Seismic data acquisition and processing pdf

1. n. [Geophysics] Generation and recording of seismic data. Acquisition includes a variety of receiver configurations, including laying geophones or seismometers on the surface of the Earth or seabed, towing hydrophones behind a marine seismic ship, suspending hydrophones vertically in the sea, or placing geophones in a wellbore (like a vertical seismic profile) to capture the seismic signal. The source, such as a vibrator unit, dynamite shot, or an air gun, generates acoustic or flexible vibrations that travel through the Earth, pass through layers of different seismic responses and filtration effects, and returns to the surface to be recorded as seismic data. Optimal procurement varies depending on local conditions and includes the use of the appropriate source (type and intensity), optimal configuration of receivers and direction of receiver lines relative to geological characteristics. This ensures that the highest signal-to-noise ratio can be recorded, the resolution is adequate and foreign effects such as air waves, soil reeds, multiples and diffractions can be minimised or distinguished and removed by processing. Synonyms: acquisition See common midpoint method, explosive seismic data, collect, geofone, hydrophone, shotpoint Go to table of contents The (artificial) production of seismic signals on land (on the surface or buried) or in water, receiving signals after transit through the interior of the earth, and (digital) recording for later analysis. Analysis of recorded seismic signals to filter (reduce/eliminate) unwanted components (noise) and create an image of the subsurface surface to allow geological interpretation, and finally to estimate the subsurface distribution (inversion) of material properties. Reflection seismic similar to the echo-in-the-well experiment, it involves calculating the depth of the geological boundary of the two-way travel time (TWT) for the seismic signal and speed. Seismic data collection and processing primarily seeks to achieve the image of sediment basins inside the Earth using waves generated by artificial earthquakes. These images can then be used to identify locations ... This is a preview of subscription content, sign in to check access. Aki, K., and Richards, P.G., 2002. Quantitative Siusiology, 2. Sausalito: University Science Books.Google ScholarBackus, M., 1959. Water echoes – nature and elimination. Geophysics, 24(2), 233-261.Google ScientistClaerbout, J.F., 1968. Synthesis of a layered medium from the acoustic transmission response. Geophysics, 33, 264.Google ScientistClaerbout, J.F., 1985a. Basics of geophysical data processing. Oxford: Blackwell. URL: J.F., 1985b. I'm training the inside of the Earth. Oxford: Blackwell. 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URL: G.J., 3-D 2002 seismic survey design. Tulsa: Society of Exploration Geophysicists.Google ScholarYilmaz, O., 2001. Seismic data analysis, processing, inversion and interpretation of seismic data, 2nd edn. Tulsa: Society exploring geophysicist. Studies geophysics, Vol. 1.Google Scientist© Springer Science + Business Media B.V. 2011Kabir Roy ChowdhuryEmail author1. Department of Earth SciencesUtrechtI UniversityUtrechtA Dutch Day 1Modul 1 – IntroductionTargets - How seismic data helps today's E&T; P - 2D vs 3D - Interpretation of seismic data - Size of operations - Questions & ConcernsModul 2 - Basic concepts of seismic surveyWhich makes a seismic trace for tracking - Body - Surface waves - Reflection and refraction - Basics of seismic drive and image or stacked traces - Stacking DiagramsModul 3 - Seismic wave propagation Wave Propagation Principles - Wave types physical - Huygens Huygens - Refractions and diffractions - Seismic speeds - Reflection amplitude, transformed waves and AVOModule 4 - Signal AnalysisWaves in time and space, frequency and wave count, Fourier analysis - Aliasing spatial and temporal - FK transformation - Evolution - Cross & Auto correlation. Day 2Module - Seismic Reflection PrinciplesSchemical WaveForms and Trace Properties - Polarity - Vertical Resolution - Lateral Resolution - Tuning - Amplitude EffectsModul 6 - Types of Seismic Data Collection - Sea, Land, Transition, Ocean Bottom, TimeLapse - Signal and Noise - Field Array Design - Alternatives to Arrays - Common Causes of FailureModule 7 - Marine Purchasing Systems and OperationsComp together Layout - Traction Technology - Sources - Receivers - Advantages of One Sensor Recording - Streamer Positioning - Narrow, Wide & Multi Azimut - Over Under / DISCover - Oblique Cables - Gradient Measurements - Ocean Bottom Recording - Concurrent Sources - Quality AssuranceModule 8- Land Acquisition Systems and OperationsSources - Sensors - Positioning - Recording the Data - Arrays or Single Sensor Recording - Full Azimuth Recording - Concurrent sources - Industry Trends Quality AssuranceDay 3Module 9 - Causes of distortions - seismic data - long and short wavelength statics - Surface consistency - Correction methods - Identification of defectsModul 1 0 - Wavelets and Wavelet ShapingReasons why Wavelet is needed to shape - Types of wavelets - Zero & Minimum Phase- Types of Deconvolution - Decon.'s place in the order - Examples.Module 11 - RegularizationIt is necessary that regularization - Types of methods used - Warnings - ExamplesModul 12 - Noise attenuation Noise types - Noise removal methods - Organized noise - Radon transformations - Seismic interference - Random noise - ExamplesModul 13 - Multiple dampingWhat are the multiples? - Types of several - Classifications and examples of removal methodsMore (different) Radon transforms - Data ExamplesDay 4Module 14 Speed analysis time processing speed - NMO section - Speed analysis techniques - Potential pitfallsModul 15 - Velocity Model BuildingImportance speed - Types of Model geometries - Tomography - Velocity model construction techniques - Diving Wave, Topographical, complex salt, full waveform inversion, Multi AzimuthModule 16 Imaging Differences in time and depth imaging - Limitations of Post stack imaging - Current imaging techniques - Strengths and weaknesses - Examples - Probably future trendsModul 17 Imaging anisotropyWhat is anisotropy? - How to cause - Thomsen parameters - Different types of anisotropy - Rule of thumb - ExamplesDay 5Module 18 - Survey DesignSurvey objectives - Geophysical & processing considerations - 3D surveying - CMP distribution - Binning - Critical survey parameters - Calculation of their values - Survey size calculations - Migration openings - Objects and and An Overview of the Learning Activity Mix