

# The Virtual Seismic Atlas

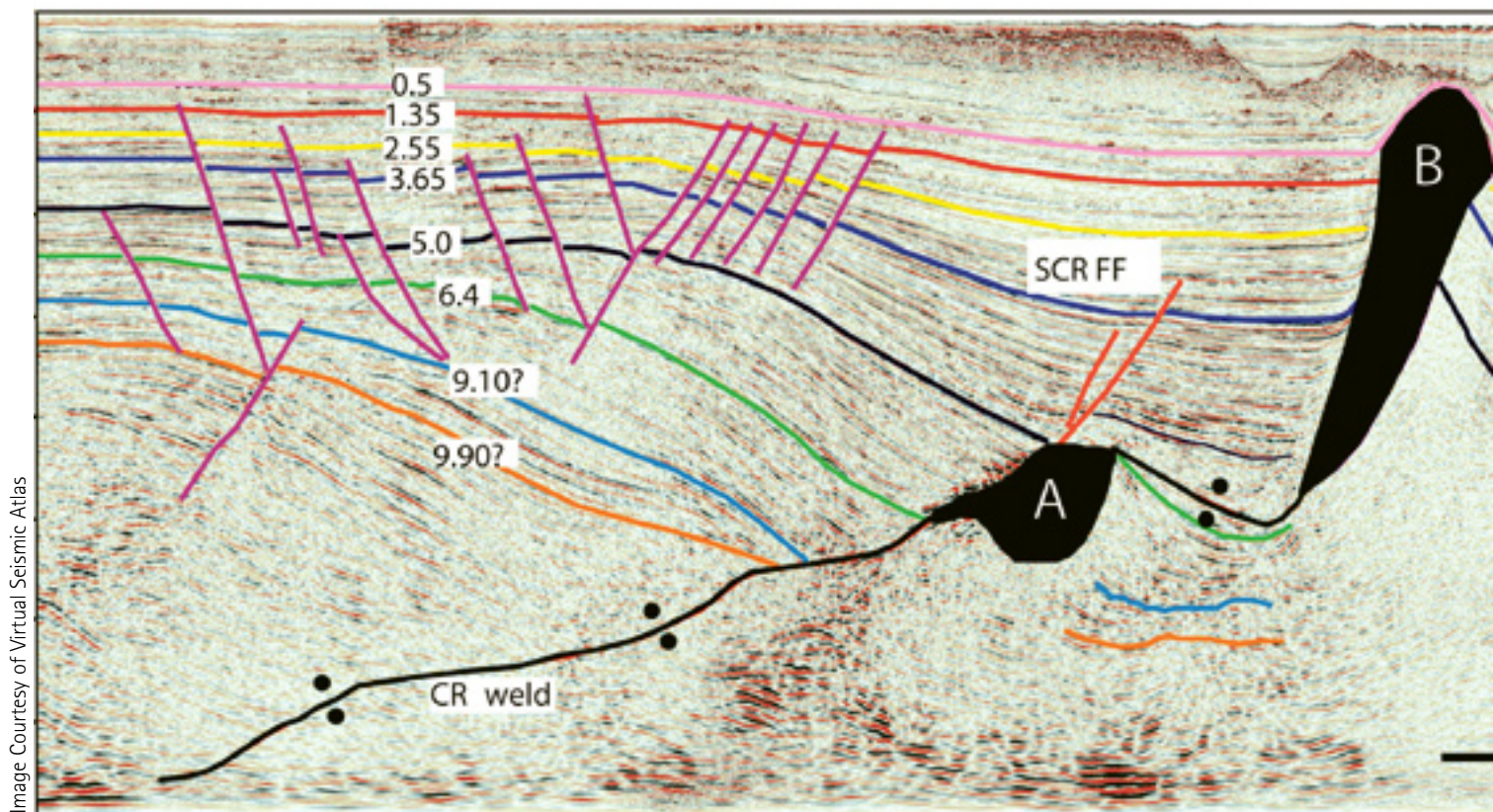


Image Courtesy of Virtual Seismic Atlas

The innovative Virtual Seismic Atlas has now been launched. This is a major contribution to teaching, training as well as research – and paves the way for further progress in the geosciences.

Halfdan Carstens

The Virtual Seismic Atlas (VSA) is now available to all of us. Here it is: [www.seismicatlas.org](http://www.seismicatlas.org), an address that should be easy to remember. The atlas was officially launched at this year's AAPG Annual Convention in San Antonio after a having been developed since 2004 and also been available since that time.

## A Rapidly Growing Collection

"The overall purpose of this freely accessible geological atlas is to make more data available for study and research," says Professor Robert Butler at the University of Aberdeen.

Butler has been instrumental in making this online knowledge base available to all of us and is acting as Project Director on behalf of the partnership.

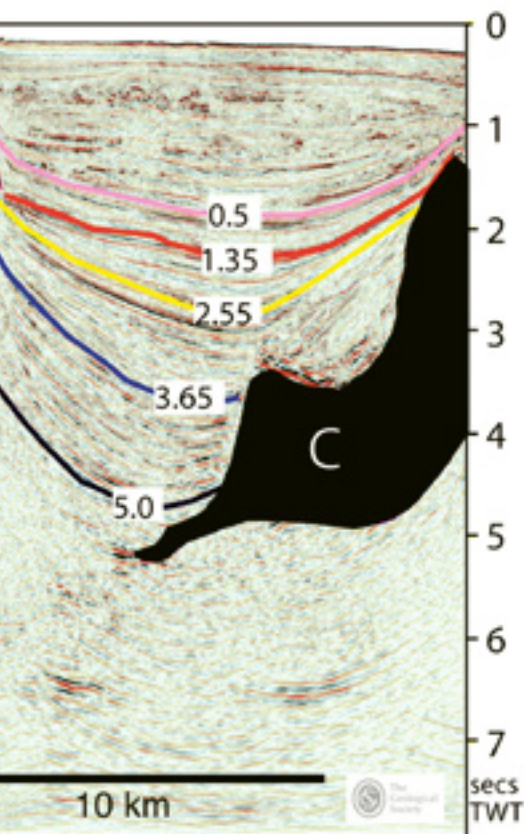
Each year oil and gas companies spend billions of dollars making images of the geology below the Earth's surface. These seismic data help them find prospects that may contain the hydrocarbons, allowing them to drill wells and produce these resources more efficiently. The same data have also revolutionized our understanding of how the world's basins have formed and been filled with sediment. And they are increasingly important for evaluating natural hazards, such as the instability of

submarine slopes.

"The seismic collected by the oil and gas business represents, by a substantial margin, humanity's greatest resource of geophysical data, both in terms of volume and in financial investment," Butler says.

*"Seismic data have revolutionized understanding of how the world's basins have formed"*

# – Now Open



This example from the Virtual Seismic Atlas shows an interpreted dip-oriented, time migrated 2D seismic section from the northern Gulf of Mexico. Salt bodies are shown in black. The image is from Trudgill & Rowan (2004: Mem Geol Soc London 29). The VSA has a standing agreement with the Geological Society to republished seismic examples to which it holds the copyright – which represents a vast collection of published interpretations. VSA content can have explicit links to the original publications or other e-resources. The VSA is free to access and, subject to respecting the Intellectual Property related to each images, the VSA imposes no restriction on the use of downloaded materials.



Professor Robert Butler at the University of Aberdeen in Scotland is director for the Virtual Seismic Atlas.

## Organic Growth

“Geologists spend much time and effort interpreting data. Yet most of the geology that the key seismic geophysical methods reveal remain the preserve of a few scientists. This exclusivity inhibits creative research, limits training opportunities for students and professionals, and restricts public understanding of earth science,” says Professor Butler.

“With the launch of the Virtual Seismic Atlas (VSA) this is about to change. The VSA is an independent, community based resource delivered freely over the internet that captures and shares the geological

## How is it done?

The VSA project is jointly run by the Universities of Aberdeen and Leeds. The VSA is effectively an on-line publishing environment. It allows everyone to browse, find and download images. Future developments will allow public authoring of content.

Searches generate image galleries that act as dramatic showcases for seismic data and the geological structures they reveal.

The really neat thing about the VSA is its ability to carry out multidimensional searches of its content. The application has developed from the “getKnowledge” intranet knowledge management resource at BHP Billiton that they built with partners Blue Fish Development. Both are VSA partners. The content of the VSA resides in an industry-standard database provided by EMC’s Documentum and is retrieved using Endeca’s ProFind information access engine (used by leading retail sites such as Tesco, Home Depot, Walmart, IBM and others). The VSA server is currently housed and maintained at the University of Leeds. The content of the VSA resides in an industry-standard database provided by EMC’s Documentum and is retrieved using Endeca’s information access engine (used by leading retail sites such as Tesco, Home depot, Walmart, IBM and others). The website is currently housed at the University of Leeds.



interpretation of seismic data globally."

"The VSA therefore aspires to global coverage and the full range of imaged crustal geology," Butler emphasizes. So far it includes diverse geological environments such as the North Sea, the Niger Delta and the Gulf of Mexico (to mention only 3), and by studying the menu you will easily realise that this is a library with tremendous amount of geological knowledge. How about taking a look at the crustal-scale images of the Chixulub impact crater in Mexico, or maybe you are curious about mud volcanoes from the Caspian Sea?

"It's early days for the VSA. A preliminary collection of images and geological interpretations are online. But the design allows rapid addition of further images so that, like most on-line community internet resources, its content can grow organically."

***"The VSA offers new opportunities for earth science research and will make training at all levels more relevant to modern industry."***

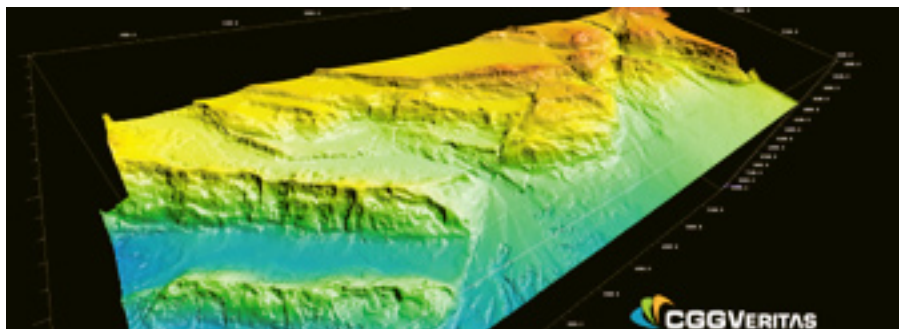
## Why have the VSA?

"Seismic data are continually released for research and training, either directly to university-based geoscientists or through intermediary data "libraries". Imagery is commonly reproduced in scientific journals and other hard-copy publications. But all these resources are dispersed," says Butler.

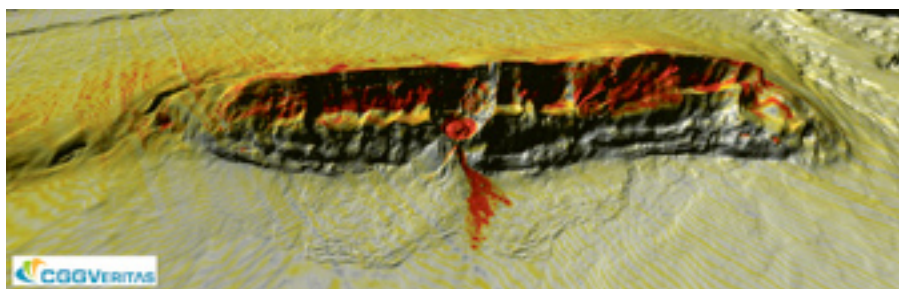
*Imagine a set of postcards of, say satellite images of our planet's surface. And these might have individual information, such as place names or geographic features labelled on them. Think how difficult it is to find information if these "postcards" are in hard copy, or even if they are digital and held on different websites. And realise just how easy it now is to find all of these images and information via GoogleEarth.*

"This ease of access to information is what the VSA aspires to, and more – because understanding seismic images demands scientific interpretation."

The Virtual Seismic Atlas (VSA) Project captures and shares the geological interpretation of seismic reflection data. In its simplest form it is a picture and workbook – in effect a digital development from



The Atlas contains a range of images from 2D and 3D datasets, some of which have never been previously published. Project partners CGGVeritas have uploaded these dramatic images of the seabed from their multiclient 3D surveys of deepwater Niger Delta. The image shows the surface expression of thrust structures in the subsurface and very clearly shows the compartmentalisation of thrust panels by oblique-lateral transform faults.



Mud volcano with recent mud flow imaged on an amplitude map of the sea bed. (CGGVeritas image from deep water Niger Delta).

existing hard-copy publications such as the classic AAPG "Bally" Atlas. However, the digital format allows for a variety of visualization types and links to supporting material that can grow organically with community involvement.

"We are aiming for comprehensive coverage of different structural, stratigraphic and geomorphological styles and a range of dif-

ferent types of seismic image with increasingly global coverage. The VSA provides a platform for the community to find and compare seismic examples, interpretations and analogues that can be located on the basis of the geology they image," concludes Robert Butler, proud Project Director for the Virtual Seismic Atlas.

## Who's on?

The VSA is a partnership between university-based geoscientists, research institutions and broad swathes of the oil and gas industry together with information technologists. The project director is Rob Butler, Professor of Tectonics at the University of Aberdeen (previously Professor of Tectonic Geology at the University of Leeds), in conjunction with Professors Bill McCaffrey and Graham Stuart (University of Leeds). The patrons of the project are Richard Hardman (former President of the Geological Society) and David Roberts (Visiting Professor at Royal Holloway, University of London and 'Distinguished Advisor' of International Exploration at BP). The project is guided by an Advisory Group drawn from universities and industry. The project has been possible due to the financial support of the UK's Natural Environment Research Council (as part of their Knowledge Transfer programme), the Petroleum Exploration Society of Great Britain and a consortium of energy companies (BG, Hess, Shell and StatoilHydro). VSA partners include Blue Fish, Endecca, BHPBilliton and EMC Documentum together with the British Geological Survey, the Geological Society and companies Badley Geoscience, CGGVeritas, Fugro and Midland Valley.