

Preface

This first report to the sponsors of the Stanford Exploration

Project covers our research from September, 1973 to March, 1974. It

is a progress report so in most cases it does not represent completed

work. I have also included some interesting but unpublished research

results of work done previous to the present period of sponsorship.

In this category is the research I did on sabbatical leave last year

at Princeton University and at Sydney University, part of the work

by John Burg, Don Funkhouser's M.S. report, and some of Professor

Madden's research on permeability and conductivity of rocks.

Jon F. Claerbout Stanford, 18 March 1974

Table of Contents

Page No.	Background Material	
1	2-D Inhomogeneous Media Wave Calculations	Claerbout
8	A Tutorial on Monochromatic Waves	Estevez
41	Approximations to the Wave Propagation Transfer Function	Schultz
60	A Benchmark Program for Migration/Diffraction	Riley
73	Two Techniques for Wave Equation Migration	Claerbout
82	First Problem for Post-Doc	Claerbout
	Diffracting Multiple Reflections	
83	Noah's Method of Deconvolution by Flooding	Claerbout
89	One Dimensional Noah's Deconvolution	Riley
100	Calculation of Diffracted Multiple Reflections	Claerbout and Riley
106	Computing Diffracted Multiples	Riley and Claerbout
126	Preliminary Results on Diffracted Multiple Modelling and Removal	Riley
	Multifold Coverage and Velocity Estimation	
136	Separate Downward Continuation of Shots and Receivers	Doherty and Claerbout
141	Transformations and Migration Equations	Doherty
157	Reconciliation of Various Downward Continuation Equations	Doherty and Claerbout
160	Velocity Analysis Based on the Wave Equation	Doherty and Claerbout
179	Some Speculative Ideas on Velocity Estimation	Claerbout

Page No.	Electromagnetics and Inversion Techniques	
189	Extrapolation of Magnetotelluric Fields	Brune and Claerbout
229	Conductivity of Porosity Relationship in Rocks	Madden
256	Curve Fitting in Geophysical Inverse Problems	Claerbout
263	Impedance Estimation	Claerbout and Madden
272	L Norm Program and Test Case	Claerbout
	Slant Frames	
279	Slant Frames	Claerbout
283	Imaging With Refraction Seismograms	Claerbout
287	Dispersion Relationship for the Slant Frames Approximation	Estevez and Schultz
	Filters and Layered Media	
296	Filters and Layered Media Predictive Deconvolution Implies the Earthquake Geometry	Riley
296 304	Predictive Deconvolution Implies the Earthquake	Riley Burg
	Predictive Deconvolution Implies the Earthquake Geometry General Principles for Estimation of Covariance	•
304	Predictive Deconvolution Implies the Earthquake Geometry General Principles for Estimation of Covariance Matrices Recommendations Concerning Maximum Entropy	Burg Burg Burg
304 318	Predictive Deconvolution Implies the Earthquake Geometry General Principles for Estimation of Covariance Matrices Recommendations Concerning Maximum Entropy Spectral Estimation An Algorithm for Obtaining the Correlation Functions	Burg Burg Burg
304 318 327	Predictive Deconvolution Implies the Earthquake Geometry General Principles for Estimation of Covariance Matrices Recommendations Concerning Maximum Entropy Spectral Estimation An Algorithm for Obtaining the Correlation Functions Between Forward and Backward Prediction Error Filte Appendix A Wave Propagation on the Surface of	Burg Burg Burg ers
304 318 327 337	Predictive Deconvolution Implies the Earthquake Geometry General Principles for Estimation of Covariance Matrices Recommendations Concerning Maximum Entropy Spectral Estimation An Algorithm for Obtaining the Correlation Functions Between Forward and Backward Prediction Error Filte Appendix A Wave Propagation on the Surface of a Sphere	Burg Burg Burg ers Funkhouser