.

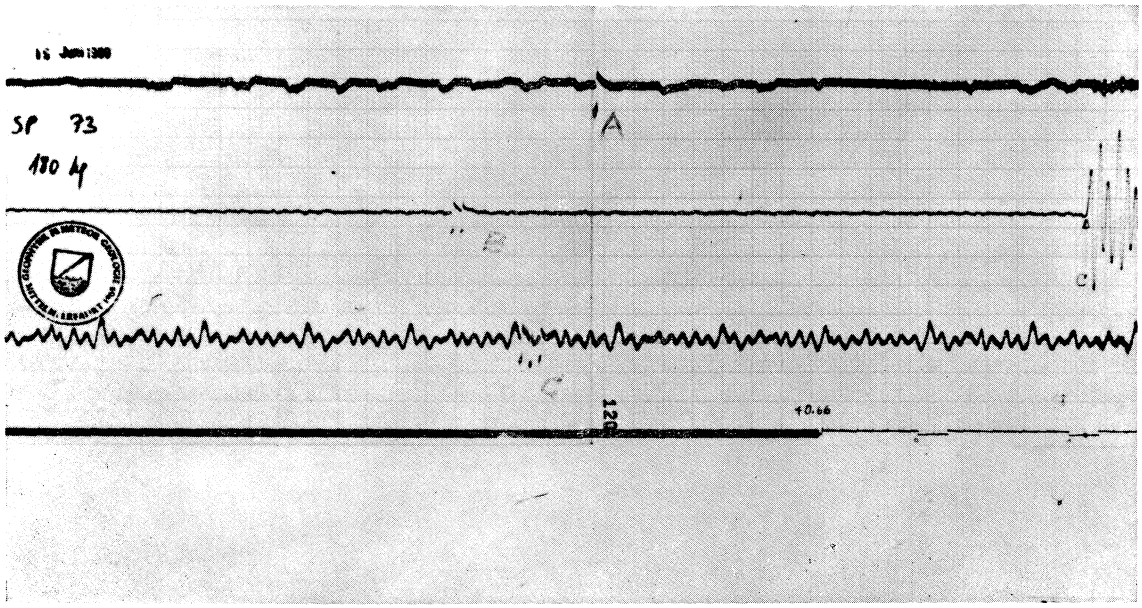

FIG. 4. — Direct-recording obtained with the telemetric system.

The time-break-receiver gives the shot time. The direct-recording shown in figure 4 was obtained in 1969 on the Mediterranean Sea. The pulses (A,B,C) on the upper seismic traces from three buoys represent the information of the amplification of the hydrofon-amplifiers, while the lower trace demonstrate the recording of the time-break and the time-marks.

References

ARIC (K.), HIRSCHLEBER (H.), MENZEL., (H.) & WEIGEL, (W.), 1970. — Über die Struktur der grossen Meteorbank nach seismischen Ergebnissen. — « *Meteor* » *Forschungsergebnisse*, C, **3**, pp. 48-64.

KEBE (H. W.), 1971. — Eine ferngesteuerte Messboje mit Datenspeicherung für refraktionsseismische Untersuchungen auf See. — « *Meteor* » *Forschungsergebnisse*, C, **6**, pp. 14-20.

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