Accreditation
In March 2013 EAGE became the first official Continuing Professional Development (CPD) Provider of the “European Geologist” title, which is a professional accreditation established by the European Federation of Geologists (EFG). In order to obtain and maintain this title, the holder must provide a record of high quality CPD activities, which include the short courses like the ones presented in this brochure. For an overview of the provided points for EAGE Short Courses and for more information about this accreditation system and corresponding EAGE learning activities please visit www.eage.org and www.learninggeoscience.org websites.

EET 4 Programme

Seismic Imaging: A Review of the Techniques, their Principles, Merits and Limitations

Mr Etienne Robein

Course description:
As the search for new resources means that we are forced to maximise the production of discovered reservoirs and explore new ones in domains that are increasingly complex, seismic imaging is becoming more and more important as a tool. Seismic imaging is the ultimate stage of a complex data processing sequence that aims to produce clear and accurate images of the Earth’s subsurface suitable for interpretation by geoscientists. This course will give the audience an overview of today’s most popular seismic depth-imaging techniques used in the oil and gas industry, while time-processing will be only briefly discussed. Depth-imaging necessitates the explicit construction of a velocity model. Recent advances in seismic acquisition, imaging technology and high-performance computing, allow us to correctly take into account a much greater complexity of earth models and consequently, start to image structures that were previously invisible. The course will present in simple terms (no equations!) the principle of imaging and model-building techniques in each class of ray-based and wavefield-extrapolation-based methods, while pointing out with examples their respective merits and limitations. The importance of anisotropy and the implication of interpreters in the imaging process will also be discussed.

Course outline:
The course addresses the following topics:
• Reminders: what is a “reflection seismic image” exactly?
• Rays versus Wavefield Extrapolation (W.E.)
• Ray-based depth migrations: Kirchhoff and Beam migrations
• Wavefield extrapolation-based techniques: WEM, RTM,
• Wavefield separation, migration of multiples, Least-squares migration
• Ray-based Anisotropic Velocity Model Building
• W.E.-based Velocity Model building, including Full Wave Form Inversion (FWI)

Participants’ Profile
The course is aimed at geoscientists involved in exploration and production projects where seismics play a role and who wish to:
• Learn more about seismic imaging concepts and the terminology used by seismic processors;
• Improve their critical view on the benefits and limitations of the seismic data sets they are using in their projects;
• Have a well-argued selection of the imaging method to apply to the seismic data shot for their projects;
• Have a better appreciation of what they can expect from reprocessing vintage data sets with modern tools.
The course will also benefit students who want to have a first acquaintance to reflection seismics in general and seismic imaging in particular.

**Prerequisites**
The course can be understood by geoscientists with a moderate mathematical background. Physical concepts are presented without equations but with a maximum of simple schemes and graphical illustrations. Some basic knowledge of wave propagation theory may help however. A comprehensive list of references is given in the book for those who are interested in more rigorous and mathematical approaches.

**About the instructor**

Etienne Robein graduated from Ecole Nationale Supérieure d’Aéronautique et Espace and Ecole Nationale Supérieure Pétrole et Moteurs / IFP in Paris in 1973. He started his career with Shell in The Hague, before joining Elf, now Total, where he has worked on operational, research and managerial assignments in France, Italy, the UK and Azerbaijan. His professional experience covers seismic acquisition, processing and interpretation. His last position with Total was R&D programme manager in Geology and Geophysics. Etienne now works as a free-lance tutor in Geophysics having set-up his own Company “ERT”.

Etienne is the author or co-author of several presentations in International Conferences, including the SEG, EAGE, WPC, AAPG, and Petroleum Geology Conference and contributed to the EAGE’s “Distinguished Lecture Programme” and “Education days”. In 2003, he published a text book on “Velocities, Time-imaging and Depth-imaging in Reflection Seismics”, and in 2010 a text book on “Seismic Imaging: A review of the techniques, their principles, merits and limitations”, which became best-sellers EAGE Edition. In 2015 and 2016, he recorded two EAGE e-Lectures on anisotropic VMB and RTM. Etienne was President of EAGE in 2000. He was also Chairman of EAGE’s Research Committee, member of the EAGE Award Committee and Europe’s representative at the SEG Council.