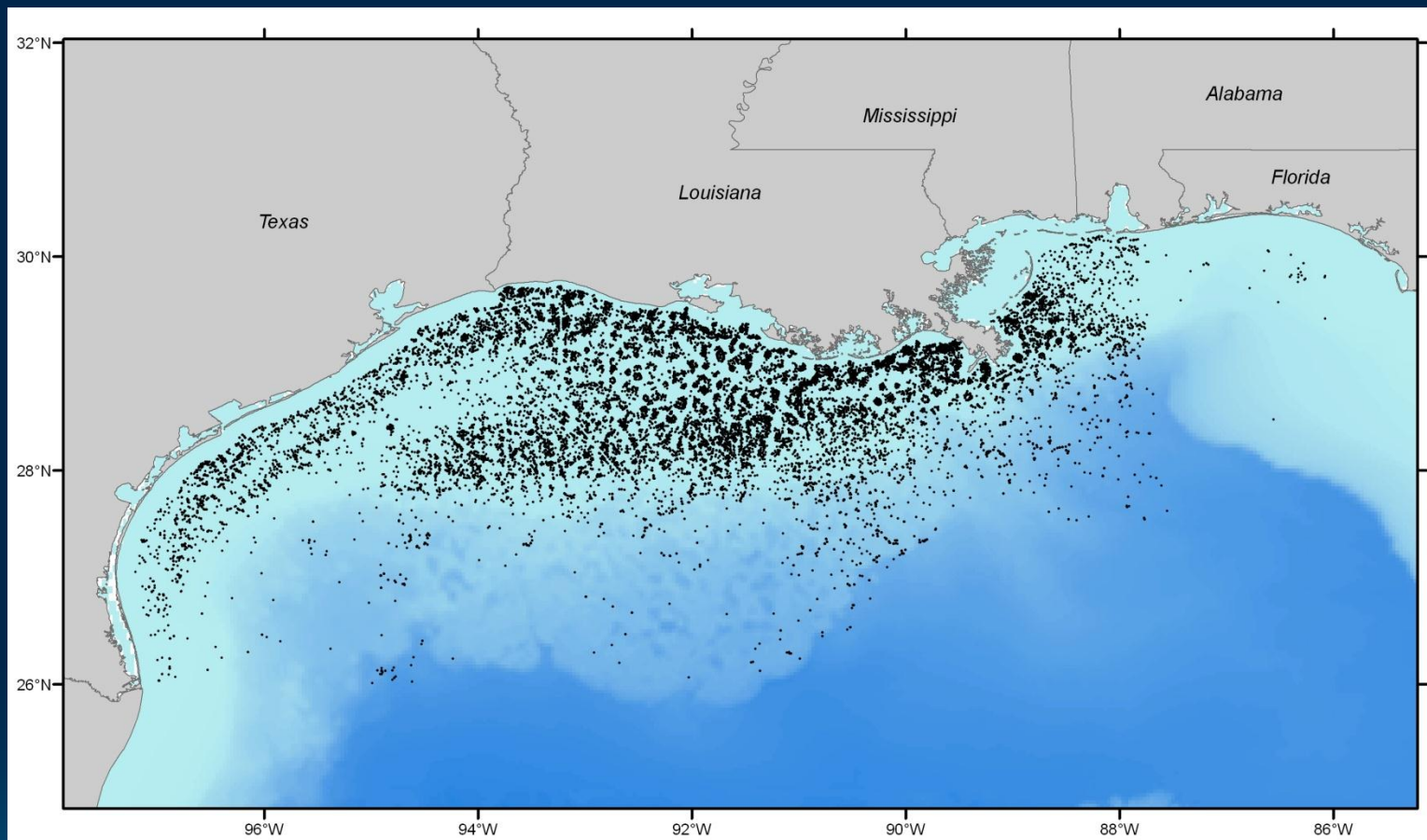


A Borehole Geothermal Database for the US Exclusive Economic Zone of the Gulf of Mexico



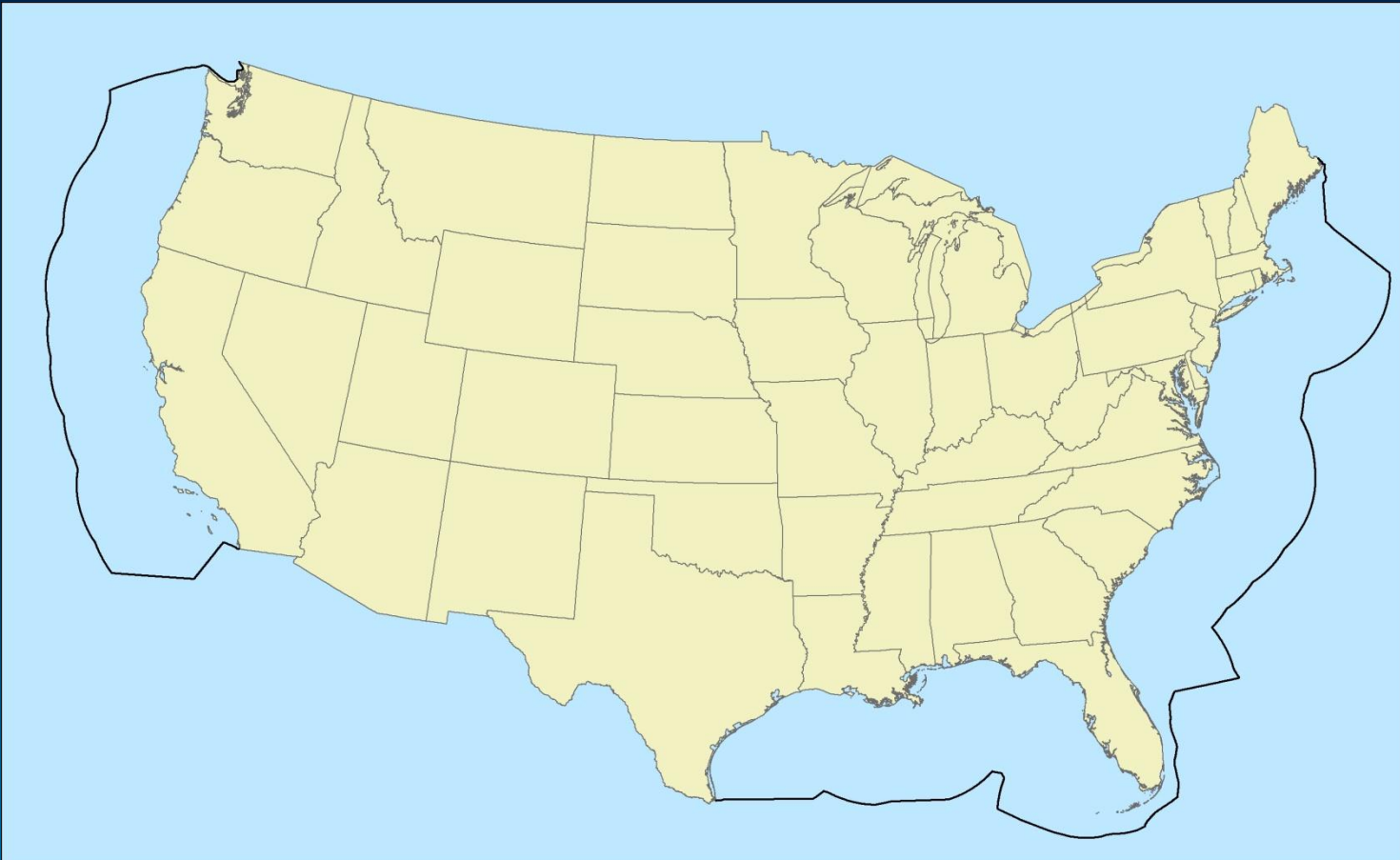
S. Nagihara, O. Ajiboye, S. Ojeda, C. Christie, N. Ogiamien, and M. Oladokun

Department of Geosciences
Texas Tech University

Exclusive Economic Zone:

200 nautical miles from the shoreline or the edge of the continental shelf, whichever is farther.

The country has exclusive rights for exploitation and use of marine (including sub-seafloor) resources within its EEZ.



Rules for Natural Resources Exploitation in the US EEZ

A company can claim exclusive rights (e.g., drilling and oil/gas production) over a piece of seafloor (and water above) by obtaining a 'lease' from the Federal Government. The Bureau of Ocean Energy Management, Regulation and Enforcement (formerly known as Minerals Management Service) oversees the leasing and exploitation activities.

The companies are expected to deliver the geologic and engineering data they obtained from their drilling activities in their leased areas to BOEMRE .

BOEMRE makes the data available to the public after 2 years, if requested.

The data include:


- Scanned copies of wire-line logs
- Velocity surveys
- Formation test results (RFT and MDT)
- Reports on other tests and analyses



Thunder Horse oil field, off Louisiana

Wikipedia

Bottom-hole (maximum recorded) temperature data are recorded in the log header.



LONG SPACING BHC
SONIC LOG

Schlumberger

EXPIRED LEAD

FOR U.S. GOVERNMENT USE ONLY

RECEIVED

COMPANY STANDARD OIL PRODUCTION COMPANY

WELL 999 WELL #1 MAY 4 1988

FIELD MOBILE AREA BLOCK 999 MINERALS MANAGEMENT SERVICE

COUNTY OFFSHORE STATE ALABAMA

5237.66' FNL & 10253.44' FEL OF
MOBILE AREA BLOCK 999
LATITUDE: 30° 00' 30"
LONGITUDE: 88° 09' 43"

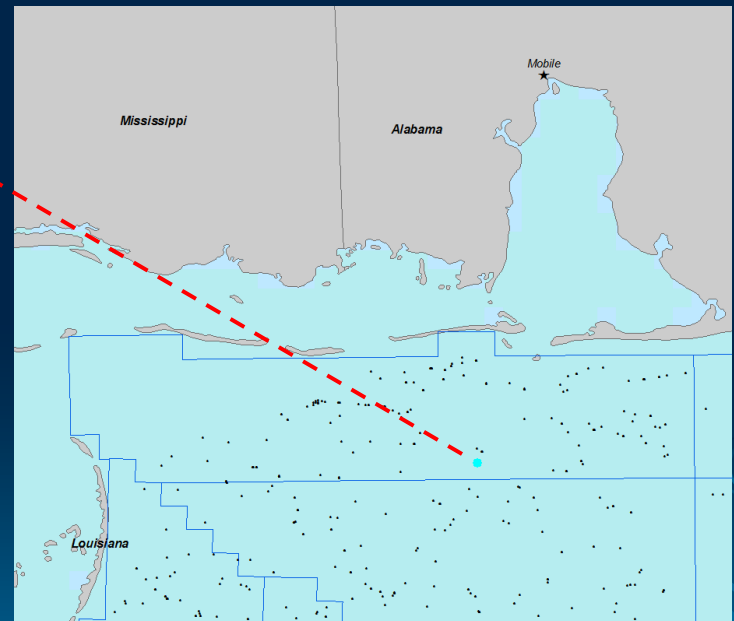
Other Services: NO.L.A. DIL/SFL

Public Information - Released by M.M.S.

Permanent Datum: MWL INDEXED Elev.: 0.0
Log Measured From: RKB 112.0 Fr. Above Perm. Datum D.F. 1111.0
Drilling Measured From: RKB G.L. 0.0

Date	6-24-87	8-18-87	12-25-87	2-1-88
Run No.	ONE	TWO	THREE	FOUR
Depth—Driller	10700	18865	23160	24159
Depth—Logger (Schl)	10688	18843	23163	24118
Btm. Log Interval	10685	18837	23155	24118
Top Log Interval	4172	10690	18700	23100
Casing—Driller	16 @ 4175	13 3/8 @ 10650	10 @ 18864	7 3/4 @ 23160
Casing—Logger	4172	10690	18870	23160
Bit Size	14 3/4	12 1/4	8 1/2	6 1/2
Type Fluid in Hole	SEE REMARKS	SEE REMARKS	VERSADRILL	VERSADRILL
Dens	9.5	38	10.4	36
Visc.			16.0	65
pH	8.2	21.8	11.8	19.2
Fluid Loss			---	---
Source of Sample	FLOWLINE	FLOWLINE		
Rm @ Meas Temp	.383 @ 76 °F	.614 @ 75 °F		
Rmf @ Meas. Temp	.234 @ 76 °F	.438 @ 75 °F		
Rmc @ Meas Temp	.277 @ 66 °F	1.04 @ 75 °F		
Source Rmf Rmc	MEAS. MEAS.	MEAS. MEAS.		
Rm @ BHT	.155 @ 198 °F	.158 @ 336 °F		
Circulation Stopped	0200 6-24	1300 8-17	2100 12-24	2130 1-31
Logger on Bottom	1030 6-24	2130 8-18	1500 12-26	1500 2-1
Max. Rec. Temp.	198 °F	336 °F	408 °F	412 °F
Equip Location	16 MBOS	T6 MBOS	T6 MBOS	T6 MBOS
Recorded By	BARNES	SHIPLEY	SHIPLEY	SHIPLEY
Witnessed By	BERNASKI	BATE	LEWIS	LEWIS

FILE COPY - GULF OF MEX



The well name, location and borehole reference data were furnished by the customer.

FOLD HERE

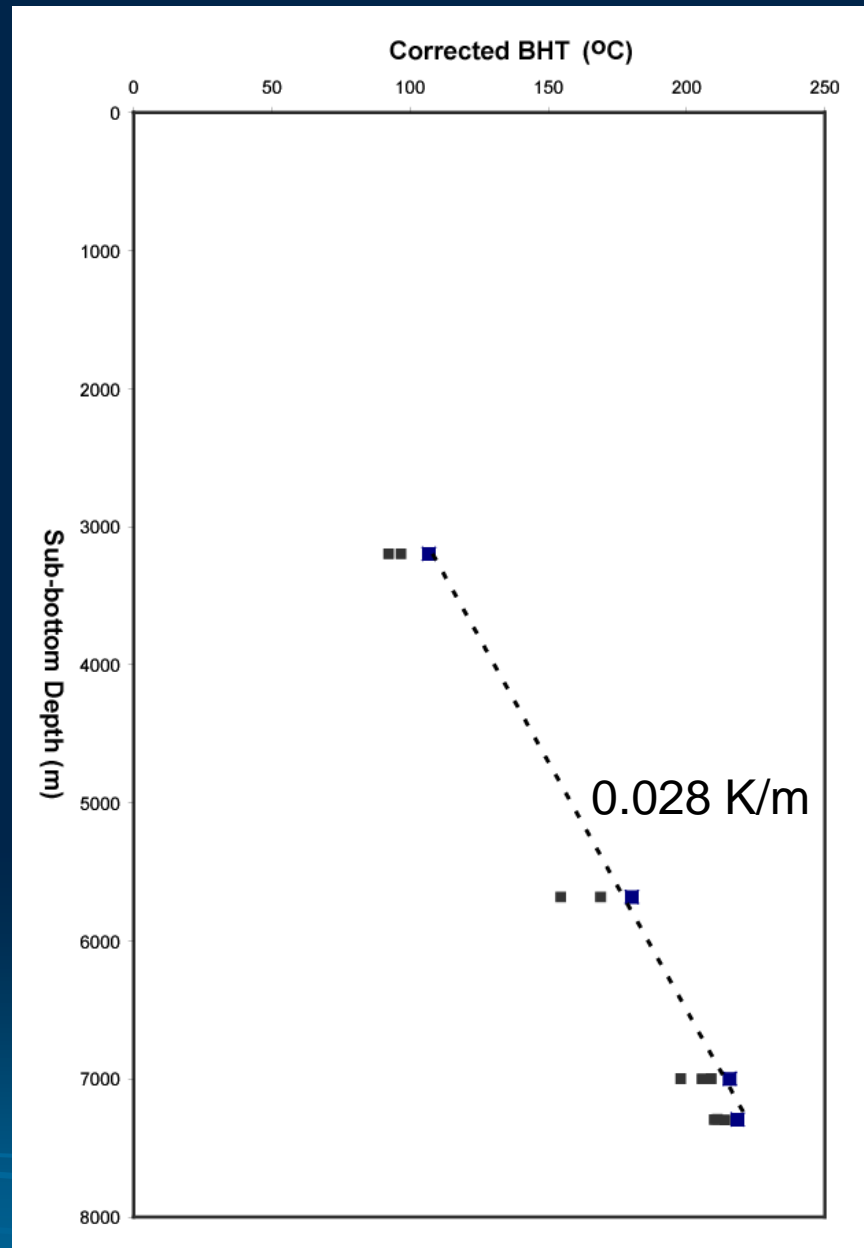
One can estimate the pre-drilling formation temperature by observing the way bottom-hole temperature changes over time after the well has been shut.

Bottom-hole Temperature Data

Mobile 999 OCS-G7863 Well #1

	Run	Time Circulation Stopped	Time Logger On Bottom	Sub-bottom Depth (m)	Shut-in Time	BHT (°C)
section 1	1	6/24/87 2:00	6/24/87 10:30	3197	8:30	92.2
	2	6/24/87 2:00	6/24/87 15:00	3197	13:00	96.7
section 2	1	8/17/87 13:00	8/18/87 2:15	5682	13:15	154.4
	2	8/17/87 13:00	8/18/87 21:30	5682	32:30	168.9
section 3	1	12/24/87 21:00	12/25/87 11:14	6999	14:14	197.8
	2	12/24/87 21:00	12/25/87 23:00	6999	26:00	205.6
	3	12/24/87 21:00	12/26/87 15:00	6998	42:00	208.9
section 4	1	1/31/88 21:30	2/1/88 10:26	7295	12:56	210.0
	2	1/31/88 21:30	2/1/88 15:00	7291	17:30	211.1
	3	1/31/88 21:30	2/1/88 22:00	7296	24:30	213.9

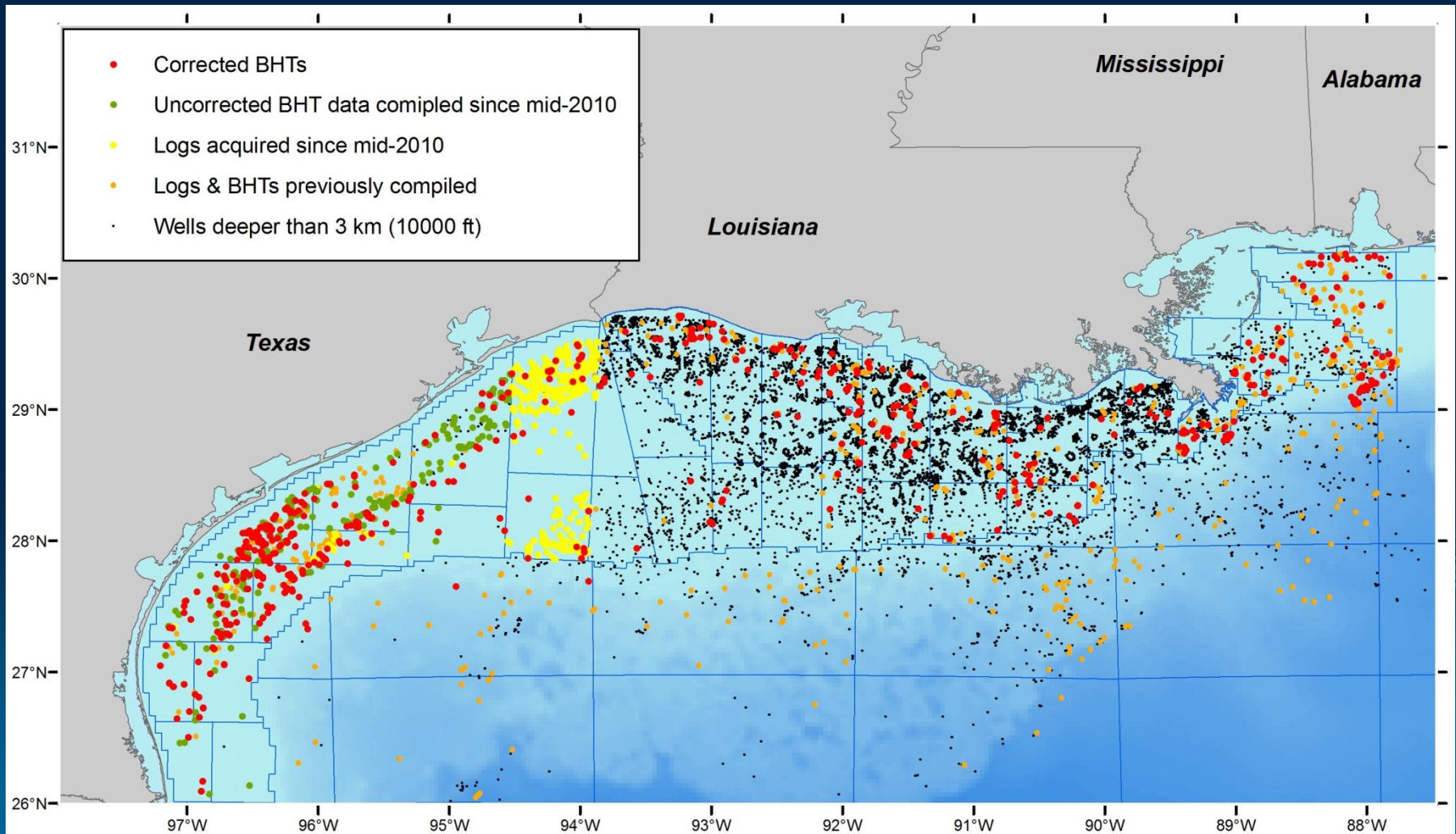
The pre-drilling (true) formation temperature can be higher than the reported BHT by anywhere between 3° C to 30° C.



Mobile 999 OCS-G7863 Well #1

Status of the Data Compilation Effort: June 6, 2011

- Nearly 1000 corrected BHTs obtained from ~750 wells
- Wire-line logs and other well data from ~2900 wells
- Data coverage for the Texas Continental Shelf near completion



In geographic information systems (GIS), all data are linked to features on maps. Multiple databases can be cross-referenced via a common attribute or mapped feature.

The screenshot shows the ArcMap interface with a map of well locations. Two data tables are overlaid on the map:

Attributes of Uncorrected BHTs (May 2011)

API	NAME_SU	WELL_NAM	FIELD_NAME	OPERATOR	LEASE_NUM	SPUD_DATE	RKB_ELEV	TD_MD	S_NORTHIN	TVD	S_EASTIN
427124001570	ST00BP00	A001	MU085A	105 G03061	19760607	90	12824	5480	11794	304	
427124003570	ST00BP00	A006	MU085A	105 G03061	19781111	98	12687	10342	11647	30E	
427124003500	ST00BP02	A006	MU085A	105 G03061	19790515	98	13960	10342	12794	30E	
427124004100	ST00BP00	A008	MU085A	105 G03061	19800326	98	14417	5480	13096	30E	
427124004700	ST00BP00	A009	MU085A	105 G03061	19801003	98	13001	5487	12692	30E	
427124011200	ST00BP00	A012	MU085A	105 G03061	19951101	127	11265	10352	10666	304	
427124012300	ST00BP00	A013	MU085A	105 G03061	20060424	124	11409	5493	11101	30E	
427124012500	ST00BP00	A014	MU085A	105 G03061	20071204	130	10456	5491	10115	30E	
427124012502	ST00BP02	A014	MU085A	105 G03061	20080207	130	11417	5491	11100	30E	
427124008900	ST00BP00	B002	MU085A	105 G03061	19860521	62	11858	4978	11706	62E	
427124009200	ST00BP00	B004	MU085A	105 G03061	19861122	124	12020	4976	11450	62E	
427124009201	ST01BP00	B004	MU085A	105 G03061	19870111	124	11937	4976	11443	62E	
427124004500	ST00BP00	005	MU085A	115 G03062	19800326	68	11130	6323	11010	81	
427124006200	ST00BP00	A001	MU090A	276 G03065	19821229	114	16060	8593	13001	86E	
427124005700	ST00BP02	A007	MU111A	105 G03068	19820625	108	12267	6321	11585	52E	
427124007800	ST00BP00	A013	MU111A	105 G03068	19840601	110	13641	6318	12288	53E	
427124010600	ST00BP00	A015	MU111A	105 G03068	19930722	111	12813	6311	12000	53E	
427124005100	ST00BP00	B001	MU111A	981 G04699	19820314	73	11851	1750	11682	61	
427124009500	ST00BP00	B004	MU111A	105 G08092	19871016	104	12290	1768	11585	61	
427124012000	ST00BP00	001	MU111A	2421 G21304	20041223	110	19537	2619	19529	25E	
427124012001	ST00BP01	001	MU111A	2421 G21304	20040430	110	18559	2619	18552	25E	

Selected Attributes of Uncorrected BHTs_PS_to_GA

File_Name	Lease_Area	Addition	Block	API	Depth	BHT	Depth1	BHT1	Depth2	BHT2	Depth3	BHT3	Depth4	BHT4	Depth5	BHT5	Depth6	BHT6	Depth7
mu000592.tif	MU	A	90	427124006200	1222	100	4892	138	7808	174	9270	196	11488	244	13996	242	15270	262	16056

A typical procedure for a quick analysis using the corrected BHT database in GIS

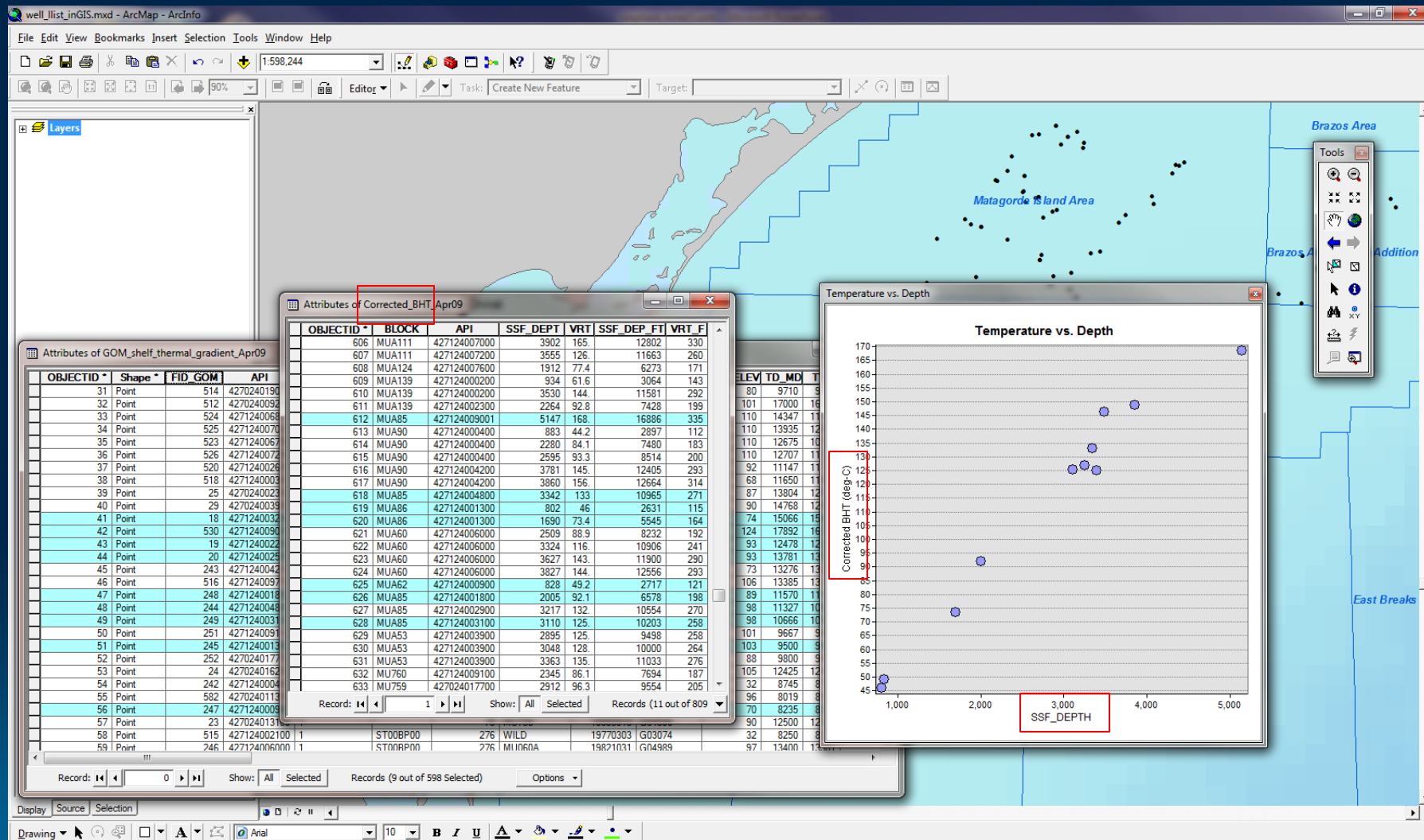
Step 1: Find an area of your interest and locate the wells in it.

Step 2: Obtain the information on the wells themselves.

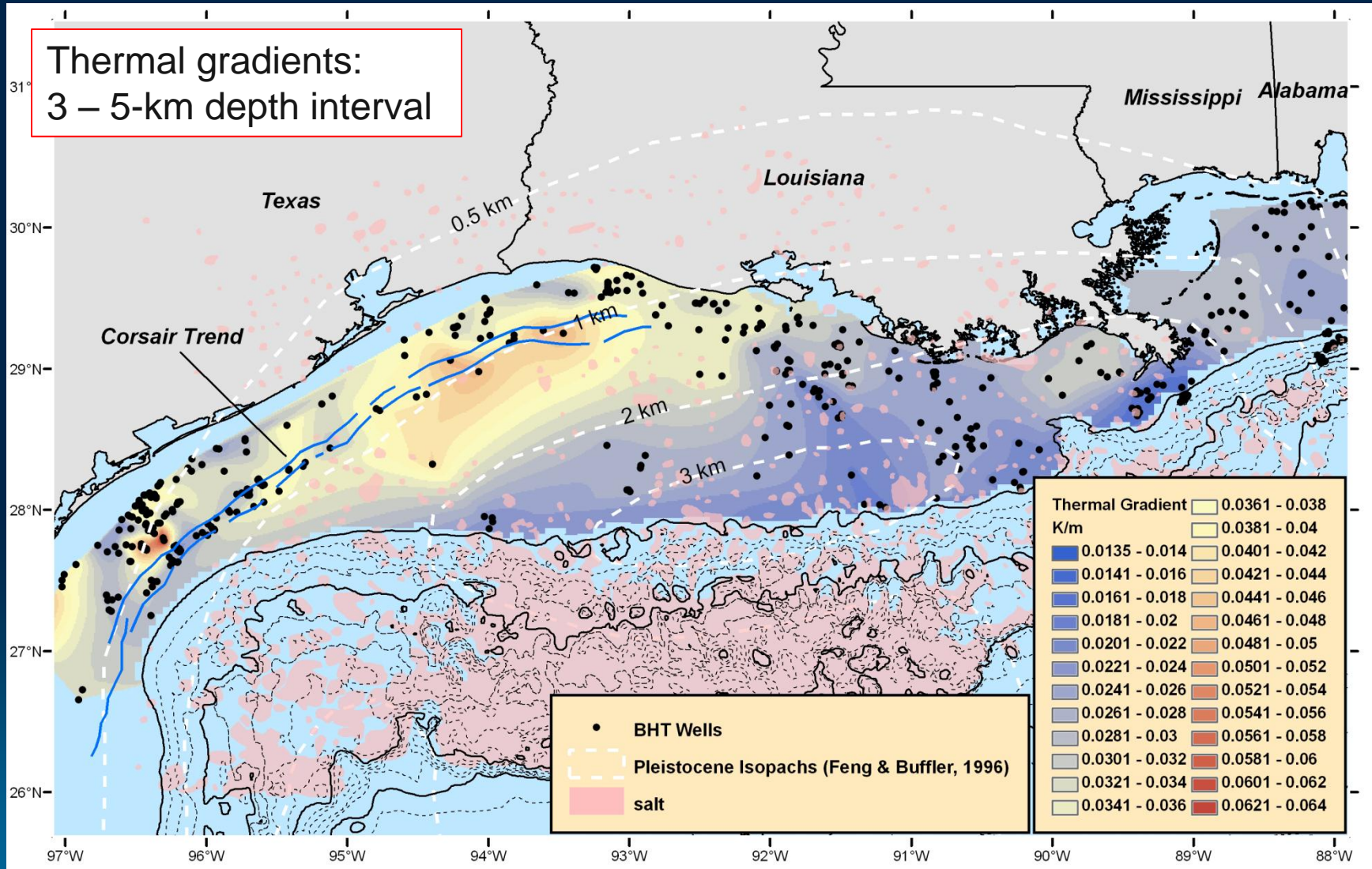
The screenshot shows the ArcGIS interface with a map of the Corpus Christi area. The map displays several well locations as black dots. A red arrow points from a well on the map to its corresponding row in the 'Attributes of GOM_shelf_thermal_gradient_Apr09' table window.

OBJECTID	Shape	FID_GOM	API	WELL_NAME	NAME_SU	OPERATOR	FIELD_NAME	SPUD_DAT	LEASE_NU	RKB_ELEV	TD_MD	TVD	S_NOR
31	Point	514	427024019001	1	ST01BP00	1046	WILD	19931013	G10169	80	9710	9512	
32	Point	512	427024009200	1	ST00BP01	114	WILD	19840312	G06016	101	17000	16970	
33	Point	524	427124006800	A010	ST00BP00	105	MU111A	19830704	G03068	110	14347	11616	
34	Point	525	427124007000	A011	ST00BP00	105	MU111A	19831005	G03068	110	13935	12988	
35	Point	523	427124006700	A002	ST00BP00	105	MU111A	19830501	G03068	110	12675	10744	
36	Point	526	427124007200	A012	ST00BP00	105	MU111A	19840327	G03068	110	12707	11394	
37	Point	520	427124002600	1	ST00BP00	105	MU111A	19780107	G03068	92	11147	11138	
38	Point	518	427124000300	3	ST00BP00	115	WILD	19751124	G03067	68	11650	11650	
39	Point	25	427024002300	1	ST00BP00	105	MU757	19770930	G03022	87	13804	12612	
40	Point	29	427024003900	1	ST00BP04	232	WILD	19801029	G03724	90	14768	12888	
41	Point	18	427124003200	4	ST00BP00	981	MU085A	19780701	G03061	74	15066	15066	
42	Point	530	427124009001	B003	ST01BP00	105	MU085A	19860914	G03061	124	17892	16314	
43	Point	19	427124002200	3	ST00BP00	115	MU085A	19770319	G03062	93	12478	12270	
44	Point	20	427124002500	4	ST00BP00	115	MU085A	19770723	G03062	93	13781	13359	
45	Point	243	427124004200	2	ST00BP00	276	MU090A	19800101	G03065	73	13276	13276	
46	Point	516	427124009700	1	ST00BP00	565	MU090A	19880303	G08986	106	13385	13385	
47	Point	248	427124001800	A002	ST00BP01	105	MU085A	19761122	G03061	89	11570	11570	
48	Point	244	427124004800	A010	ST00BP00	105	MU085A	19810329	G03061	98	11327	10968	
49	Point	249	427124003100	A004	ST00BP00	105	MU085A	19780819	G03061	98	10666	10599	
50	Point	251	427124009100	1	ST00BP00	81	WILD	19860827	G04694	101	9667	9667	
51	Point	245	427124001300	1	ST00BP01	115	MU085A	19761225	G03062	103	9500	9500	
52	Point	252	427024017700	1	ST00BP00	992	MU759	19891108	G08972	88	9800	9800	
53	Point	24	427024016200	1	ST00BP00	846	MU756	19880728	G05986	105	12425	12406	
54	Point	242	427124000400	1	ST00BP00	276	MU090A	19760204	G03065	32	8745	8736	
55	Point	582	427024011300	A001	ST00BP00	48	MU754	19841220	G05985	96	8019	8018	
56	Point	247	427124000900	1	ST00BP00	115	WILD	19760211	G03068	70	8235	8235	
57	Point	23	427024013100	1	ST00BP00	78	MU738	19850918	G04596	90	12500	12500	
58	Point	515	427124002100	1	ST00BP00	276	WILD	19770303	G03074	32	8250	8250	
59	Point	246	427124006000	1	ST00BP00	276	MU060A	19821031	G04989	97	13400	13381	

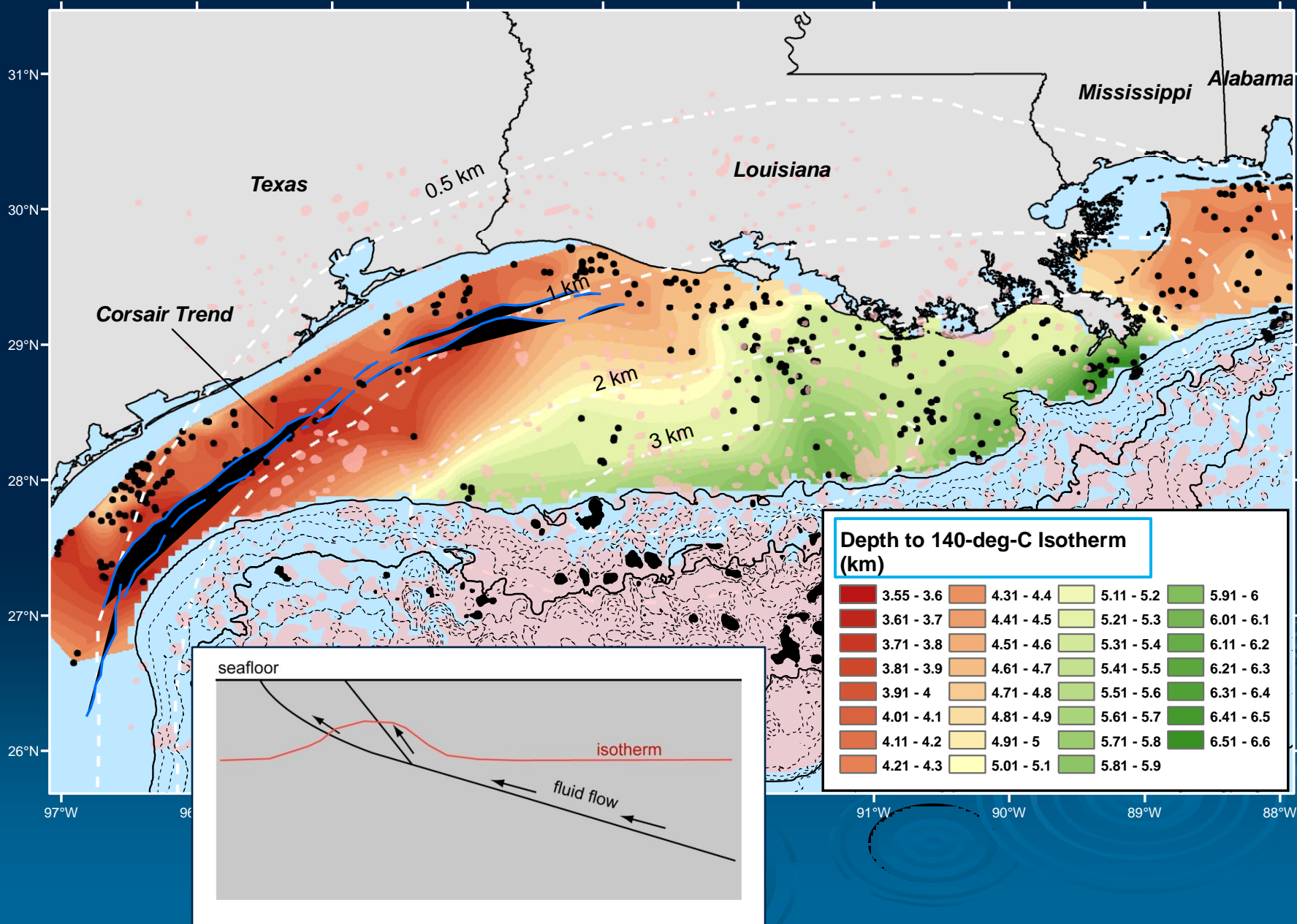
Step 3: Find the corrected BHTs for the wells in a cross-referenced database.
 Step 4: Make a temperatures vs. depth graph.



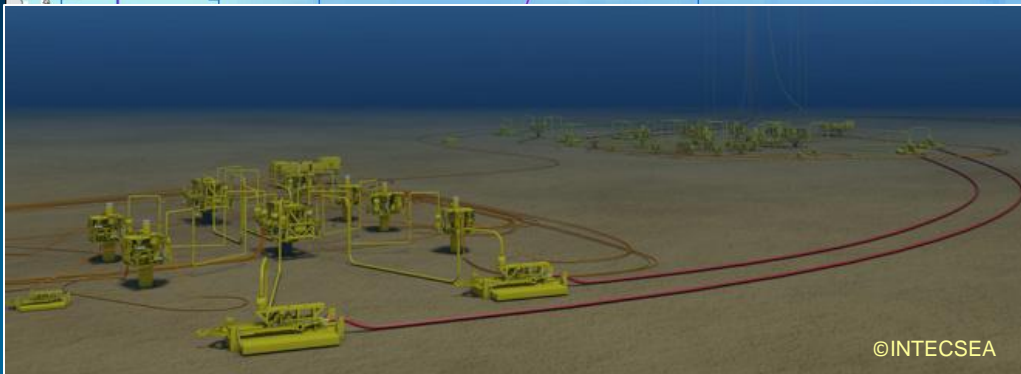
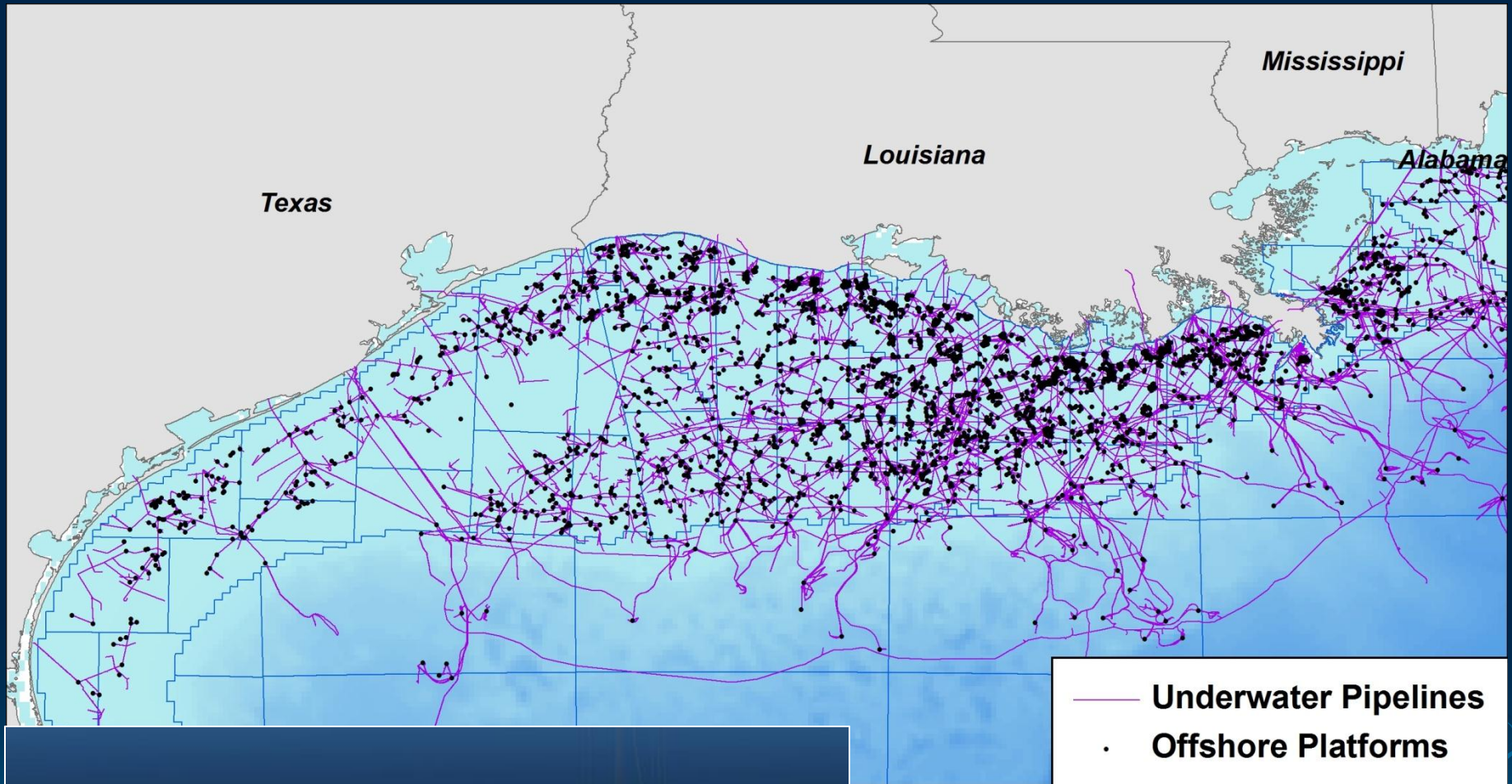
Step 5: Derivative databases are generated from the Corrected BHT and other databases.



Isotherms are elevated in the vicinity of the Corsair growth fault zone.



Energy production infrastructure is already in place.



Hard-working students at Texas Tech Geosciences Department



This project is supported by the US Department of Energy.

