Input Seismic Angle Stacks



DATA TO LEADS Turning Seismic Into Intelligence

Extract Objects of Interest



High-Graded Resource List

Intelligence: Table & Report





Sweet Spotting Informs Decisions

Drill or Drop

- De-Risk Targets - Optimize Wells - Find Fairways - Map Reservoirs -Invest / Divest



Data to Leads (D2L): Impacts on a field's life



Exploration Establish HC Presence / Absence

Development

Guide Appraisal Wells Selection



Data to Leads impact your asset evaluation at any stage of development



Production

Target Wells with Porosity and Net

- Anomaly Strength - Porosity Proxy - AVO Classification - Object Labels



Abandonment Guide Decisions to Invest / Divest





Unconventional Identify Sweetest Targets for Laterals



Identify Large Porous Geobodies

Data to Leads (D2L): Geophysical problems solved

Has my acreage any statistically valid AVO anomalies ? D2L's intelligence lists anomalies with key geobody-wide statistics D2L anomalies signatures can be compared between surveys

Is my data noisy, misaligned, impacting the quality of AVO products? D2L produces the best possible clean, unbiased and detrended AVO derivatives D2L saves time to find/confirm/rank seismic anomalies

Is my data conditioned for AI processes? D2L produces harmonized outputs that allows AI models to be used across surveys

Having issues with incompatible seismic datasets amplitudes? D2L makes it possible to make regional maps directly D2L harmonizes background amplitudes across stacks and surveys Post D2L, derivatives can be merged in regional 3D surveys







Data to Leads (D2L): Technical Advantages

Ne

Far

Mid

Classic Seismic-based Object Identification Pitfalls

- Amplitude and frequency spectra vary widely from survey to survey or even within a single survey
- Compromised AVO due to damaged far stack amplitudes during processing
- **8** Bandwidth differences and misalignments between stacks degrade AVO results
- AVO results from Survey A are not comparable to those from Survey B
- Solution Classic workflows often use reflectivity stacks and do not perform inversion processes to remove side lobes and wavelet effects on amplitudes
- Random and non-structural noise degrades seismic amplitude continuity
 - noisy and uncalibrated, and are not to detect outliers
- Leads must be detected and interpreted before amplitudes can be extracted

AVO products such as A and B cubes are routinely used to create geobody volumes

Data to Leads **Object Identification Benefits**

- Intelligent bandwidth balancing that preserves the degree of anomaly of all outliers from shallow to deep
- Ubiquitous energy balancing from near to far and from shallow to deep
- Intelligent across stacks time alignment improves AVO consistency
- AVO results compare and are consistent across surveys and basins
- Smart color inversion operators varying from near to far, laterally and vertically, reduce significantly Tuning effects. Final amplitudes correlate to rock properties
- Dip-steered noise reduction is applied to all stacks before derivatives are created
- Object labels are generated from robust and consistently conditioned AVO derivatives to objectively <u>highlight outliers</u>

Leads are delivered as outlines, top and



base horizons with amplitude extractions

Data to Leads (D2L): Seismic Anomalies

Core of the D2L ranking: a detrended Intercept(A)/Gradient(B) AVO crossplot









Decrease Sand %

Decrease Sw (class I)

Data to Leads (D2L): Intelligence



Ranked shortlist of seismic anomalies with key statistics

Object ID	Area (bins)	Vol (samples)	X (m)	Y (m)	IL	XL	TWT ms	REF twt ms	TWT ms BML	Intercept Average	Gradient Average	AVO Strength Average	AVO class Average	Intercept Sweetspot	Gradient Sweetspot	AVO Strength Sweetspot	AVO class Sweetspot	GRV bbl
566	164,537	2,650,124			2,840	1,571	1,226	90	1,136	-64,053	-44,258	-100,210	2.85	-98,150	-77,755	-134,776	2.75	4.68E+09
175	90,409	1,291,385			2,486	1,559	842	90	752	-76,161	-51,683	-122,822	2.79	-137,942	-96,301	-171,453	2.78	2.15E+09
527	89,434	1,284,192			2,791	1,389	758	90	668	-105,898	-37,042	-133,656	3.13	-201,196	-75,363	-193,802	3.20	2.11E+09
974	49,296	551,145			3,040	1,814	1,412	90	1,322	-39,116	-38,078	-70,824	2.35	-60,753	-59,038	-88,234	2.59	1.00E+09
769	40,312	390,354			2,923	1,673	748	90	658	-45,066	-36,283	-69,887	2.51	-66,683	-62,855	-89,169	2.56	6.39E+08
260	21,733	189,124			2,438	1,538	1,078	90	988	-74,403	-23,635	-84,966	3.24	-115,240	-48,025	-112,886	3.21	3.26E+08
408	8,119	117,362			2,558	1,869	798	90	708	-62,279	-41,992	-100,080	2.66	-97,968	-84,533	-139,458	2.61	1.94E+08
874	13,771	109,833			2,995	1,367	706	90	616	-32,801	-41,384	-69,806	2.26	-45,684	-72,121	-87,935	2.30	1.79E+08
1,080	8,242	96,550			3,079	1,778	1,342	90	1,252	-72,765	-12,066	-76,040	3.28	-113,210	-18,213	-98,188	3.46	1.74E+08
485	11,389	98,235			2,707	2,003	422	90	332	-16,304	-82,104	-96,340	1.68	-32,615	-160,104	-129,541	1.59	1.53E+08
565	7,707	81,302			2,706	1,971	1,458	90	1,368	-24,687	-52,470	-71,133	1.92	-23,352	-86,721	-91,211	1.74	1.49E+08
1,068	7,937	85,812			3,070	1,771	1,036	90	946	-83,951	-1,336	-79,946	3.47	-124,004	-4,288	-104,057	3.46	1.47E+08
1,078	10,771	89,769			3,112	1,664	676	90	586	-50,605	-25,588	-70,583	2.79	-81,718	-31,459	-88,653	2.95	1.45E+08
572	6,350	94,324			2,705	2,007	310	90	220	-2,708	-72,102	-74,136	1.09	-11,076	-112,355	-95,602	1.65	1.44E+08
1,170	8,996	84,303			3,174	1,688	616	90	526	-40,513	-33,426	-70,306	2.49	-61,597	-57,658	-86,011	2.63	1.35E+08
462	8,894	80,432			2,683	2,010	714	90	624	-41,459	-47,003	-79,253	2.34	-73,512	-77,320	-104,597	2.56	1.31E+08
514	9,190	70,111			2,687	1,999	782	90	692	-28,746	-50,278	-75,060	2.07	-51,940	-91,913	-100,489	2.18	1.15E+08
590	6,067	74,104			2,740	1,982	220	90	130	11,283	-87,259	-76,706	1.05	15,030	-141,143	-99,709	1.01	1.12E+08
812	6,149	62,600			2,881	1,716	504	90	414	-58,104	-22,140	-71,948	2.90	-79,277	-49,709	-88,729	2.86	9.86E+07
456	6,015	56,149			2,672	2,006	496	90	406	-61,794	-26,703	-76,466	2.70	-99,505	-55,097	-98,039	2.87	8.83E+07
851	4,477	55,102			2,905	1,709	404	90	314	-22,176	-55,663	-72,369	1.97	-35,254	-89,101	-93,215	1.88	8.54E+07
1,188	4,195	48,563			3,168	1,704	368	90	278	-28,650	-46,932	-69,708	2.10	-41,675	-81,594	-88,060	2.24	7.48E+07
543	4,684	44,823			2,690	2,010	600	90	510	-44,008	-43,445	-78,440	2.41	-63,358	-82,405	-100,228	2.35	7.17E+07
1,113	3,684	41,235			3,080	1,773	900	90	810	-95,137	15,847	-78,535	3.51	-161,018	31,034	-108,865	4.00	6.92E+07
564	2,808	38,038			2,652	1,882	1,268	90	1,178	-50,089	-43,347	-88,032	2.65	-68,716	-76,269	-121,621	2.51	6.77E+07
635	4,150	39,687			2,738	2,015	936	90	846	-45,605	-37,451	-74,251	2.38	-46,708	-97,387	-98,410	2.11	6.70E+07
861	2,987	34,491			2,918	1,715	676	90	586	-63,713	-19,266	-77,637	3.09	-111,374	-34,426	-91,661	3.22	5.58E+07
664	3,446	26,956			2,750	2,014	842	90	752	-25,951	-50,516	-69,378	2.05	-36,759	-81,980	-86,891	2.09	4.48E+07
618	2,154	21,763			2,686	1,972	2,060	90	1,970	-32,526	-60,981	-76,149	2.16	-38,392	-83,014	-96,322	1.95	4.40E+07
273	1,905	23,258			2,406	1,239	1,540	90	1,450	-31,201	-48,357	-73,003	2.13	-49,558	-79,342	-95,600	2.26	4.32E+07
60	3,284	24,410			2,327	1,404	966	90	876	-52,920	-14,592	-63,884	3.07	-73,091	-40,496	-86,628	3.11	4.14E+07
2	2,285	21,010			2,221	1,384	1,178	90	1,088	-46,224	-30,623	-67,999	2.56	-56,867	-74,199	-87,249	2.40	3.69E+07
451	2,011	20,751			2,582	1,563	1,086	90	996	-41,580	-45,491	-77,228	2.58	-20,065	-99,926	-103,293	2.23	3.59E+07
176	1,872	18,680			2,371	1,260	1,148	90	1,058	-72,310	-26,130	-91,054	2.92	-114,182	-96,245	-135,124	2.74	3.26E+07
1,181	1,592	21,268			3,168	1,723	252	90	162	8,214	-91,638	-84,263	1.05	7,799	-160,647	-110,480	1.26	3.22E+07
245	1,481	17,260			2,388	1,261	1,306	90	1,216	-72,400	-24,077	-82,425	3.02	-118,773	-49,720	-119,321	3.26	3.09E+07
1,116	1,655	20,289			3,089	1,799	246	90	156	10,543	-83,332	-73,178	1.00	11,745	-129,771	-91,730	1.00	3.07E+07
595	3,141	18,074			2,719	2,012	864	90	774	-21,917	-57,466	-73,851	2.12	-34,215	-72,933	-87,839	2.12	3.02E+07
622	2,729	17,523			2,713	2,005	548	90	458	-44,836	-33,560	-73,655	2.31	-80,883	-46,324	-95,719	2.68	2.78E+07
173	1,553	15,230			2,373	1,328	1,148	90	1,058	-8,802	-70,113	-78,691	2.00	-3,724	-147,345	-103,183	2.00	2.66E+07
1,225	1,429	15,654			3,201	1,653	266	90	176	9,072	-77,465	-69,134	1.00	6,433	-111,850	-86,570	1.10	2.37E+07
20	2,208	12,998			2,250	1,197	1,288	90	1,198	-36,353	-49,513	-73,225	2.09	-32,517	-93,730	-97,820	2.00	2.32E+07
1,263	1,876	13,480			3,214	1,664	736	90	646	-69,434	-8,309	-70,198	3.34	-86,410	-19,647	-85,699	3.42	2.20E+07
1	1,390	10,002			2,205	1,395	948	90	858	-52,892	-21,558	-67,576	2.68	-57,505	-64,652	-88,277	2.55	1.69E+07
122	1,376	9,055			2,324	1,240	1,032	90	942	-65,014	1,319	-66,206	3.58	-92,131	-5,464	-90,376	3.69	1.55E+07
521	1,136	7,959			2,636	2,014	458	90	368	-26,060	-54,728	-74,235	2.03	-50,052	-79,661	-91,182	2.20	1.24E+07

Extract from published case study for Perenco UK (2023)





Perenco
validation
DRILLED
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Data to Leads (D2L): Competitive Advantage



Accelerate asset evaluation "First in wins": Get ahead of the competition by focusing on the most promising leads up-front, streamline seismic data evaluation



Make informed decisions "Drill or drop": Quickly decide if an acreage position is worth keeping or abandoning with an unbiased resource evaluation



Loss prevention Reduce OPEX exposure: Where should I spend? Optimize well positioning decisions, minimize the risk of dry holes, maximize well production



Opportunity generation Before committing CAPEX: Assess acreage potential using existing 2D/ 3D surveys by applying an unbiased proven statistical approach





Data to Leads (D2L): Geophysics put to work



Gain valuable and unbiased intelligence upfront that de-risks: high reservoir quality hydrocarbon accumulations presence source rock presence v reservoir thickness and porosity fairways before you start your evaluation

Leverage fully existing seismic stacks √ harmonize seismic datasets across surveys and basins v build analogs for well property predictions from seismic attributes

Focus your efforts on the most promising geobodies, upfront





Access an unbiased ranked list of sweet-spots for AVO plays





Data to Leads (D2L): Cost / Speed



D2L Cost / Lead Time

parameters and complexity

km2)

Typical 3D surveys:

• \$5-20 per km2 or linear km of 2D line depending of data size, acquisition

• Turnaround time for a complete study is 1-4 weeks for a medium survey (500



- High Resolution survey 500 km2 (~200 sqm), 3 stacks => \$30k - Exploration survey 3500km^2 (~1350 sqm), 4 stacks => \$80k





• Extra slides





Data to Leads (D2L): Value of Information

Sweet spotting hydrocarbon or geothermal potential of an acreage If no potential is discovered, it can save the value of an exploration well: \$USD 5-150 million per well Focus the client's efforts on the sweetest spots, resulting in better flowing wells and larger connected tanks: \$USD 5++ million over the life of one well

Assess acreage potential for a fraction of the cost/time • Turnkey evaluation in 1-4 weeks versus to 1-2 years for a team of 5-10: \$USD 5-20 Million per project

Focus human resources on sweet spots • Focus geoscience team efforts on best acreage spots upfront saving 1-2 man-years: \$USD 1-5 Million per project

Bring highly technical expertise to your geoscience team • Assist companies lacking advanced geoscience / geophysics expertise, saving them the cost of hiring advanced geoscientists: \$USD 1-2 million per year • Deliver carefully conditioned seismic data and intelligence, typically the domain of the largest shops, for faster data evaluation and integration: \$USD 1-5 Million per project



Data to Leads (D2L): Q/A



What do you do ?

We consistently accelerate and streamline the evaluation of clients seismic data in order to extract valuable and unbiased intelligence that de-risk the presence of hydrocarbons and high reservoir quality in the subsurface, without prior knowledge.



Why would I run the "Data to Leads" workflow on my data?

Leverage existing data: With the "Data to Leads" workflow, we pre-condition existing seismic data to provide consistent, structurally de-noised, bandwidth-balanced, timealigned seismic derivatives on each survey. Using conditioned volumes, we provide a ranked list of seismic geobody outliers with key geobody-wide statistics relevant to correlation with rock properties and key well properties, to continuity and rock volume. Prepare for the future: Al technologies are revolutionizing every industry. "Data to Leads" deliverables make current and future seismic-based AI tools faster to implement and more efficient.



Does your technology works onshore for unconventional? Yes, provided that the seismic data has sufficient acquisition parameters to sample high incidence angles and that the difference in rock properties between hydrocarbon and wet layers is measurable in the seismic data. Our technology magnifies the difference between the wet trend and the hydrocarbon layers so that subtle differences can be exploited. Stay calm under pressure knowing you leveraged fully your data.





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Data to Leads (D2L): Q/A

Do you sell software ?

No, we sell services. We customize agile workflows for each client and use our experience to help all clients. Our technology is detailed oriented with a strong focus on statistical risk analysis.



Our staff ?

Absolutely. First, we can build your team's skills and confidence by demonstrating how to use Data to Leads results. Second, we can train your team members using our extensive expertise in global geoscience and geophysical techniques.



What the main benefits of your products ?

Our main goal is to accelerate and streamline the evaluation of seismic data for de-risking the presence of Hydrocarbon and quality reservoirs or source rocks. Data to Leads results can be used by the oil and gas, geothermal and other extractive industries. Bottom line, we increase your efficiency by focusing your efforts on the right leads.



How can my team benefit from your services ?

Our goal is the free up your team to focus on big-picture strategies by providing you with carefully conditioned datasets and clear intelligence. By saving your team time and money, we help you make informed business decisions.





Data to Leads (D2L): Q/A



Can your products discover subtle accumulations ?

Absolutely. The Data to Leads workflow is designed to find outliers in your datasets that would be either too time consuming to enhance or difficult to pinpoint. We detrend your datasets so that outliers become obvious. Our ranked list of leads enables you to prioritize which part of the data to work on, even drill or drop the asset.



Why using post-stack data versus pre-stack? Final post stack data is always available to individual clients. In most cases, this data is neither consistent nor comparable across surveys and basins. Therefore, we focus on harmonizing clients' bread and butter datasets to produce consistent derivatives that are used to create our ranked lead list. Pre-stack data is typically not available to clients and is much more difficult to use, making studies much more extensive and time consuming.



What other services do you propose ? Classic geophysical workflows: seismic data cleanup, velocity modeling building, uncertainty studies, well ties, forward seismic modeling, well log prediction from seismic, etc...

Geoscience Reservoir Advise: assess your existing workflows, suggest improvements of existing best practices, promote rock physics based rational thinking



