

Seismic in Survey Education

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Recessionary effects

- John Westwood's talk from IECO 2009
 - Clear dependence upon continued oil and gas
 - Evidence of temporary reductions in exploration
 - Expectation of return to recent levels
 - Clear need for major investment over thirty years



Demographics

- Andrea Windsor-Collins
 - Statistics applicable only to consultancy ...
 - Only 10% of marine and land seismic personnel under 40



UK land and hydro courses

- Plymouth
- London
- Nottingham
- Newcastle



Seismic exploration in context, i

- Geodesy
 - UK, European, Global examples
 - Metric, Footric
- GPS
 - Stand-alone, Differential, RTK, PPK
 - WAAS, EGNOS, MSAS
 - Glonass, Galileo, Compass



Seismic exploration in context, ii

- Water, seawater parameters
 - Physics, chemistry, sound, light
- Acoustics
 - Transmission characteristics, ranging
- Geology
- Electronics



Seismic exploration in context, iii

- Survey planning, the exploration and production cycle
- Health and safety
- Costing, tendering, qc, qa
- ... and so to seismic vessels, planning, navigating



Offshore and land seismics

- Plymouth
 - Offshore seismic industry dominates our teaching
 - Land survey intrinsic to our introductory teaching and revised later in the course
 - If fieldwork occurs at all, it is with a borrowed sub-bottom profiler in waters from 10 to 40 metres deep



External influences

- FIG/IHO/ICA joint syllabus



E6.3 Marine geology and geophysics, i

Marine geology:

- Seabed samplers: grabs, corers and dredges
- Rock types and structure of the Earth

Geomorphology:

- Geomorphological structures and processes
- Effects on seabed topography, especially the continental shelf



E6.3 Marine geology and geophysics, ii

Earth's magnetic field:

- Magnetic field terms. Geomagnetic surveys and the use of magnetometers. Correction by observatory records. Define polar reversals and anomalies.

Earth's internal structure:

- Gravimetric terms. Gravity surveys. Gravimeters and the application of Eötvös correction



E6.3 Marine geology and geophysics, iii

Seismic profiling

- Continuous reflection/refraction seismic profiling
- Equipment: sound sources, receivers and recorders

Geotechnical sampling:

- The objective of geotechnical sampling
- Equipment
- Sampling, storage, analysis

Deposition and erosion:

- Seabed material. Sediment transport and deposition, ...



Option 3: Offshore geophysical surveying, i

O3.1 Geomagnetic surveys

- Geomagnetic surveys principles; distinguish different aerial survey techniques and applications. Use magnetometer

O3.2 Gravity surveys

- Gravity surveys and operations, both offshore and onshore. Fundamentals of a gravimeter

O3.3 Digital seismic techniques

- Reflection, refraction, multiple fold profiling, 2D, 3D, high resolution shallow seismic, navigation processing for 3D seismic, integrated seismic network solutions, Kalman filtering. Specify and Plan Seismic Surveys



Option 3: Offshore geophysical surveying, ii

O3.4 Digital seismic data acquisition

- Acoustic sources, streamers, resolution, penetration, depth of tow, tail buoys and equipment tests for specific applications. Appropriate equipment for seismic data acquisition

O3.5 Digital seismic data processing

- Basic techniques: stacking, migration, normal moveout, interpretation (conventional and computer-assisted) techniques to identify anomalies

O3.6 Analogue equipment

- Profilers: boomers, sparkers and chirp systems. Frequency and wavelength wrt resolution and penetration. Equipment for towing, launch and recovery. Coverage and penetration of systems and select equipment for appropriate applications



External influences

- IHO syllabus
- IMCA



IMCA Requirements, 2008

- Health, Safety and Environment
- Bathymetry
- Geology and Geophysics
- Computations
- Acoustics
- Land and Engineering Survey
- Data Management and Presentation
- Data bases
- Technical Report Writing
- Geodesy
- Oceanography
- Mathematics
- Surface Positioning
- **Marine Survey Industry**
- IT Skills
- Project Management



Marine Survey Industry

- Oil and gas industry
- Telecommunications industry
- Nautical/navigational charting
- Marine survey and exploration
- Seismic industry and techniques
- Offshore vessel types
- ROVs and AUVs
- Dredgers and rock dumpers



External influences

- IHO syllabus
- IMCA
- IMarEST
- RICS
- CICES
- The Hydrographic Society



Plymouth

- Not a seismic vessel, but a vessel



Plymouth

- Sampling;
- Sub-bottom profiling



MSc Syllabus

- Methods in hydrography
- Positioning and geodesy
- Marine geophysical and acoustic sensing
- Oceanography and sedimentation
- Survey project management
- Integrated digital systems
- Industrial applications



Detail of half of offshore module

- EEZ Surveys
- Acoustic & Seismic Theory
- Azimuth & Orientation
- Side scan Sonar; theory and practice
- Principles of Swathe Sounding
- Sub-bottom Profiling
- Geophysical Surveys
- Exploration Seismics
- Swathe Sounding practicals on Catfish



France, Netherlands, Germany



KTP Project, WGP, Bude

- Government subsidised (NERC, DTI)
- 2 way flow of information and experience
 - Industrial level seismic experience
 - Establishment of GIS
- Interesting project
- Short course and consequential publicity
- Accreditation



Conclusion

- Originally employed with recent industrial experience
- Now a concentration on research ...
- Occasional forays afloat ...



Experience offshore, 2006

