INFORMATION FROM THE SCATTERING PARTS OF LUNAR SEISMOGRAMS; R. Meissner, F. Schildknecht, J. Voss, W. Weinrebe, Institut für Geophysik, Neue Universität, D-2300 Kiel, Germany

Scattering determines the overall structure of lunar seismograms, and in their later parts no clear arrivals of body waves or surface waves can be detected. In this paper we present two attempts to gain information on lunar structure from the scattered parts of the seismograms: i) polarization filtering of the artificial impact recordings which yields indications for a discontinuity in about 300 km depth and ii) statistical methods applied to the last parts of lunar seismograms which result in some verification of the photogeologic observation of the lunar grid system.

Polarization filtering: In order to improve the reliability of the identification of arrivals in the first part of lunar seismograms a polarization filter (1) was applied to records of artificial impacts. This filter enhances rectilinearly polarized and vertical directed motion. Fig. 1 is a record section with the filtered seismograms of artificial impacts. Extremely large amplitudes at nearly all traces, aligned along a hyperbola like curve, indicate a reflection from a depth of about 300 km. This confirms the existence of a discontinuity at that depth which has also been suggested from seismological (2) and petrological (3) reasons.

Statistics within the scattered parts of lunar seismograms: In order to investigate the scattering properties of the subsurface a moving window analysis (4) has been applied to the last part of lunar seismograms. The frequency analysis was used to calculate ellipses of particle motions in the horizontal plane as function of frequency. The lengths of the major axis of those ellipses with an eccentricity of greater than 0.6 have been summed and plotted in polar diagrams. In Fig. 2 two different events, the A_1 moonquake of April 26, 1970, and the meteorite impact of June 4, 1970, recorded by the Apollo 12 seismic station, are plotted together with the local lunar grid system (5). Although the direction to the sources are different, the two groups show a remarkable correlation in the NW (SE) direction. This indicates that the lunar grid system involves some deep reaching lineaments which strongly influence the direction of scattering ellipses. Especially long wavelengths (= low frequencies) seem to be effected by the grid system, and a depth of at least 5 km must be assumed for the lineaments.

SCATTERING IN LUNAR SEISMOGRAMS

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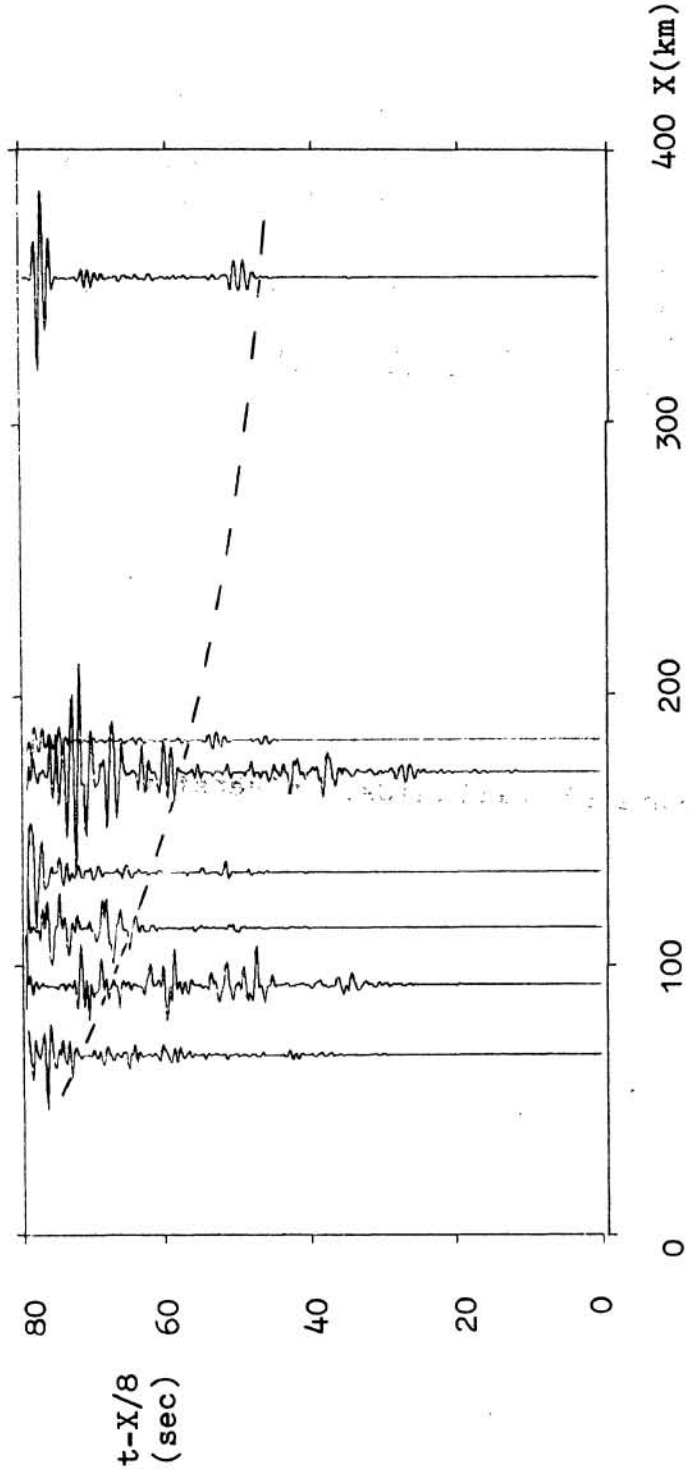

Fig.1: Record section from artificial impacts, obtained by polarization filtering. Traces from left to right: LM14 at 14, LM15 at 15, LM14 at 12, SIVB 13 at 12, SIVB14 at 12, SIVB15 at 14, SIVB15 at 12.

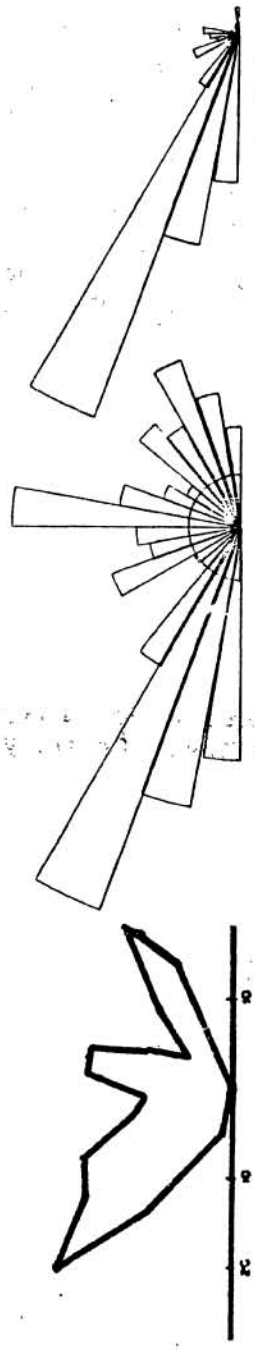

Fig.2: Comparison between i) local lunar grid system at Apollo 12 (5), ii) direction of scattering ellipses of A1 moonquake, and iii) direction of scattering ellipses of meteorite impact.