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KTUT-GENİŞ BAND DEPREM KAYITÇISININ KONUMU İÇİN GÜRÜLTÜ ANALİZİ VE ZEMİN ÖZELLİKLERİNİN BELİRLENMESİ

DETERMINATION OF GROUND CHARACTERISTICS AND NOISE ANALYSIS FOR LOCATIONS OF KTUT-BROAD BAND EARTHQUAKE RECORDER

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Anahtar Kelimeler: Sismik gürültü (Mikrotremor), Zemin büyütmesi, Nakamura (Y/D) yöntemi

ÖZ KTU kampus alanında bulunan geniş band deprem kayıtçısının (KTUT) konumunun doğruluğunu test etmek için kampus alanı içerisinde değişik noktalarda gürültü seviyeleri belirlenmeye çalışılmıştır. Bu amaçla belirlenen noktalarda ivmeölçer aleti ile gürültü kayıtları (mikrotremor) alınarak, Nakamura yöntemi ile zemin transfer fonksiyonları hesaplanmış ve deprem kayıtları üzerindeki zemin etkileri belirlenmeye çalışılmıştır.

Key Words: Seismic noise (Microtremors), Ground amplification, Nakamura (H/V) method

ABSTRACT *We investigate the seismic noise level at different places in the campus area for testing the accuracy of locations of broad band earthquake recorder (KTUT) placed in the KTU campus. For this purpose, we give some results of ground transfer functions using the Nakamura's method on noise records (microtremors) received by accelerometer at the specified points. We research the ground effects on the earthquake records.*

INTRODUCTION

The subject of this study is to determine the ground characteristics of KTUT-earthquake record station in the KTU campus. The most important characteristic of broad band earthquake recorder is record the data in a wide frequency interval (0.33-50Hz). Aim of the earthquake study is only recorded the seismic waves propagated from the earthquake source. All of the other effects are described as noise. In this study, we took the noise records at different places in KTU campus with microtremors tool and determined ground transfer functions with the Nakamura method and detected the ground structure of KTUT station.

METHOD

Nakamura method is a new method of approach used to determine of ground effect. Source of the seismic noises is Rayleigh waves formed by surface sources. Rayleigh waves are equally influenced by horizontal and vertical movements in a layered medium. The vertical components of noise vibrations aren't influenced from the ground layers according to the Nakamura method (Nakamura, 1989). However, the horizontal components are acquired major amplifications depending on ground layer's low velocity and density. Consequently, the ground transfer function is obtained by divided of the horizontal components spectrum to vertical components spectrum. Nakamura method can be applied easily in the area with low seismic density and without base rock (Dikmen, 2005). Namely, the reference point isn't necessary for this method. The flowing diagram of Nakamura method using at the analysis of seismic noise data is given below (Fig. 1).

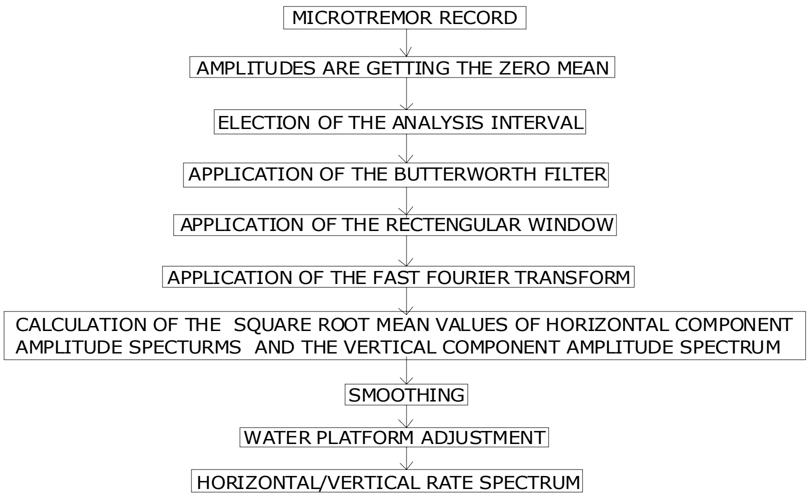
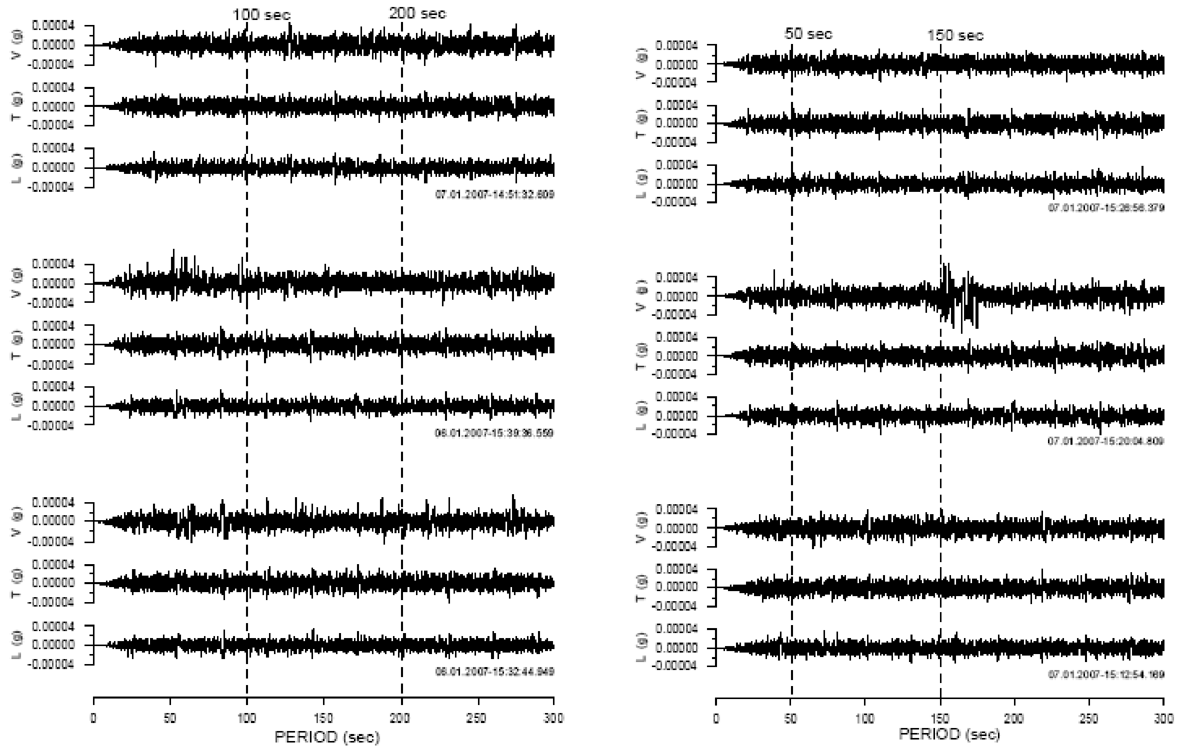


Figure-1 Flow diagram of the Nakamura method (H/V).

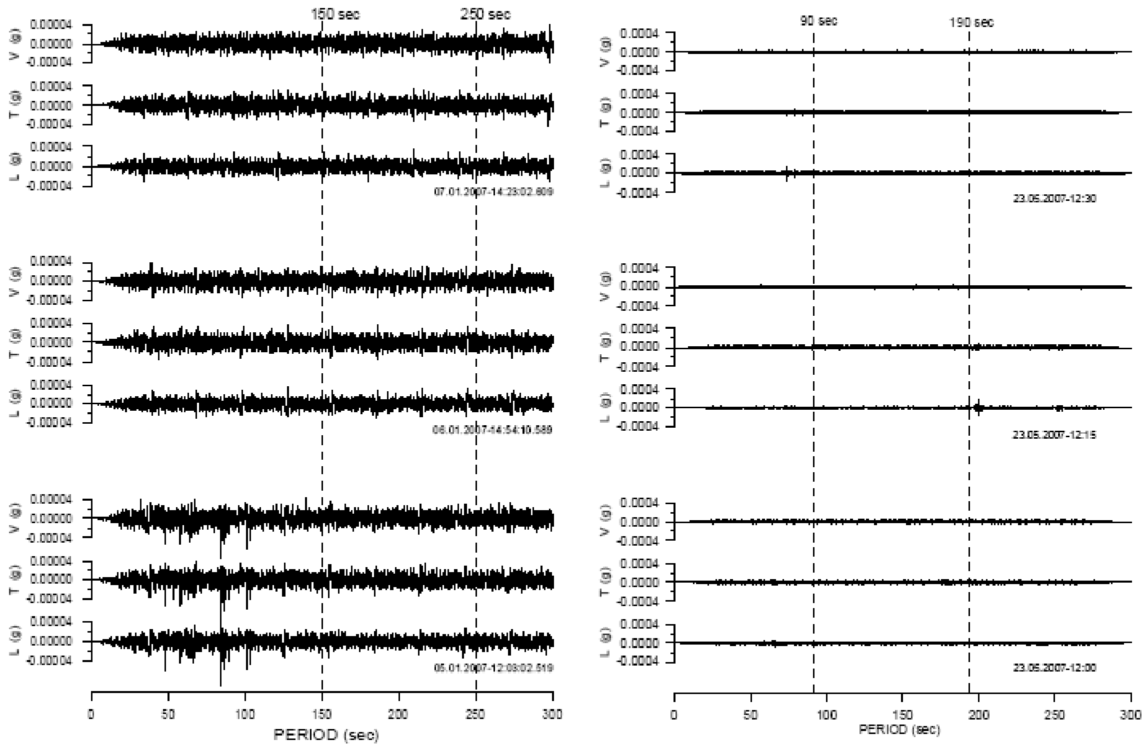
ANALYSIS

In this study, microtremor records have been taken by department of Geophysics (GD), department of foreign languages (FD), KTUT station (KTUT) and coast formation (CF) took place in the KTU campus. These records are three components microtremor records and each one has taken by five minutes with sampling interval of 0.01 sec in different time periods. In the analysis of the microtremor records took from four locations (GD, FD, KTUT and CF), parts of 100 sec of all components consistent with each other and with the low noise level have been used (intervals of 100 sec is shown by dashed lines in Fig. 2 and 3). The results of the Nakamura methods (1989) applied for determine the ground characteristics have been given Figures 4 and 5. Frequencies belonging to the harmonic maximum amplitudes and magnifications in the frequency bands existent of the peaks with 1-2 Hz width have been selected as ground predominant frequencies. The ratio of the square root mean values of horizontal components amplitude spectrums to the vertical component spectrums has also been given ground magnifications. Thickness and sorts of layers in the measurement locations have been determined (Table 1).



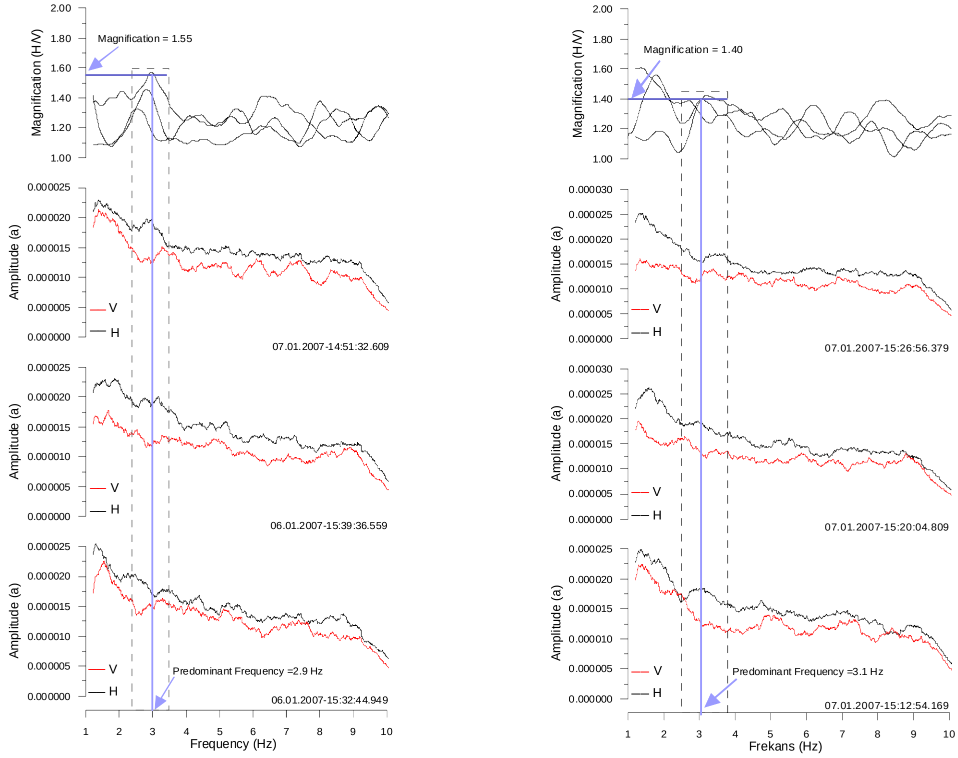
(a) (b)

Figure-2 Three component microtremor records; a) department of Geophysics (GD), b) department of foreign languages (FD). L: longitudinally, T: transverse, V: vertical



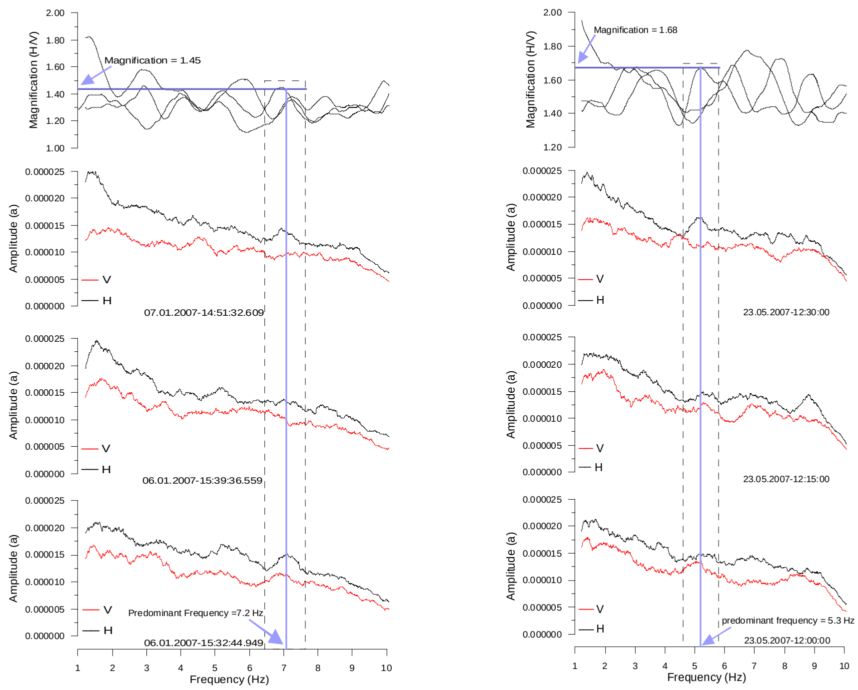
(a) (b)

Figure-3 Three component microtremor records; a) KTUT station (KTUT), b) coast formation (CF). L: longitudinally, T: transverse, V: vertical



(a) (b)

Figure-4 Analysis of three component microtremor records by the Nakamura method. a) for GD locations, b) for FD locations. V, vertical component; H, square root mean values of horizontal components amplitude spectrums.



(a) (b)

Figure-5 Analysis of three component microtremor records by the Nakamura method. a) for KTUT locations, b) for CF locations. V, vertical component; H, square root mean values of horizontal component amplitude spectrums.

Table-1. The results of the analysis in locations (GD,FD,KTUT,CF).

Locations Symbol	Ground Predominant Frequency (Hz)	Ground Magnification	Cover Layer Thickness (m)	Sort of Ground (Kanai, 1983)
GD	2.9	1.55	22	II
FD	3.1	1.40	20	“
KTUT	7.2	1.45	6.2	“
CF	5.3	1.68	9.5	“

II: alluvial layer with 5 meters or thicker including sandy gravel and sandy hard clay and like materials.

CONCLUSIONS

According to the analysis of the three components microtremor records took from four different locations (GD, FD, KTUT and CF), it can be denoted that the noise levels with broad band at KTUT locations is lower than the others and KTUT locations is acceptable for earthquake record station. The thicknesses of cover layers in the measurement points have been approximately estimated with the relation of $H=96/(f^{1.388})$ founded for the soft ground by Lower Rhine Embayment (Karabulut, 2005). f symbol in this relation is ground predominant frequency. The cover layer near the locations of KTUT with great predominant frequency of 7.2 Hz and the low magnification value of 1.45 is denote the hardy ground character having natural clay structure in comparing with the other locations.

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