

Assessment of Undiscovered Conventional Oil and Gas Resources of South America and the Caribbean, 2012

Using a geology-based assessment methodology, the U.S. Geological Survey estimated means of 126 billion barrels of oil and 679 trillion cubic feet of undiscovered natural gas in 31 geologic provinces of South America and the Caribbean.

Introduction

The U.S. Geological Survey (USGS) assessed the potential for undiscovered conventional oil and gas fields within priority geologic provinces of South America and the Caribbean as part of the USGS World Petroleum Resources Project (fig. 1). Thirty-one geologic provinces were assessed in this study, which represents a complete re-assessment of the South America–Caribbean region published in 2000 (U.S. Geological Survey World Energy Assessment Team, 2000).

The methodology for the assessment included a complete geologic framework description for each province based mainly on published literature and definition of petroleum systems and assessment units (AU) within these systems. Exploration and discovery history was a critical part of the methodology to determine sizes and numbers of undiscovered accumulations. In those AUs with few or no discoveries, geologic and production analogs were used to estimate sizes and numbers of undiscovered oil and gas accumulations. Each assessment unit was assessed for undiscovered oil and nonassociated gas accumulations, and co-product ratios were used to calculate the volumes of associated gas (gas in oil fields) and volumes of natural gas liquids. This assessment is for conventional oil and gas resources only; unconventional resource assessments (shale gas, shale oil, tight gas) for this region are being completed in a separate study.

The provinces assessed in this study represent a wide range of tectonic settings and evolution, stratigraphic fill, thermal evolution, petroleum systems, and exploration history. There are many provinces in this region that have been maturely explored, such as Maracaibo Basin, Neuquen Basin, Magallanes

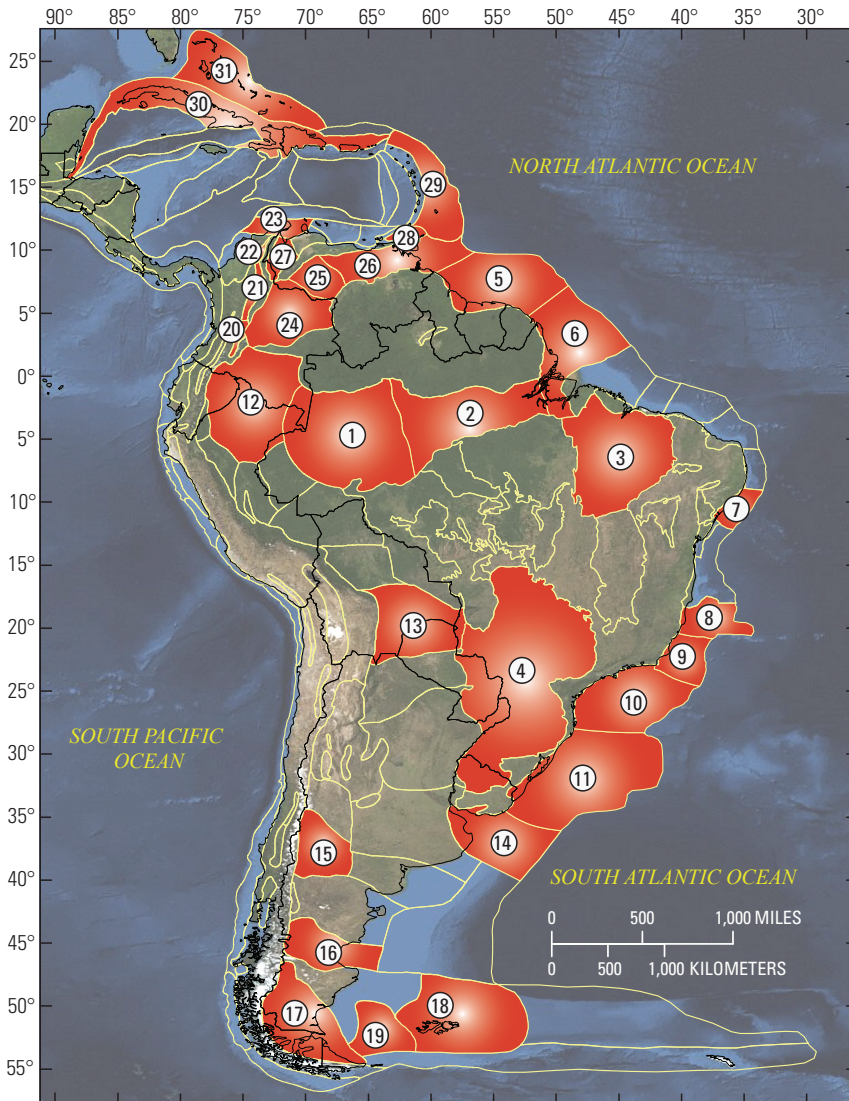


Figure 1. Locations of 31 provinces of South America and Caribbean assessed in this study. Province numbers and names are included in table 1.

Basin, and Llanos Basin, whereas several provinces have few or no discoveries, such as Salado-Punta del Este, Parnaiba, and Bahama Platform. The range of resource estimates for each province reflects the geologic uncertainty.

Resource Summary

The USGS assessed undiscovered conventional oil and gas resources in assessment units within 31 geologic provinces (table 1). For undiscovered resources, the mean totals are as follows: (1) 125,900 million barrels of oil (MMBO), with a range from 44,556 to 261,862 MMBO; (2) 678,537 billion cubic feet of gas (BCFG), with a range from 229,547 to 1,476,008 BCFG; and (3) 21,001 million barrels of natural gas liquids (MMBNGL), with a range from 6,850 to 46,581 MMBNGL.

Table 1. South America and Caribbean assessment results for undiscovered, technically recoverable oil, gas, and natural gas liquids.

[MMBO, million barrels of oil; BCFG, billion cubic feet of gas; MMBNGL, million barrels of natural gas liquids. Results shown are fully risked estimates. For gas accumulations, all liquids are included as NGL (natural gas liquids). Undiscovered gas resources are the sum of nonassociated and associated gas. F95 represents a 95-percent chance of at least the amount tabulated; other fractiles are defined similarly. Fractiles are additive under assumption of perfect positive correlation. Gray shading indicates not applicable]

Map location number	Province name	Province code	Field type	Total undiscovered resources											
				Oil (MMBO)				Gas (BCFG)				NGL (MMBNGL)			
				F95	F50	F5	Mean	F95	F50	F5	Mean	F95	F50	F5	Mean
1	Solimoes Basin	6011	Oil	260	536	1,018	574	2,108	4,358	8,316	4,673	45	104	229	116
			Gas				9,420	17,317	31,363	18,454	260	478	867	509	
2	Amazonas Basin	6012	Oil	130	330	742	369	1,057	2,684	6,061	3,005	22	63	168	75
			Gas				2,709	6,024	12,734	6,648	75	166	351	184	
3	Parnaiba Basin	6016	Oil	1,397	2,786	5,201	2,972	11,357	22,662	42,414	24,197	247	542	1,137	598
			Gas				8,342	16,628	31,114	17,759	230	459	860	490	
4	Parana Basin	6020	Oil	188	400	770	429	1,527	3,250	6,275	3,492	32	76	175	86
			Gas				3,240	6,215	11,364	6,610	140	272	502	289	
5	Guyana-Suriname Basin	6021	Oil	5,167	12,494	25,981	13,608	6,998	18,284	45,230	21,196	186	490	1,244	574
			Gas				4,253	9,887	20,664	10,836	111	262	561	289	
6	Foz do Amazonas Basin	6022	Oil	201	583	1,511	684	251	848	2,638	1,075	7	23	73	29
			Gas				16,136	31,742	58,701	33,786	813	1,600	2,963	1,704	
7	Sergipe-Alagoas Basin	6029	Oil	561	1,684	4,425	1,986	1,203	3,683	10,227	4,435	72	223	635	271
			Gas				644	2,704	11,729	3,902	38	163	709	236	
8	Espirito Santo Basin	6034	Oil	334	1,329	5,508	1,908	638	2,697	11,840	4,011	10	49	235	76
			Gas				3,285	10,983	39,831	14,803	107	386	1,485	536	
9	Campos Basin	6035	Oil	1,924	7,807	44,836	14,736	1,192	10,256	95,243	27,560	28	297	2,896	829
			Gas				115	1,142	22,502	5,302	4	36	703	167	
10	Santos Basin	6036	Oil	23,839	54,434	113,392	59,689	56,405	131,477	291,722	147,515	1,668	3,853	8,514	4,309
			Gas				10,203	43,103	182,998	62,305	302	1,284	5,448	1,857	
11	Pelotas Basin	6037	Oil	244	664	1,736	782	557	1,526	4,090	1,817	34	93	249	110
			Gas				8,104	17,505	34,141	18,817	173	378	754	410	
12	Putamayo-Oriente-Maranon Basin	6041	Oil	3,157	4,585	6,633	4,698	1,411	2,092	3,061	2,144	37	56	82	57
			Gas				0	0	0	0	0	0	0	0	
13	Santa Cruz-Tarija Basin	6045	Oil	60	111	196	118	249	475	866	505	5	11	19	11
			Gas				11,091	24,012	47,595	26,016	468	1,033	2,156	1,137	
14	Salado-Punta del Este Basin	6054	Oil	643	1,752	4,064	1,975	1,471	4,058	9,503	4,593	89	246	580	279
			Gas				8,129	19,910	43,735	22,180	173	432	960	482	
15	Neuquen Basin	6055	Oil	153	311	591	334	206	446	955	497	4	9	21	10
			Gas				1,511	3,427	7,230	3,777	23	53	116	59	
16	San Jorge Basin	6058	Oil	33	63	116	67	23	46	93	51	0	1	2	1
			Gas				95	195	373	210	2	4	7	4	
17	Magallanes Basin	6059	Oil	60	163	501	205	134	379	1,249	497	2	5	15	6
			Gas				2,747	5,510	10,412	5,896	73	159	339	176	
18	Falklands Plateau	6060	Oil	1,457	4,413	12,224	5,302	3,215	9,837	28,575	12,060	40	125	372	154
			Gas				10,584	32,885	88,316	38,940	257	820	2,478	1,024	
19	Malvinas Basin	6063	Oil	38	118	307	138	85	277	774	333	1	3	10	4
			Gas				2,560	5,394	10,227	5,760	67	156	333	172	
20	Upper Magdalena Basin	6089	Oil	163	357	729	390	225	502	1,077	556	5	10	22	11
			Gas				81	358	1,424	499	1	5	22	8	
21	Middle Magdalena Basin	6090	Oil	238	495	959	534	384	840	1,850	942	6	13	29	15
			Gas				131	490	1,831	666	2	7	28	10	
22	Lower Magdalena Basin	6091	Oil	15	66	286	97	45	199	867	293	1	4	18	6
			Gas				971	2,584	6,211	2,951	70	189	470	218	
23	Guarija Basin	6095	Oil	6	36	208	63	18	108	629	190	0	2	13	4
			Gas				578	1,982	5,554	2,385	12	41	118	50	
24	Llanos Basin	6096	Oil	957	2,418	5,215	2,665	1,702	4,545	11,008	5,219	55	151	376	175
			Gas				599	2,350	8,789	3,184	61	245	943	338	
25	Barinas-Apure Basin	6097	Oil	90	398	1,567	551	7	29	114	40	0	1	2	1
			Gas				42	400	3,447	887	0	4	35	9	
26	East Venezuela Basin	6098	Oil	1,138	2,944	7,126	3,379	3,837	9,914	24,081	11,410	82	214	538	249
			Gas				11,269	26,387	55,483	28,938	301	729	1,605	810	
27	Maracaibo Basin	6099	Oil	340	838	1,822	929	637	1,693	4,178	1,959	26	69	174	80
			Gas				1,584	4,938	13,934	5,969	45	142	401	172	
28	Tobago Trough	6103	Oil	0	0	0	0	0	0	0	0	0	0	0	0
			Gas				6,558	14,554	29,048	15,742	22	54	140	65	
29	Barbados Accretionary Prism	6107	Oil	22	92	498	154	33	168	1,028	310	1	6	39	12
			Gas				4,184	12,550	32,009	14,599	92	289	783	344	
30	North Cuba Basin of Greater Antilles Deformed Belt	6117	Oil	1,185	4,301	9,364	4,660	1,865	7,558	17,961	8,432	163	709	1,825	814
			Gas				141	862	3,418	1,190	7	44	185	63	
31	Bahamas Platform	6119	Oil	554	1,591	4,336	1,906	692	2,028	5,736	2,467	42	126	362	155
			Gas				705	2,723	12,170	4,051	11	45	212	70	
Total conventional resources				44,556	108,098	261,862	125,900	229,547	571,684	1,476,008	678,537	6,850	17,507	46,581	21,001

Of the mean oil total of 125,900 MMBO, about 44 percent (55,601 MMBO) is estimated to be in subsalt reservoirs in the Santos, Campos, and Espirito Santo Basin Provinces, with most undiscovered subsalt oil estimated to be in the Santos Basin Province. In addition, several provinces are estimated to have significant undiscovered conventional oil potential, including the Guyana–Suriname Basin Province (mean of 13,608 MMBO); Falklands Plateau Province (mean of 5,302 MMBO); Putumayo–Oriente–Maranon Basin Province (mean of 4,698 MMBO); North Cuba Basin Province (mean of 4,660 MMBO); and the Parnaiba Basin Province (mean of 2,972 MMBO).

For the mean undiscovered conventional gas total of 678,537 BCFG, about 55 percent (374,956 BCFG) is estimated to be in five provinces: (1) Santos Basin Province (mean of 209,820 BCFG); (2) Falklands Plateau Province (mean of 51,000 BCFG), (3) Parnaiba Basin Province (mean of 41,956 BCFG), (4) East Venezuela Basin Province (mean of 40,348 BCFG), and (5) Guyana–Suriname Basin Province (mean of 32,032 BCFG).

Reference Cited

U.S. Geological Survey World Energy Assessment Team, 2000, U.S. Geological Survey world petroleum assessment 2000—Description and results: U.S. Geological Survey Digital Data Series DDS-60, 4 CD-ROMs.

For Further Information

Supporting studies of the geologic models and the methodology used in the assessment of South America and Caribbean provinces are in progress. Assessment results are available at the USGS Energy Program website, <http://energy.usgs.gov/oilgas/>.



Eocene turbidites of the Scotland District, Barbados. Photograph by C.J. Schenk, U.S. Geological Survey, 2011.



Cliffs of carbonate rock along the east coast of the island of Barbados. Photograph by C.J. Schenk, U.S. Geological Survey, 2011.

South America–Caribbean Assessment Team

Christopher J. Schenk, Michael E. Brownfield, Ronald R. Charpentier, Troy A. Cook, Timothy R. Klett, Mark A. Kirschbaum, Janet K. Pitman, Richard M. Pollastro, and Marilyn E. Tennyson.