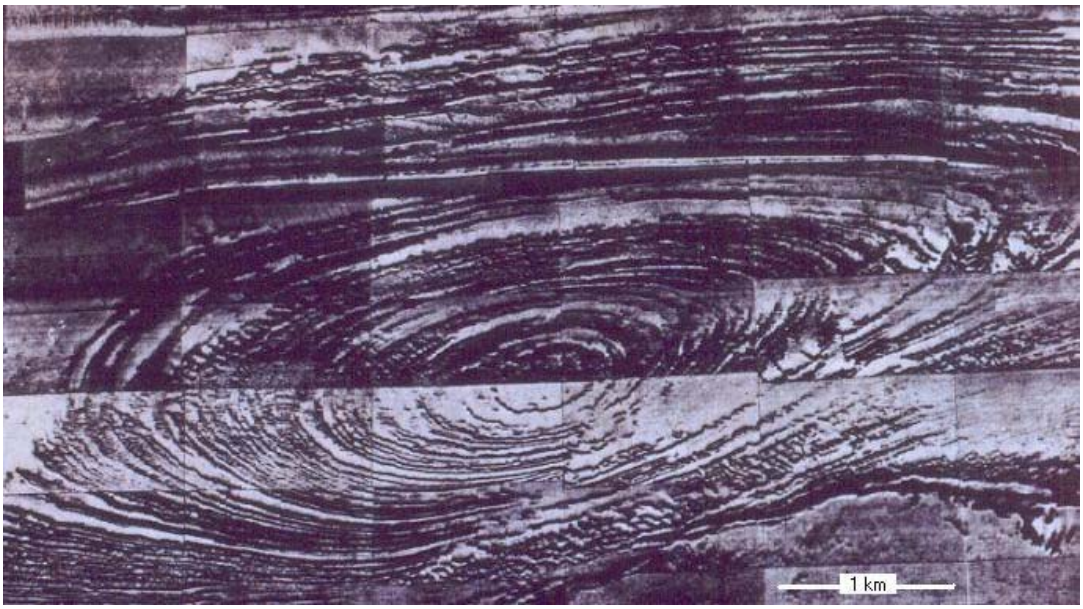
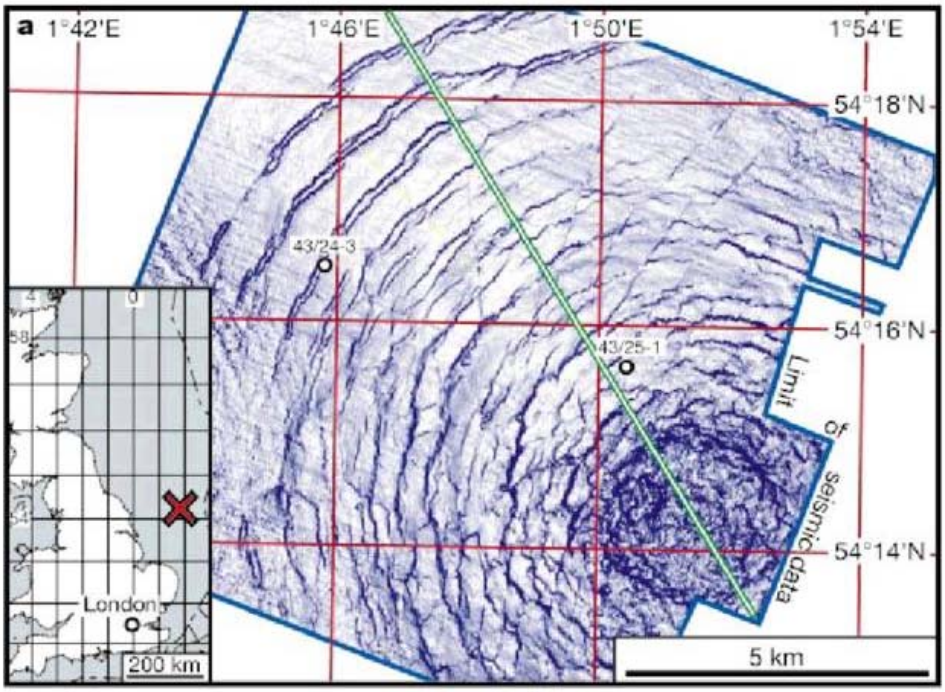
Bay of Biscay Feature: Multi-ringed?

Richard R. Donofrio, EDGe Research Associate, November 2002



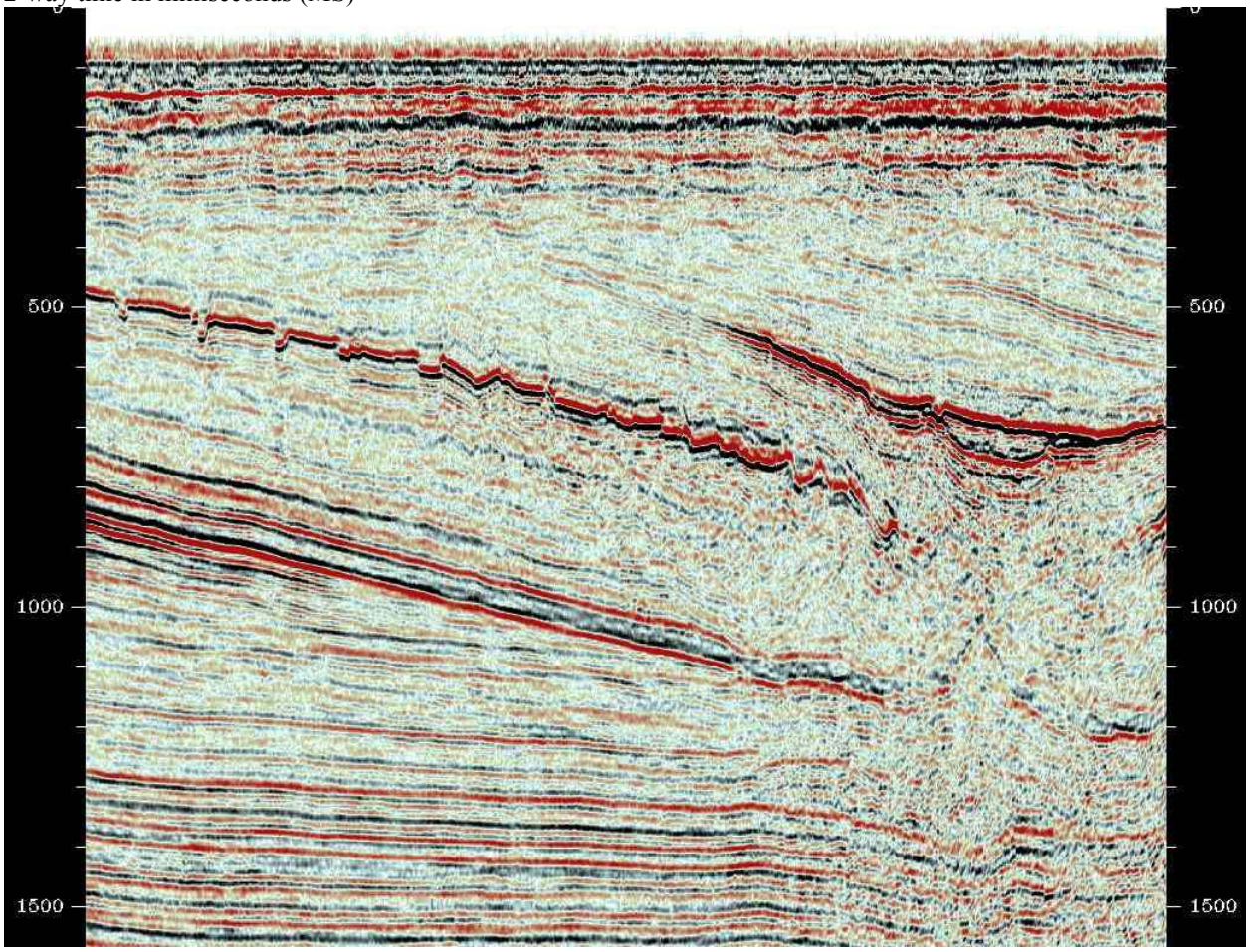
EDGe is investigating the above sea floor anomaly in the Bay of Biscay, offshore France. This unique side-scan sonar mosaic was taken over 30 years ago by the IFP (Institut Francais du Petrole), an independent French petroleum research institute. The feature is located at 43º 29' N, 01º 39' W in 15 to 80 meters of water. If our maps are correct, this is less than 7 km offshore from Biarritz, France near the coastal border with Spain. Hence, the feature is referred to here as the Biarritz structure. Apparently the original sonar image, which is slightly different from the above sepia, appeared in 1972 in *Sonographs of the Sea Floor*. The authors of that book state that the sonograph mosaic shows "sedimentary rocks folded into a small basin." A picture like the above was also shown in *Geotimes* in 1972 in a promotion for side-scan sonar systems.

Biarritz appears to have a diameter of perhaps 5 to 6 km and is somewhat similar to the Silverpit structure, a 20-km wide multi-ringed feature in the North Sea. Silverpit has been mapped by 3-D seismic and has the profile of a multi-ringed impact crater (figures are shown below). Unlike the buried Silverpit structure with 10 concentric rings however, the Biarritz feature affects the present-day sea floor and appears to have dozens of concentric rings. These "rings" may be merely a sedimentary pattern having no structure or relationship to any impact process. Interestingly, the high number of "rings / rims" does not necessarily exclude an impact origin. Based on collision dynamics and quantum mechanics, a theoretical limit of about 60 rings was proposed by geophysicist M.D. Butler in a discussion of impact cratering in the May 1996 issue of the SEG (Society of Exploration Geophysicists) *Leading Edge*. Criticism of the proposal appears to arise because readers don't understand it, primarily the equations. Biarritz may not be the structure to test that proposal, but eventually a suitable multi-ringed impact structure will be found or recognized



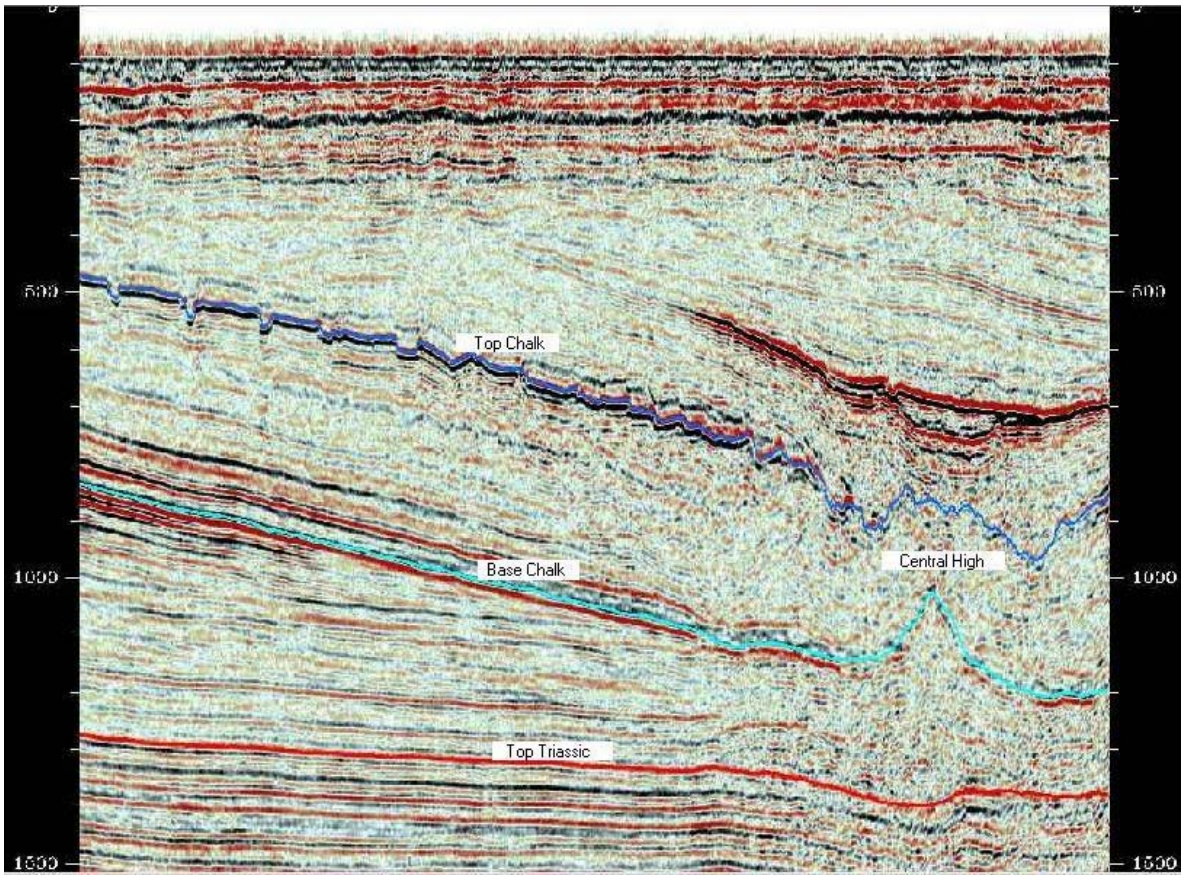
Silverpit crater with contours on Top Chalk formation. The (green) cross-section line runs NW – SE and is shown below. The two small circles are the locations of two exploration wells, one drilled in 1984 (right) and the other in 1993 (left). Both wells were deep enough to sufficiently penetrate the structure but neither was drilled using the astrobleme (impact structure) model. Slightly more than half of the crater is displayed. Silverpit is buried beneath several hundred meters of relatively undisturbed sediments and would not be evident on side-scan sonar, which is normally limited to seafloor configuration (Nature/British Petroleum /Production Geosciences, Ltd. image)

2-way time in milliseconds (MS)



Silverpit seismic cross-section approximately 12 km long. The resolution is excellent and affords a rare look into the internal structure of a probable hydrobleme (marine impact structure). Several distinct seismic reflectors are evident and are highlighted below. Seismic images and specifics are courtesy of Phil Allen at PGL and Simon Stewart at BP.

2-way time (MS)



Interpretative seismic cross-section of Silverpit crater from NW to SE. Note the distortion throughout the area of the central uplift (central high), typical of complex-type impact structures. The "surface" of the central uplift is actually on Top Chalk. Ring formation is shown by the peaks and troughs in the Top Chalk. (BP/PGL image)

Relative to Biarritz, EDGe is checking with IFP about a seismic survey that may have been done in conjunction with the side-scan sonar. There are certain terrestrial features that mimic astroblemes, and it will be informative to compare the cross-sections with Silverpit. Further data will be posted at the EDGe website when available.

NOTES

In an email to the author of this EDGe article, Phil Allen of Production Geosciences, Ltd. in the UK mentioned about Silverpit, *"I owe you one. It was only when someone (Simon Stewart I think) showed me your illustration in Oil & Gas Journal (1998) that I was convinced that we had an impact!"*

That's a great compliment coming from the other side of the Atlantic, and we Yanks here at EDGe are appreciative. The Oil and Gas Journal article he is referring to has been online at EDGe News since it was published ('North American impact structures hold giant field potential' - May 11, 1998). We thank Alan Petzet, Chief Exploration Editor of

the Oil and Gas Journal, for making it available. Also, the cover of that issue shows a computer-simulated impact sequence into the ocean, which was done at Sandia National Laboratories by David Crawford. We've had requests for that image and we will make an effort to get it online. EDGe will continue to post information about impact structures, particularly as they relate to oil and gas exploration.

Additional Silverpit crater information can be found at the Geological Society (UK): http://www.geolsoc.org.uk/template.cfm?name=Silverpit

Also: http://www.xs4all.nl/~carlkop/silverpe.html

REFERENCES [and comments]

Belderson, R.H., Kenyon, N.H., Stride, A.H., and Stubbs, A.R., 1972, Sonographs of the sea floor: Elsevier, p. 26-27. [Shows numerous sonographs, mostly from the British National Institute of Oceanography; discusses the long range sonar vehicle, GLORIA]

Butler, M.D., 1996, Round Table – The MI theory: reply and further comments: The Leading Edge, v. 15, no. 5, (May) p. 384-391. [Proposes an esoteric theory of impact cratering dynamics from basin rings to continents]

Donofrio, R.R., 1981, Impact craters: implications for basement hydrocarbon production: Journal of Petroleum Geology, v. 3. no. 3, (January) p. 279-302. [Discusses impact craters as hydrocarbon traps; shows a lunar multi-ringed impact basin of much larger dimensions than Silverpit; PDF copy at EDGe News]

Geotimes, 1972, products & services, v. 17, no. 3, (March) p. 54. [The unidentified Bay of Biscay feature is shown in an advertisement for side-scan sonar systems]

Stuart, S.A., and Allen, P.J., 2002, A 20-km-diameter multi-ringed impact structure in the North Sea: Nature, v. 417, (August 1) p. 520-523. [Discusses Silverpit structure and its recognition as an impact crater from previously acquired and reprocessed 3-D seismic data; HTML / PDF copy at Nature]

Personal communication with G. Kozak at Klein Associates, Inc. [Assistance with locating the Bay of Biscay feature and discussing side-scan sonar systems]

Comments: mailto:mcartwright@ou.edu.

Back to home page:

University of Oklahoma
Exploration and **D**evelopment **Ge**osciences
http://www.edge.ou.edu/