SITE RESPONSE TO EARTHQUAKES, WITH REFERENCE TO THE APPLICATION OF MICROTREMOR MEASUREMENTS

Thesis presented for the degree of

Doctor of Philosophy

- at the -

School of Engineering

University of Auckland

- by -

IAN M. PARTON, B.E. Hons. (Civil)

May, 1972

TABLE OF CONTENTS

CORRIGENDUM

Page	Correction
4	for Everson read Evison
6	Eqtn 2.19b, L.H.S. to read $\rho \frac{\partial^2 \psi}{\partial t^2}$
11	Col. 2 para. 3 line 2, for km read m
14	Second term of eqtn 3.4 to read $b_j e^{i(\omega t - k_j z_j)}$
16	Col. 2 para. 3 line 12, for eqtn 2.18 and 2.19 read 2.20 and 2.21.
20	Col. 2 last para line 9, for moment read movement
33	Col. 2 line 9, for Tamaki read Yamahara
38	Col. 2 para 2 line 9, for nett read net
48	Eqtn 6.23, for $d\tau$ read df
49	Col. 2 para 2 line 4, read as '...could have arisen from'
57	Col. 2 para 2, for plastocene read pleistocene
82	Fig. 8.1, for G read μ
86	Col. 2 para 3 line 2, delete 'from'
92	Interchange titles for Figs VI and VII.
97	Eqtn 8.32, to read $\dot{\theta} = \omega\theta_m \cos\omega t$
97	Eqtns 8.35 and 8.36 T_o should read T_o^2
98	Line preceding eqtn 8.39, for equation 8.3 read 8.38
109	Eqtn 8.46, R.H.S. to read $\frac{5}{9} + \frac{5Dr}{900}$
123	Table 9.1 read M7.1 for El Centro
136	Col. 1 para 2 line 6, for 'T_o has' read 'T_o is'
180	Yamahara H. (1970) ref. should read Vol. 18, No. 1, March.

NOTATION

A	displacement ratio
C	wave group velocity, damping matrix, auto-covariance
C_o	variance
D	diameter
E	energy, strain deviator tensor, Youngs modulus
F	frequency ratio
H	thickness of soil layer, transfer function
I	polar moment of inertia
J	compliance, mass moment of inertia
K	stiffness matrix, constant term
L	length
M	earthquake magnitude, mass matrix
MM	earthquake intensity
P	principal stress, compression waves, spectral density
R	load vector, radius
S	shear waves
T	period, time, torque
U	displacement
W	strain energy, power
X	displacement vector, body force
a	wave propagation constant
b	wave propagation constant
c	wave celerity, damping coefficient
c_c	critical damping coefficient
c_{eq}	equivalent viscous damping coefficient
d	diameter
f	frequency, force, shear stress, constant term
g	acceleration of gravity
h	transfer function, radial clearance, constant term
k	bulk modulus, wave propagation constant, stiffness
m	mass, gradient
p	pressure, stress
q	constant term
t	time
u	displacement
$\dot{u}$	velocity
$\ddot{u}$	acceleration
x	coordinate direction
y	coordinate direction
z	coordinate direction
α	compression wave velocity, impedance ratio, damping constant,
β	shear wave velocity, damping constant,
γ	unit weight, shear strain
ε	strain tensor
η	viscosity
θ	dilatation, rotation, angular displacement
κ	wave number
λ	wavelength, damping factor
λ_{eq}	equivalent viscous damping factor
μ	shear modulus
ν	Poisson's ratio
ξ	viscosity
ρ	mass density
τ	lag
ϕ	scalar quantity, phase angle, autocorrelation function
ψ	vector potential
ω	rotation, angular frequency

ACKNOWLEDGEMENTS

The work described in this thesis was carried out at the University of Auckland, School of Engineering, under the supervision of Associate Professor P.W. Taylor. The author expresses his appreciation to Associate Professor Taylor for his unfailing enthusiasm, encouragement and advice. The author also wishes to thank the following, whose assistance is appreciated.

Dr. G.R. Martin who supervised the work while Associate Professor Taylor was on sabbatical leave.

My wife for her patience and understanding during the course of this work.

Mrs. G. Margetts for her care and thoroughness in setting out and typing the text.

Mr. E. Fleming and the Workshop staff for their excellent work in constructing equipment.

Messrs. G. Duske, R.F. Bowen, R.R. Rutledge, C. Collins for the various parts they have played.

Professor H.A. Whale, Director of the Radio Research Centre of Auckland University, for the help and advice given during the course of this study.