3-D Seismic Imaging

Geophysics 280 – MWF 1:30 – 2:20

3 units with labs: 50% quizzes, 50% labs – Grade only S/NC
2 units without labs: 100% quizzes – Grade only S/NC

Instructor: Biondo Biondi – biondo@stanford.edu
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Lecture Schedule

4/6 Introduction

Watch videos: 3DCube+Tutorial.mp4 and 5Ddata-Image.mp4

4/8 3D Geometries (Chapter 1)

4/10 Sep3D software (Appendix A)

Lab 1: Introduction to 3D Geometries - released

4/13 Kirchhoff prestack migration (Chapter 2)

4/15 Kirchhoff prestack migration (isotropy vs. anisotropy) (Chapter 2 + Notes: Aniso-Kir.pdf)

4/17 NMO+DMO+AMO and prestack partial migration (Chapter 3)

Lab 2: Handling seismic data and Normal MoveOut - released

4/20 Wavefield-continuation migration (Chapter 4)

Lab 1 due 5:00pm

4/22 Common image gathers in offsets and angles (Chapter 6)

Watch videos: Tutorial-5DCube.mp4 and 5DImages.mp4

4/24 Common image gathers in offsets and angles (Chapter 6)

4/27 Numerical methods for wavefield-continuation – two-way wave equation (Notes)

Lab 2 due 5:00 pm

4/29 Numerical methods for wavefield-continuation – one-way wave equation (Chapter 5)

5/1 Definition of waveform inversion – migration as adjoint of linearized modeling (Notes)

Lab 3: Depth Imaging using Reverse Time Migration - released

5/4 Linearized waveform inversion – phase encoding in migration and inversion (Notes)

5/6 Imaging and aliasing (Chapter 8)

5/8 Imaging and irregular geometries (Chapter 9)

5/11 Imaging and irregular illumination + linearized Inversion (Chapter 9 + Notes)

Lab 3 due 5:00 pm

5/13 Stacking velocity, Dix inversion, and traveltime tomography (Chapter 10)

5/15 Inversion of stacking velocities (Chapter 10) and time migration velocity analysis (Chapter 11)

Lab 4: Seismic Illumination and Imaging through Inversion - released

5/18 Vertical and tomographic velocity updating (Chapter 11)

5/20 Tomographic velocity updating (Chapter 11)

5/22 Tomographic velocity updating (Chapter 11)

5/25 Memorial Day, No class

Lab 4 due 5:00 pm

5/27 Full waveform inversion (FWI) (Notes)

5/29 Full waveform inversion (FWI) (Notes)

Lab 5: Full waveform toolbox- released

6/1 Migration velocity analysis by wavefield-continuation (Notes)

6/3 Migration velocity analysis by wavefield-continuation (Notes)

6/5 Tomographic Full waveform inversion (TFWI) (Notes)

6/8 Full waveform inversion with Model Extension (FWIME) (Notes)

6/10 Reviews and Q&A

Lab 5 due 5:00 pm