

INTRODUCTION

In the course of the research project „DFNK-Deutsches Forschungsnetz Naturkatastrophen“ the Institute of Soil Mechanics and Geotechnical Engineering of the University of Berlin performed a microzonation of the Cologne area from an earthquake engineer's perspective. Using three different methods of wave propagation analysis the influence of the

sedimentary cover underneath Cologne on incoming earthquake signals was investigated, elastic acceleration response spectra and transferfunctions determined and compared with the elastic spectra of the new E-DIN 4149. Moreover a comparison of the used methods of propagation analysis was performed..

ANALYSIS

Analysis procedure

- division of the area of Cologne into 8 regions with approximately uniform soil profile → regional map
- determination of geophysical soil parameters using in-situ test results and values from literature
- generation of synthetic earthquakes using the standard events of the E-DIN 4149 (new) for earthquake zones 1 and 2
- statistical calculation of transferfunctions and elastic acceleration response spectra (50% fractile) for all 8 regions
- comparison of the fundamental frequencies in the transferfunctions with in-situ measurements (Parolai et al., 2001)
- comparison and discussion of the spectra with the elastic design spectra of the E-DIN 4149
- comparison of the three methods of analysis (SIMUL, SHAKE91 and 1-Layer-Model)

RESULTS

Region 1: Sedimentdicke $d = 390$ m, Transferfunktionen

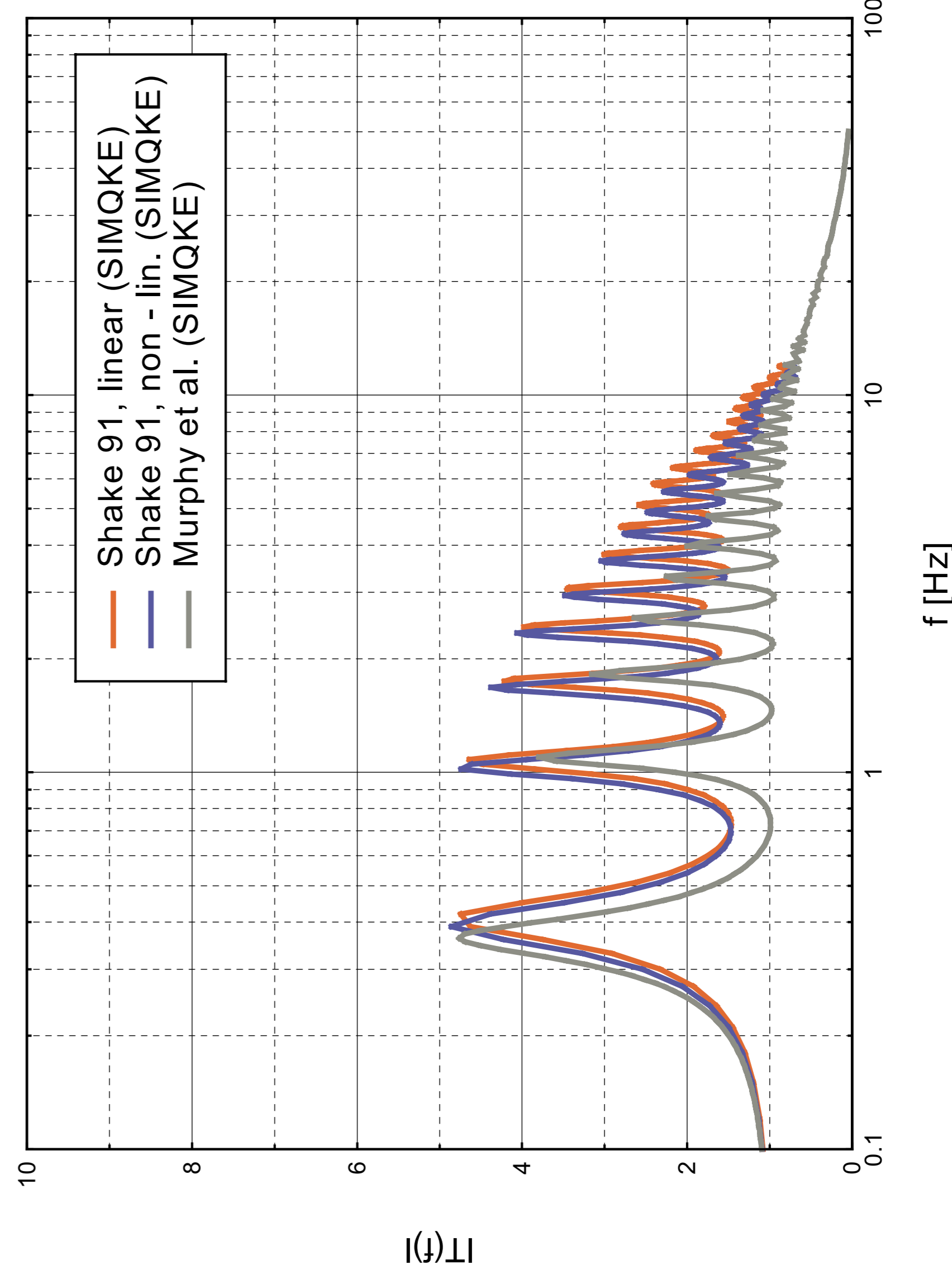


Fig. 1: Typical Transferfunctions

Region 1: Sedimentdicke $d = 390$ m, Resultierende Antwortspektren

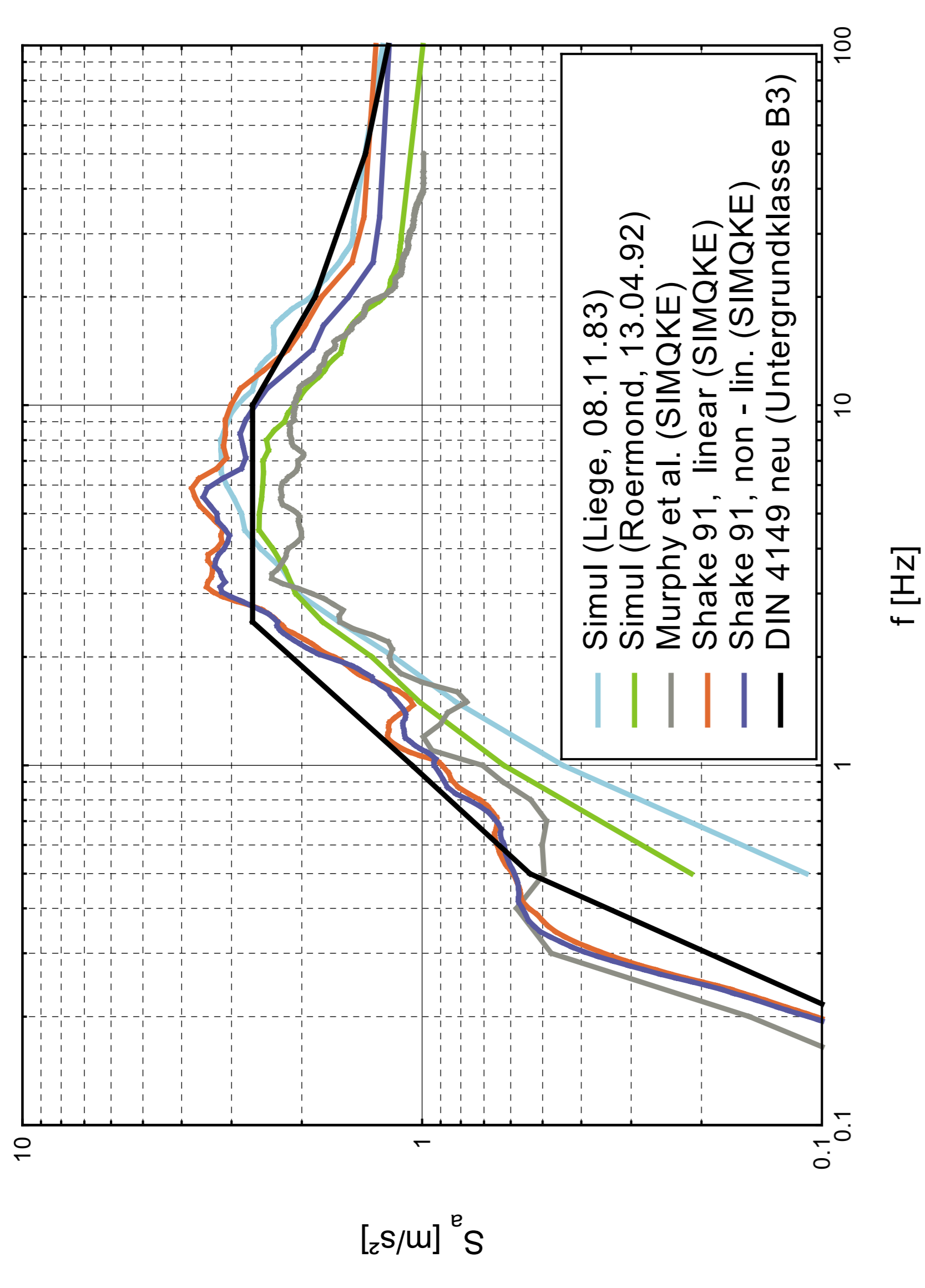


Fig. 2: Typical Response Spectra compared to DIN Spectra

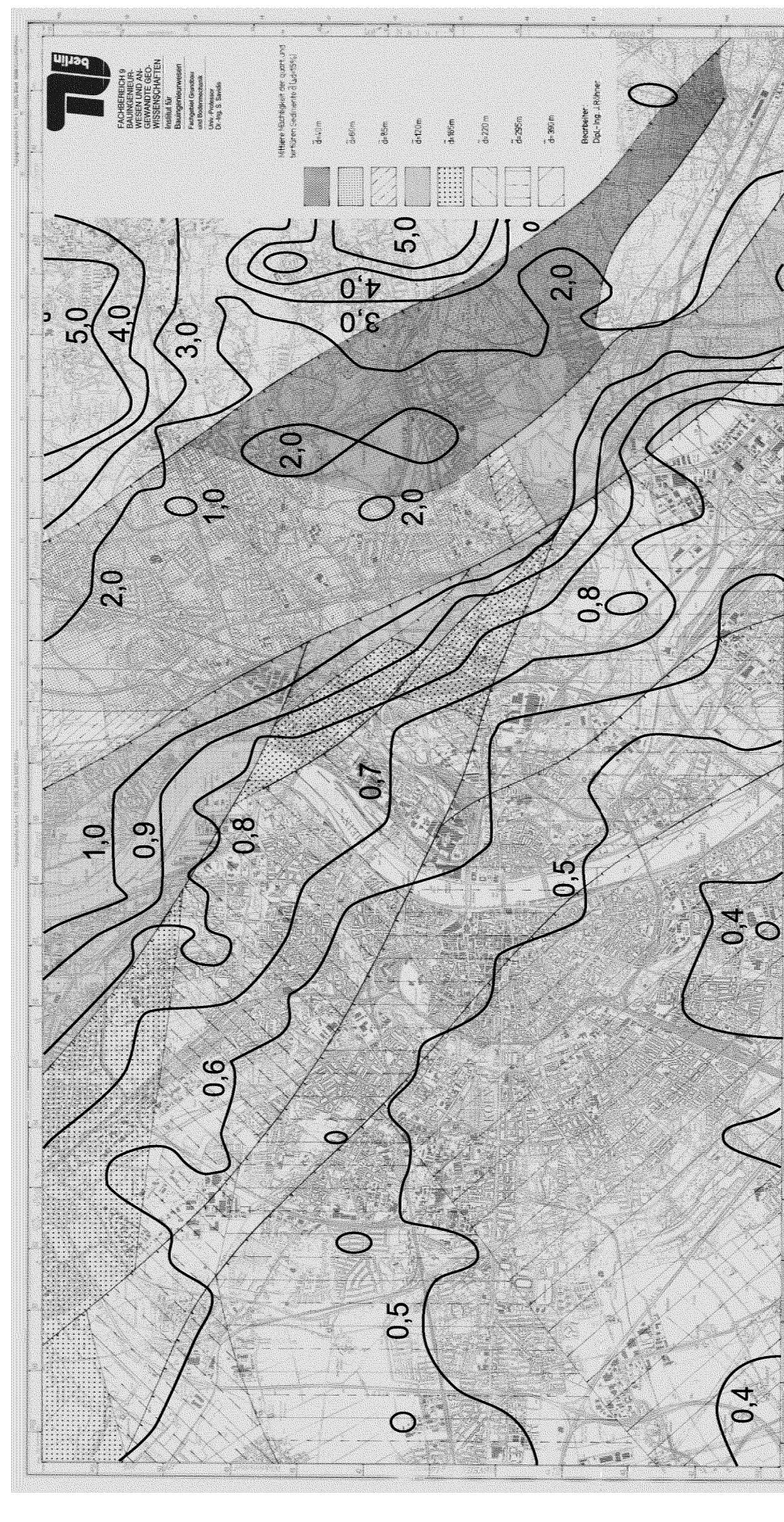


Fig. 3: Division of the Cologne area into 8 regions with approximately uniform soil profile; superimposed are the fundamental ground frequencies measured in-situ by Parolai et al. (Journ. Earthq. Eng., Vol.5, No. 4, 2001)

Earthquakezone 1

Event	Schwäb. Alb, 26. Feb. 1969	Event:	Liege, 8. Nov. 1983
Focal Depth:	$h_0 = 8$ km	Focal Depth:	$h_0 = 6$ km
Moment:	$M_0 = 4.2 \times 10^{15}$ Nm	Moment:	$M_0 = 1.0 \times 10^{16}$ Nm
Stress drop	$\Delta\tau = 1.9 \pm 0.6$ MPa	Stress drop	$\Delta\tau = 2.0 \pm 0.4$ MPa

Event:	Roermond, 13. Apr. 1992
Focal Depth:	$h_0 = 14.6$ km
Moment:	$M_0 = 6.5 \times 10^{16}$ Nm
Stress drop	$\Delta\tau = 3.3 \pm 0.8$ MPa

Sponsor: DFNK

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