Chapter RH

ASSESSMENT HIERARCHY AND INITIAL PROVINCE RANKING

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ASSESSMENT HIERARCHY AND INITIAL PROVINCE RANKING

For the U.S. Geological Survey's World Petroleum Assessment 2000 project, the world was divided into a hierarchical series of geographic and geologic units in order to organize, evaluate, and delineate assessment areas. These units are regions, geologic provinces, total petroleum systems, and assessment units. Regions serve as organizational units and geologic provinces are used as prioritization tools. *Regions and geologic provinces are not used as fundamental assessment entities in the formal assessment procedure*, although results are aggregated at these scales.

The total petroleum system (TPS) and assessment unit (AU) are the geologic entities for which assessments of undiscovered oil and gas volumes were made. These are delineated within each of the geologic provinces that are considered for assessment. The boundaries of TPS's and AU's need not be entirely contained within a single geologic province because petroleum may migrate across geologic-province boundaries.

A numeric code identifies each region, geologic province, TPS, and AU. These codes are used consistently throughout this assessment project and serve to identify a specific unit in any of the related publications. The code is as follows:

Region, single digit	**3**
Geologic Province, three digits to the right of region code	3**162**
Total Petroleum System, two digits to the right of province code	3162**05**
Assessment Unit, two digits to the right of total petroleum system code	316205**04**

Regions

For assessment purposes, the world's land areas were divided into eight regions (fig. RH-1) that approximate those used by the U.S. State Department and the U.S. Department of Energy. Each of the following regions was assigned a coordinator and staff responsible for assessment: 1, Former Soviet Union; 2, Middle East and North Africa; 3, Asia Pacific; 4, Europe; 5, North America; 6, Central and South America; 7, Sub-Saharan Africa and Antarctica; and 8, South Asia (fig. RH-1).

Geologic Provinces

Geologic provinces were defined by the USGS to encompass all the world's major land areas and adjoining water to depths of at least 2,000 m. Each geologic province is an area having characteristic dimensions of perhaps hundreds to thousands of kilometers encompassing a natural geologic entity (for example, sedimentary basin, thrust belt, delta) or some combination of contiguous geologic entities. Province boundaries were drawn along natural geologic boundaries, although in the open oceans, they are sometimes located at an arbitrary water depth.

Geologic provinces were defined from geologic maps and available published literature. Digital maps were then compiled from this information. Geologic provinces of the United States were established in the 1995-1996 U.S. Department of the Interior National Oil and Gas Assessment (Gautier and others, 1995; Lore and others, 1996).

Worldwide, 937 geologic provinces were identified. Figure RH-1 shows the geologic-province outlines for each of the eight regions. A four-digit numeric code, in which the first digit represents the region, and a descriptive name were given to each. Table RH-1 lists the geologic provinces that contain discovered

petroleum (406 geologic provinces) in addition to 5 geologic provinces that are considered petroliferous although no discoveries have yet been made.

Total Petroleum Systems

The TPS is a mappable entity encompassing genetically related petroleum that occurs in seeps, shows, and accumulations (discovered or undiscovered) that have been generated by a pod or by closely related pods of mature source rock. In addition, the TPS contains the essential mappable geologic elements (source, reservoir, seal, and overburden rocks) that controlled fundamental processes of generation, migration, entrapment, and preservation of petroleum. Particular emphasis is placed on the similarities of the fluids of accumulations within TPS's, unlike geologic provinces in which similarities of the rocks are emphasized. Total petroleum systems were delineated using information and data found in the literature, proprietary databases, and personal communication with petroleum-industry representatives. A composite TPS, a mappable entity encompassing all or a portion of two or more TPS's, was defined to facilitate petroleum-resource assessment, in cases where fields within an AU were thought to be charged by more than one source rock.

The TPS was chosen as the foundation for petroleum-resource assessments for the following reasons, (1) the TPS offers a practical approach that standardizes and focuses the gathering and communication of relevant geologic knowledge; (2) it is an element based on geology and geochemistry that can be scientifically tested; (3) petroleum geologists are generally familiar with the criteria used to identify and map TPS's; (4) new information that improves the understanding of the TPS can be incorporated into an assessment; and (5) because a TPS accounts for all hydrocarbons (discovered and undiscovered) that emanate from a single pod or

closely related pods of mature source rock it is a naturally occurring, fluid-based element on which to base an assessment.

Assessment Units

An AU is a mappable volume of rock within a TPS that encompasses fields (discovered and undiscovered) which share similar geologic traits and socio-economic factors (such as current political and economic environments, onshore or offshore, infrastructure, administrative boundaries, and so on). The fields within an AU should constitute a sufficiently homogeneous population so that the chosen methodology of resource assessment is applicable. A TPS might equate to a single AU, but can be subdivided into two or more AU's if necessary in order that each AU is sufficiently homogeneous to assess individually. However, every geologic or socio-economic heterogeneity within a TPS cannot be separated into an individual AU. Assessment units commonly contain inherent heterogeneities and, because of lack of data, there may be a need to generalize. In such cases, petroleum-accumulation density and exploration concepts are not extrapolated across the entire AU.

Assessment units are the basic entity for which the input data form was completed (Chapter AM) and for which sizes and number of undiscovered fields were forecast. They also serve as the basic entity for which assessment results were calculated.

INITIAL PROVINCE RANKING

The primary geologic provinces to be examined for assessment were selected by ranking the 937 identified geologic provinces in terms of total known petroleum volumes (as billion barrels of oil equivalent or BBOE) and selecting those that contain the greatest volumes. Of the 937 identified geologic provinces, 354

provinces outside of the U.S. and 52 within the U.S. contain known petroleum volumes (table RH-1).

Known petroleum volume is defined as cumulative production plus remaining reserves. Natural gas is accommodated in this definition by the term "barrels of oil equivalent" (BOE), where 6,000 ft^3 of natural gas (CFG) equals 1 BOE. Total known petroleum volume is the sum of the volumes of oil, in barrels; natural gas (combined non-associated gas and associated-dissolved gas), in terms of its energy equivalent in barrels of oil; and natural gas liquids (NGL), in barrels. The following material was drawn from Klett and others (1997).

Geologic provinces were ranked in two ways, one including U.S. provinces and the other without U.S. provinces. The World Petroleum Assessment 2000 is exclusive of the U.S. The U.S. was previously assessed and the estimated resources published in 1995 (Gautier and others, 1995; Lore and others, 1996). The ranking and the percent of the world's volume of total known petroleum volume for each petroliferous geologic province are shown in table RH-1. The relative rank of 52 U.S. provinces are also shown in table RH-1. Figure RH-2 shows percent cumulative total known petroleum volume as a function of province rank for geologic provinces exclusive of the U.S. Figure RH-3 shows the volumes of total known petroleum in the 100 top-ranked geologic provinces exclusive of the U.S.

Those geologic provinces that together represent 95 percent of the world's total known petroleum volume exclusive of the U.S., are here called priority provinces, and comprise a group of 76 provinces that were analyzed for the World Petroleum Assessment 2000. Initially, an additional 26 geologic provinces were chosen to be considered for assessment analysis for a variety of geologic,

political, technical, or geographic reasons and are identified as boutique provinces. Figure RH-1 highlights the locations of the initially defined priority and boutique provinces.

Boutique provinces rank below the priority provinces in terms of total known petroleum (table RH-1). Most of the boutique provinces contain some known volume of petroleum. During the course of the assessment process, some of the initially chosen boutique provinces (listed in table RH-1) were not analyzed, but others were added (especially in South America).

Database and Allocation of Petroleum Resources to Geologic Provinces

About 32,000 fields contained in three oil and gas production databases purchased by the USGS (Petroconsultants, 1996; NRG Associates, Inc., 1995a, 1995b) were allocated to world regions and then to geologic provinces. This allocation was based on the location of the field's center point using geographic information systems (GIS) applications. All subsequent statistics rely on data contained in these databases.

Field data for United States onshore areas and State waters are from the Significant Oil and Gas Fields of the United States database (NRG Associates, Inc., 1995a) and are current through 1992. Canadian field data are from the Significant Oil and Gas Pools of Canada database (NRG Associates, 1995b) and are current through 1993. All other field data are from the Petroleum Exploration and Production Database (Petroconsultants, 1996) and are current through 1995. Province-level data for U.S. Federal offshore areas are from Minerals Management Service (Lore and others, 1996) and are current through 1994.

Relationship of Ranking to Undiscovered Resources

The world geologic-province ranking of table RH-1 provided a quantitative rationale for selecting provinces for the assessment of potential undiscovered petroleum resources. For depicting the relative potential for new-field discoveries, however, a ranking scheme that includes estimates of undiscovered resources is provided in the data analysis chapter (AR).

Use of total known petroleum volume as a basis for ranking geologic provinces has at least two advantages: (1) provinces that have contributed greatly to the world's energy supply, and have thus been of direct or indirect significance to United States economic security, emerge as high priority; and (2) mature provinces where undiscovered resources are close to well-developed infrastructure, and where marginal costs will be low, tend to be ranked relatively high.

Most petroleum endowment occurs in a small number of geologic provinces (figs. RH-2 and RH-3). The bulk of the undiscovered petroleum resources also is most likely to occur in these same provinces. Stated overly simply, the ranking of geologic provinces according to total known petroleum volume embodies the idea that "acorns are found near oak trees." Some boutique-province designations focus attention on those frontier areas where the existence of a substantial petroleum endowment is suspected but not yet established in the form of total known petroleum volume. Others focus attention on areas that might be of particular political, economic, or strategic significance to the United States.

The world province ranking of table RH-1 is based on currently known petroleum volumes--volumes that have not been adjusted for future reserve growth. The possibilities for changes in relative ranking that might be caused by different reserve-growth rates among geologic provinces are mitigated somewhat because many of the world's large fields were discovered more than two decades ago and have already experienced significant reserve growth.

An alternative ranking system might be based on remaining reserves rather than known petroleum volumes. Such a ranking system would lower the relative ranking of mature geologic provinces that have large cumulative production. However, the problem of inadequately ranking relatively unexplored geologic provinces in which most or all of the petroleum resource is undiscovered would still not be solved. In such geologic provinces, little oil or gas has been produced to date, and total known petroleum volume essentially equals remaining reserves.

SUMMARY

A hierarchical series of geographic and geologic units was derived in order to guide the U.S. Geological Survey World Petroleum Assessment 2000. The ranking of geologic provinces served to direct the assessment to those areas of the world that have the highest potential for petroleum resources. Total petroleum systems and assessment units provide a geologic basis on which to conduct the assessment.

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Petroconsultants, 1996, Petroleum exploration and production database: Houston, Texas, Petroconsultants, Inc.; database available from Petroconsultants, Inc., P.O. Box 740619, Houston, TX 77274-0619 USA.

Table RH-1. Initial ranking of world geologic provinces that contain oil and gas by total known petroleum volumes. [The ranking given in the first column includes all geologic provinces. The ranking in the second column is exclusive (excl.) of United States provinces. The 76 provinces that contain 95 percent of the world's known petroleum volume (exclusive of the U.S.) are called priority provinces. Plots shown in figures RH-2 and RH-3 were constructed using these rankings.]

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
1	1	1174	West Siberian Basin	Priority	14.3	14.3
2	2	2024	Mesopotamian Foredeep Basin	Priority	13.8	28.1
3	3	2021	Greater Ghawar Uplift	Priority	7.7	35.8
4	4	2030	Zagros Fold Belt	Priority	7.6	43.4
5	5	2019	Rub Al Khali Basin	Priority	4.9	48.3
6	6	2022	Qatar Arch	Priority	3.7	52.0
7	7	1015	Volga-Ural Region	Priority	3.3	55.3
8	8	4025	North Sea Graben	Priority	3.1	58.4
9		5047	Western Gulf			
10		5044	Permian Basin			
11	9	6099	Maracaibo Basin	Priority	2.2	60.6
12	10	7192	Niger Delta	Priority	2.1	62.7
13	11	6098	East Venezuela Basin	Priority	2.1	64.8
14	12	1016	North Caspian Basin	Priority	1.8	66.6
15	13	2043	Sirte Basin	Priority	1.7	68.4
16	14	5305	Villahermosa Uplift	Priority	1.7	70.1
17	15	1154	Amu-Darya Basin	Priority	1.6	71.7
18		5097	Gulf Cenozoic OCS			
19	16	5243	Alberta Basin	Priority	1.3	73.0
20	17	3127	Bohaiwan Basin	Priority	1.1	74.1
21	18	4035	Northwest German Basin	Priority	1.0	75.1
22	19	2058	Grand Erg/Ahnet Basin	Priority	1.0	76.1
23	20	1112	South Caspian Basin	Priority	1.0	77.1
24		5001	Northern Alaska			
25		5058	Anadarko Basin			

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
26	21	2054	Trias/Ghadames Basin	Priority	0.8	77.9
27	22	1008	Timan-Pechora Basin	Priority	0.8	78.7
28	23	2023	Widyan Basin-Interior Platform	Priority	0.8	79.5
29	24	7203	West-Central Coastal	Priority	0.7	80.1
30		5010	San Joaquin Basin			
31		5048	East Texas Basin			
32	25	3144	Songliao Basin	Priority	0.6	80.8
33		5049	Louisiana-Mississippi Salt Basins			
34	26	3702	Greater Sarawak Basin	Priority	0.6	81.4
35	27	1109	Middle Caspian Basin	Priority	0.6	81.9
36	28	3808	Central Sumatra Basin	Priority	0.6	82.5
37	29	3701	Baram Delta/Brunei-Sabah Basin	Priority	0.5	83.0
38	30	8043	Bombay	Priority	0.5	83.5
39	31	4036	Anglo-Dutch Basin	Priority	0.5	84.0
40	32	2056	Illizi Basin	Priority	0.5	84.5
41	33	3703	Malay Basin	Priority	0.5	85.0
42		5043	Palo Duro Basin			
43	34	3817	Kutei Basin	Priority	0.5	85.5
44	35	1050	South Barents Basin	Priority	0.5	86.0
45	36	1009	Dnieper-Donets Basin	Priority	0.5	86.4
46	37	3948	Northwest Shelf	Priority	0.5	86.9
47	38	6035	Campos Basin	Priority	0.4	87.3
48	39	2071	Red Sea Basin	Priority	0.4	87.8
49		5014	Los Angeles Basin			
50		5022	San Juan Basin			
51	40	5301	Tampico-Misantla Basin	Priority	0.3	88.1
52		5045	Bend Arch-Fort Worth Basin			
53	41	6096	Llanos Basin	Priority	0.3	88.4

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
54	42	4061	Carpathian-Balkanian Basin	Priority	0.3	88.7
55	43	3115	Junggar Basin	Priority	0.3	89.0
56	44	6041	Putumayo-Oriente-Maranon Basin	Priority	0.3	89.2
57	45	2020	Interior Homocline-Central Arch	Priority	0.3	89.5
58	46	5244	Williston Basin, Canada	Priority	0.3	89.8
59	47	2016	Fahud Salt Basin	Priority	0.3	90.0
60	48	3930	Gippsland Basin	Priority	0.2	90.3
61	49	6055	Neuquen Basin	Priority	0.2	90.5
62	50	1322	North Sakhalin Basin	Priority	0.2	90.8
63	51	1210	Nepa-Botuoba Arch	Priority	0.2	91.0
64	52	4017	Vestford-Helgeland	Priority	0.2	91.3
65	53	3822	North Sumatra Basin	Priority	0.2	91.5
66	54	6059	Magallanes Basin	Priority	0.2	91.7
67	55	2048	Pelagian Basin	Priority	0.2	91.9
68	56	4057	Transylvanian Basin	Priority	0.2	92.1
69	57	2014	Ghaba Salt Basin	Priority	0.2	92.3
70	58	3824	Northwest Java Basin	Priority	0.2	92.5
71	59	4048	Pannonian Basin	Priority	0.2	92.7
72		5013	Ventura Basin			
73	60	3828	South Sumatra Basin	Priority	0.2	92.9
74	61	2004	Ma 'Rib-Al Jawf/Masila Basin	Priority	0.2	93.1
75	62	6045	Santa Cruz-Tarija Basin	Priority	0.2	93.2
76	63	6058	San Jorge Basin	Priority	0.2	93.4
77		5037	Southwestern Wyoming			
78		5064	Illinois Basin			
79	64	6103	Tobago Trough	Priority	0.2	93.5
80		5061	Southern Oklahoma			
81	65	1108	Azov-Kuban Basin	Priority	0.1	93.7

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
82	66	4047	North Carpathian Basin	Priority	0.1	93.8
83	67	8034	Assam	Priority	0.1	94.0
84	68	4060	Po Basin	Priority	0.1	94.1
85		5062	Arkoma Basin			
86		5055	Nemaha Uplift			
87	69	8042	Indus	Priority	0.1	94.3
88		5033	Powder River Basin			
89	70	6090	Middle Magdalena	Priority	0.1	94.4
90	71	3913	Browse Basin	Priority	0.1	94.5
91	72	3910	Bonaparte Gulf Basin	Priority	0.1	94.6
92		5034	Big Horn Basin			
93		5053	Cambridge Arch-Central Kansas Uplift			
94	73	5245	Rocky Mountain Deformed Belt	Priority	0.1	94.8
95	74	1150	North Ustyurt Basin	Priority	0.1	94.9
96	75	5304	Saline-Comalcalco Basin	Priority	0.1	95.0
97	76	5215	Labrador-Newfoundland Shelf	Priority	0.1	95.1
98		5031	Williston Basin, U.S.			
99	77	8025	Sulaiman-Kirthar		0.1	95.2
100		5003	Southern Alaska			
101	78	6043	Madre dos Dios Basin		0.1	95.3
102		5020	Uinta-Piceance Basin			
103	79	8048	Irrawaddy	Boutique	0.1	95.4
104	80	1175	Yenisey-Khatanga Basin		0.1	95.5
105	81	2070	Mediterranean Basin		0.1	95.6
106	82	2012	East Flank Oman Sub-basin		0.1	95.7
107	83	8047	Ganges-Brahmaputra Delta	Boutique	0.1	95.8

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
108	84	3966	New Guinea Foreland Basin-Fold Belt		0.1	95.9
109	85	4033	German-Polish Basin		0.1	96.0
110	86	4044	Pyrenean Foothills-Ebro Basin		0.1	96.1
111		5060	Cherokee Platform			
112	87	2011	South Oman Salt Basin		0.1	96.2
113	88	6081	Talara Basin		0.1	96.3
114	89	3805	Bintuni/Sulawati Province		0.1	96.3
115		5063	Michigan Basin			
116	90	3507	Thai Basin		0.1	96.4
117	91	3142	Sichuan Basin	Boutique	0.1	96.5
118	92	1214	Lena-Vilyuy Basin		0.1	96.6
119		5012	Santa Maria Basin			
120	93	6032	Reconcavo Basin		0.1	96.6
121	94	4030	Irish Sea		0.1	96.7
122	95	3924	Eromanga Basin		0.1	96.8
123		5039	Denver Basin			
124	96	3154	Tarim Basin	Boutique	0.1	96.9
125	97	3809	East Java Basin	Boutique	0.1	96.9
126	98	3031	Taranaki Basin		0.1	97.0
127	99	3128	Ordos Basin	Boutique	0.1	97.1
128	100	5300	Burgos Basin		0.1	97.1
129	101	4019	Faeroes-Shetland-Orkney Basin	Boutique	0.1	97.2
130	102	3825	Penyu/West Natuna Basin	Boutique	0.1	97.2
131	103	4015	Hammerfest-Varanger Basin		0.1	97.3
132		5009	Sacramento Basin			
133	104	2039	North Egypt Basin		0.1	97.4
134		5036	Wyoming Thrust Belt			

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
135	105	4046	Bohemia		0.1	97.4
136	106	3505	Saigon Basin	Boutique	0.1	97.5
137	107	1156	Afghan-Tajik Basin		0.1	97.5
138	108	3159	Yingehai Basin		0.1	97.6
139	109	1209	Angara-Lena Terrace	Boutique	0.1	97.7
140	110	4051	Alps		0.1	97.7
141	111	3605	Palawan Shelf		0.1	97.8
142	112	2074	Khleisha Uplift		0.1	97.8
143	113	2089	Anah Graben		0.1	97.9
144	114	6051	Cuyo Basin		0.1	97.9
145	115	7146	Sud	Boutique	0.1	98.0
146	116	1059	Ludlov Saddle		0.1	98.0
147	117	2038	Abu Gharadiq Basin		0.1	98.1
148	118	2075	Euphrates/Mardin		0.1	98.1
149		5059	Sedgwick Basin			
150	119	5306	Macuspana Basin		<0.1	98.2
151	120	3503	Mekong/Cuulong/Vung Tau Basin		<0.1	98.2
152	121	6092	Eastern Cordillera Basin		<0.1	98.3
153	122	2045	Murzuk Basin		<0.1	98.3
154		5035	Wind River Basin			
155	123	1159	Fergana Basin	Boutique	<0.1	98.4
156	124	7303	Orange River Coastal	Boutique	<0.1	98.4
157	125	3606	Pamusian Tarakan Basin		<0.1	98.5
158	126	6097	Barinas-Apure Basin		<0.1	98.5
159	127	6089	Upper Magdalena		<0.1	98.5
160	128	2047	Hamra Basin		<0.1	98.6
161	129	1207	Baykit Arch	Boutique	<0.1	98.6
162	130	6029	Sergipe-Alagoas Basin		<0.1	98.6
163		5028	North-Central Montana			
164		5021	Paradox Basin			

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
165	131	5217	Scotian Shelf		<0.1	98.7
166	132	4040	Anglo-Paris Basin		<0.1	98.7
167	133	4058	Adriatic Basin		<0.1	98.7
168	134	6027	Potigar Basin		<0.1	98.8
169	135	1167	South Turgay Basin		<0.1	98.8
170	136	3130	Pearl River Mouth Basin		<0.1	98.8
171	137	7363	South African Coastal		<0.1	98.9
172	138	7255	Somali		<0.1	98.9
173	139	3126	Nanyang Basin		<0.1	98.9
174	140	8026	Kohat-Potwar		<0.1	98.9
175	141	3147	Subei Yellow Sea Basin		<0.1	99.0
176		5011	Central Coastal			
177	142	6095	Guajira Basin		<0.1	99.0
178	143	2077	Palmyra Zone		<0.1	99.0
179	144	2009	Masila-Jeza Basin		<0.1	99.1
180	145	4066	Sicily		<0.1	99.1
181	146	3131	Qaidam Basin		<0.1	99.1
182	147	7343	Mozambique Coastal	Boutique	<0.1	99.1
183	148	7183	Gulf of Guinea	Boutique	<0.1	99.2
184	149	1010	Pripyat Basin		<0.1	99.2
185	150	6036	Santos Basin		<0.1	99.2
186	151	4049	Molasse Basin		<0.1	99.2
187	152	3308	Niigata Basin		<0.1	99.2
188	153	6011	Solimoes Basin		<0.1	99.3
189		5065	Black Warrior Basin			
190	154	1165	Chu-Sarysu Basin		<0.1	99.3
191	155	8045	Krishna-Godavari		<0.1	99.3
192	156	2035	Nile Delta Basin		<0.1	99.3
193	157	1105	North Crimea Basin		<0.1	99.3
194	158	4021	Baltic Depression		<0.1	99.3
195	159	1113	Kura Basin		<0.1	99.4
196	160	2046	Fezzan Uplift		<0.1	99.4

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
197	161	3969	Papuan Basin-Shelf Platform		<0.1	99.4
198	162	4045	Aquitaine Basin		<0.1	99.4
199	163	3304	Japan Volcanic Arc/Accreted Terrane		<0.1	99.4
200	164	3151	Taiwan Thrust and Fold Belt		<0.1	99.4
201	165	4026	Ireland-Scotland Platform		<0.1	99.5
202	166	6107	Lesser Antilles Deformed Belt		<0.1	99.5
203	167	3109	East China Sea Basin		<0.1	99.5
204	168	6100	Falcon Basin		<0.1	99.5
205	169	4062	Tuscany-Latium-Paola		<0.1	99.5
206	170	3103	Beibuwan Basin		<0.1	99.5
207	171	5246	Mackenzie Foldbelt		<0.1	99.5
208	172	4083	Iberic Cordillera		<0.1	99.5
209	173	6091	Lower Magdalena		<0.1	99.6
210	174	3181	South China Continental Shelf Slope		<0.1	99.6
211	175	3112	Jianghan Basin		<0.1	99.6
212	176	7273	Tanzania Coastal		<0.1	99.6
213	177	4064	West Black Sea Basin		<0.1	99.6
214	178	3958	Surat Basin		<0.1	99.6
215		5098	Gulf Mesozoic OCS			
216	179	5225	Algonquin Arch-Michigan Basin		<0.1	99.6
217		5066	Cincinnati Arch			
218	180	5323	Sabinas Basin		<0.1	99.6
219	181	6083	Progreso Basin		<0.1	99.7
220	182	3903	Amadeus Basin		<0.1	99.7
221	183	5317	Chicontepec Basin		<0.1	99.7
222	184	2015	Central Oman Platform		<0.1	99.7

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
223	185	7136	Benue		<0.1	99.7
224	186	6040	Ucayali Basin		<0.1	99.7
225	187	4016	Baltic Shield-Norwegian Caledonides		<0.1	99.7
226	188	3114	Jiuquan Minle Wuwei Basin		<0.1	99.7
227	189	5302	Veracruz Basin	Boutique	<0.1	99.7
228	190	6102	Cariaco Basin		<0.1	99.7
229	191	3306	Kanto Basin		<0.1	99.7
230	192	2006	Shabwah Basin		<0.1	99.8
231	193	3508	Thailand Mesozoic Basin Belt		<0.1	99.8
232	194	3110	Erlian Basin		<0.1	99.8
233		5056	Forest City Basin			
234	195	3950	Otway Basin		<0.1	99.8
235	196	3156	Turpan Basin		<0.1	99.8
236	197	6046	Oran-Olmedo Basin		<0.1	99.8
237	198	4023	Horda-Norwegian-Danish Basin		<0.1	99.8
238	199	2031	Zagros Thrust Zone		<0.1	99.8
239	200	6034	Espirito Santo Basin		<0.1	99.8
240	201	3804	Barito Basin		<0.1	99.8
241	202	6026	Caera Basin		<0.1	99.8
242	203	4075	Aegean		<0.1	99.8
243	204	6022	Foz do Amazonas Basin		<0.1	99.8
244	205	8044	Cauvery		<0.1	99.8
245	206	2033	Sinai Basin		<0.1	99.9
246	207	7066	Chad		<0.1	99.9
247	208	3124	Luxi Jiaoliao Uplift		<0.1	99.9
248		5040	Las Animas Arch			
249	209	3952	Perth Basin		<0.1	99.9
250	210	3833	Sumatra/Java Magmatic Arc		<0.1	99.9

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
251	211	3502	Khorat Platform		<0.1	99.9
252	212	3146	South China Fold Belt		<0.1	99.9
253		5050	Florida Peninsula			
254	213	3135	Qinling Dabieshan Fold Belt		<0.1	99.9
255	214	4055	Rhine Graben		<0.1	99.9
256	215	1011	Russian Craton Margin		<0.1	99.9
257	216	3806	Bone Basin		<0.1	99.9
258		5067	Appalachian Basin			
259	217	4011	Svalbard High		<0.1	99.9
260	218	3611	Sulu Sea Basin		<0.1	99.9
261	219	1300	Anadyr Basin		<0.1	99.9
262	220	3153	Taixinan Basin		<0.1	99.9
263	221	2081	Lesser Caucasus		<0.1	99.9
264	222	3907	Bass Basin		<0.1	99.9
265	223	3803	Banda Arc		<0.1	99.9
266	224	5242	Northern Interior Basins		<0.1	99.9
267	225	2085	Thrace/Samsun		<0.1	99.9
268	226	3832	Sumatra/Java Fore-Arc Basins		<0.1	99.9
269		5054	Salina Basin			
270	227	3303	Ishikari Hidaka Basin		<0.1	99.9
271	228	6021	Guyana-Suriname Basin		<0.1	99.9
272	229	3316	Tsushima Basin		<0.1	99.9
273	230	3301	Akita Basin		<0.1	99.9
274	231	2026	Jafr-Tabuk Basin		<0.1	99.9
275	232	3916	Carnarvon Basin		<0.1	99.9
276	233	8023	Central Afghanistan		<0.1	99.9
277		5019	Eastern Great Basin			
278	234	5332	Salton Trough		<0.1	99.9
279	235	3161	Yunnan Guizhou Hubei Fold Belt		<0.1	99.9
280	236	1158	Tian Shan Foldbelt		<0.1	99.9

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
281	237	2032	Levantine Basin		<0.1	99.9
282	238	2061	Ougarta Uplift		<0.1	100.0
283		5029	Southwest Montana			
284	239	2076	Haleb		<0.1	100.0
285	240	2053	Atlas Uplift		<0.1	100.0
286	241	2029	Wadi-Surhan Basin	Boutique	<0.1	100.0
287	242	4077	Alentejo-Guadalquivir Basin		<0.1	100.0
288	243	3207	Temtsag Hailar Basin		<0.1	100.0
289	244	3821	North Banda Basin		<0.1	100.0
290	245	3305	Joban Basin		<0.1	100.0
291	246	8006	Tenasserim-Shan		<0.1	100.0
292	247	5310	Sierra Madre de Chiapas-Peten Foldbelt		<0.1	100.0
293	248	1051	Kola Monocline-Finnmark Platform		<0.1	100.0
294	249	4012	Central Barents Platform		<0.1	100.0
295	250	2072	Rif Basin		<0.1	100.0
296	251	1203	Tunguska Basin		<0.1	100.0
297	252	3819	Meratus High		<0.1	100.0
298	253	4038	Munsterland Basin		<0.1	100.0
299	254	6063	Malvinas Basin		<0.1	100.0
300		5024	Northern Arizona			
301	255	4070	Spanish Trough-Cantabrian Zone		<0.1	100.0
302	256	2064	Essaouni Basin		<0.1	100.0
303	257	3829	Sulawesi Accretionary Prism		<0.1	100.0
304	258	3160	Yinshan Da and Xiao Hingganling Uplift		<0.1	100.0
305	259	3162	Zhangguangcailing Uplift		<0.1	100.0

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
306	260	1328	Tatar Strait Basin		<0.1	100.0
307		5007	Northern Coastal			
308	261	3125	Nanpanjiang Depression		<0.1	100.0
309	262	1311	West Kamchatka Basin		<0.1	100.0
310	263	3802	Bali Basin		<0.1	100.0
311	264	6033	Bahia Sul Basin		<0.1	100.0
312		5038	Park Basins			
313	265	7013	Senegal	Boutique	<0.1	100.0
314	266	3118	Kunlunshan Fold Belt		<0.1	100.0
315	267	3609	Reed Bank Basin		<0.1	100.0
316	268	3204	Gobi Basin		<0.1	100.0
317	269	1103	Dobrogea Foreland		<0.1	100.0
318	270	3810	East Natuna Basin		<0.1	100.0
319	271	3823	Northern Irian Jaya Waropen Basin		<0.1	100.0
320	272	4027	Midland Valley-Forth Approaches Basin		<0.1	100.0
321	273	1211	Cis-Patom Foredeep	Boutique	<0.1	100.0
322	274	2060	Reggane Basin		<0.1	100.0
323	275	3113	Jiangnan South Jiangsu Fold Belt		<0.1	100.0
324	276	5320	Parras Basin		<0.1	100.0
325	277	3911	Bowen Basin		<0.1	100.0
326	278	3140	Shanxi Plateau		<0.1	100.0
327	279	7373	Morondava		<0.1	100.0
328	280	2101	Arabian Shield		<0.1	100.0
329	281	4013	Barents Continental Slope		<0.1	100.0
330	282	4028	Mid-North Sea High		<0.1	100.0
331	283	8005	Indo-Burman		<0.1	100.0
332	284	8002	Himalayan		<0.1	100.0
333		5004	Western Oregon-Washington			

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
334		5046	Marathon Thrust Belt			
335	285	2007	Sharmah Rift Basin		<0.1	100.0
336	286	1302	Khatyrka Basin		<0.1	100.0
337	287	5308	Yucatan Platform		<0.1	100.0
338	288	2040	Cyrenaica Uplift		<0.1	100.0
339	289	3310	Ryukyu Volcanic Arc		<0.1	100.0
340	290	3815	Java/Banda Sea		<0.1	100.0
341	291	6023	Santana Platform		<0.1	100.0
342	292	6074	Central Chile Forearc Basin		<0.1	100.0
343	293	6031	Tucano Basin		<0.1	100.0
344	294	3312	Sea Of Japan Backarc Basin		<0.1	100.0
345	295	3914	Canning Basin		<0.1	100.0
346	296	1204	Turukhan-Norilsk Folded Zone		<0.1	100.0
347	297	1111	Rioni Basin		<0.1	100.0
348	298	6012	Amazonas Basin		<0.1	100.0
349	299	2079	Adana/Sivas		<0.1	100.0
350	300	3149	Taihangshan Yanshan Fold Belt		<0.1	100.0
351	301	2052	Tellian Foredeep		<0.1	100.0
352	302	3602	Cagayan Basin		<0.1	100.0
353	303	3816	Ketuneau/Sintang Terrane		<0.1	100.0
354	304	1327	Aniva Basin		<0.1	100.0
355	305	3007	Great South Basin		<0.1	100.0
356	306	8035	North Burma		<0.1	100.0
357	307	3801	Arafura Basin-Irian Jaya		<0.1	100.0
358	308	1223	Upper Bureya Basin		<0.1	100.0
359	309	3612	Visayan		<0.1	100.0
360	310	3704	Malay Peninsula		<0.1	100.0

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
361	311	5236	Parry Island Foldbelt		<0.1	100.0
362	312	3102	Altunshan Fold Belt		<0.1	100.0
363	313	3136	Qiongdongnan Basin		<0.1	100.0
364	314	3404	Korba Bay Basin		<0.1	100.0
365	315	2034	South Harrah Volcanics		<0.1	100.0
366		5008	Sonoma-Livermore Basin			
367	316	6020	Parana Basin		<0.1	100.0
368		5027	Montana Thrust Belt			
369	317	4071	Dinaric Alps		<0.1	100.0
370	318	1004	Belorussian-Voronezh High		<0.1	100.0
371	319	3134	Qilianshan Fold Belt		<0.1	100.0
372	320	3959	Sydney Basin		<0.1	100.0
373	321	5321	Coahuila Platform		<0.1	100.0
374	322	4052	Jura		<0.1	100.0
375	323	6025	Barreieinas Basin		<0.1	100.0
376	324	4082	Tajo-Duero Basin		<0.1	100.0
377	325	2078	Beirut		<0.1	100.0
378	326	3608	Philippine Magmatic Arc		<0.1	100.0
379	327	3837	Zambalez/Central Luzon Basin		<0.1	100.0
380	328	3919	Clarence-Moreton Basin		<0.1	100.0
381	329	2050	Tellian Uplift		<0.1	100.0
382	330	3940	Maryborough Basin		<0.1	100.0
383	331	6094	Cesar Basin		<0.1	100.0
384	332	6065	Altiplano Basin		<0.1	100.0
385	333	3021	New Zealand Orogenic Belt		<0.1	100.0
386	334	3311	Sagara Basin		<0.1	100.0
387	335	4043	Massif Central		<0.1	100.0

Table RH-1. Continued

Rank	Rank excl. of U.S.	Geologic province code	Geologic province name	Initial assessment type	Percent of world volume excl. of U.S.	Cum. percent of world volume excl. of U.S.
388	336	5322	Burros Uplift		<0.1	100.0
389	337	2066	Aaiun-Tarfaya Basin		<0.1	100.0
390	338	3108	Cuoqing Lupola Basin		<0.1	100.0
391	339	3929	Georgina Basin		<0.1	100.0
392	340	5314	Jalisco-Oaxaca Platform		<0.1	100.0
393	341	4039	Southwest German Basin		<0.1	100.0
394	342	6069	Temuco Basin		<0.1	100.0
395	343	5316	Trans-Mexican Neovolcanic Axis		<0.1	100.0
396	344	4056	Lion-Camargue		<0.1	100.0
397	345	3122	Lhasa Terrane		<0.1	100.0
398	346	6093	Perija-Venezuela-Coastal Ranges		<0.1	100.0
399	347	5334	Vizcaino Basin		<0.1	100.0
400	348	6010	Tacutu Basin		<0.1	100.0
401	349	8003	Indian Shield		<0.1	100.0
402	350	1018	Mugodzhary-South Emba		0.0	100.0
403	351	1106	Northeast Black Sea Shelf		0.0	100.0
404	352	1153	Karabogaz-Karakum High		0.0	100.0
405	353	5234	Sverdrup Basin	Boutique	0.0	100.0
406	354	5239	Mackenzie Delta		0.0	100.0
*	*	1060	North Barents Basin	Boutique		
*	*	4068	Provence Basin	Boutique		
*	*	5200	East Greenland Rift Basins	Boutique		
*	*	5207	Baffin Basin	Boutique		
*	*	7355	Karoo	Boutique		

* These geologic provinces currently have no known petroleum volume reported in the databases used in this assessment and therefore cannot be ranked.

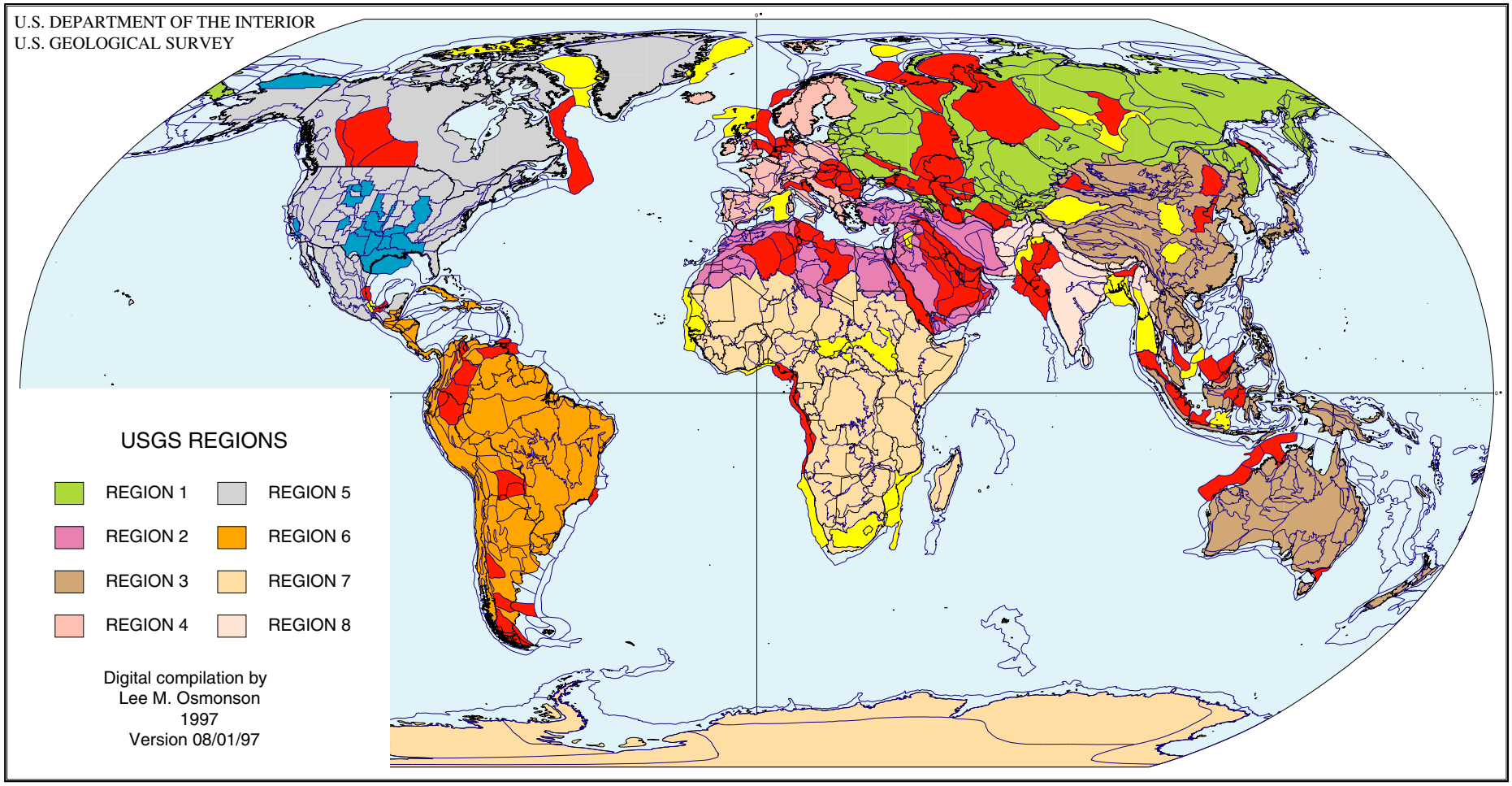

Figure RH-1. Geologic provinces of the world. Provinces highlighted in red are priority provinces, exclusive of the United States; provinces highlighted in yellow are the boutique provinces initially chosen at the onset of the U.S. Geological Survey World Petroleum Assessment 2000; and provinces highlighted in blue are U. S. provinces that rank as high as the priority provinces (from Klett and others, 1997).

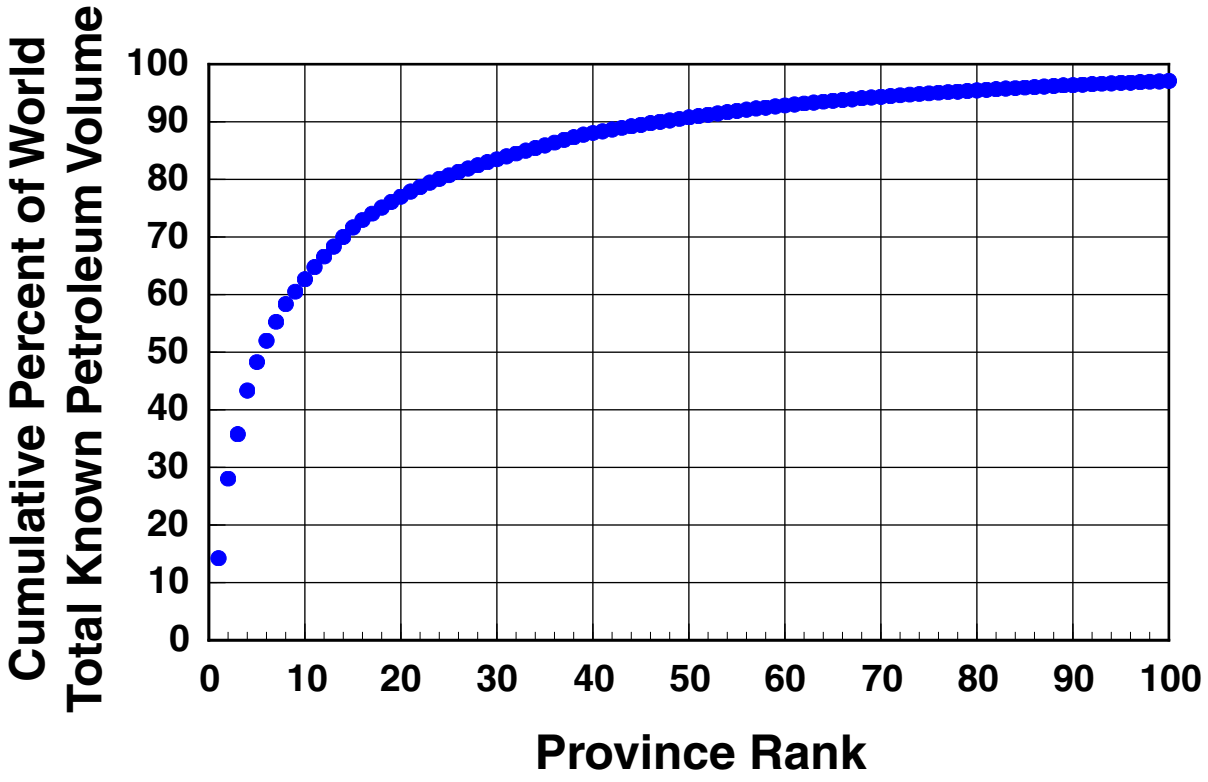

Figure RH-2. Cumulative percent of world total known petroleum volume by the 100 top-ranked geologic provinces (exclusive of the U.S.). For identification of provinces by rank, see table RH-1 (from Klett and others, 1997).

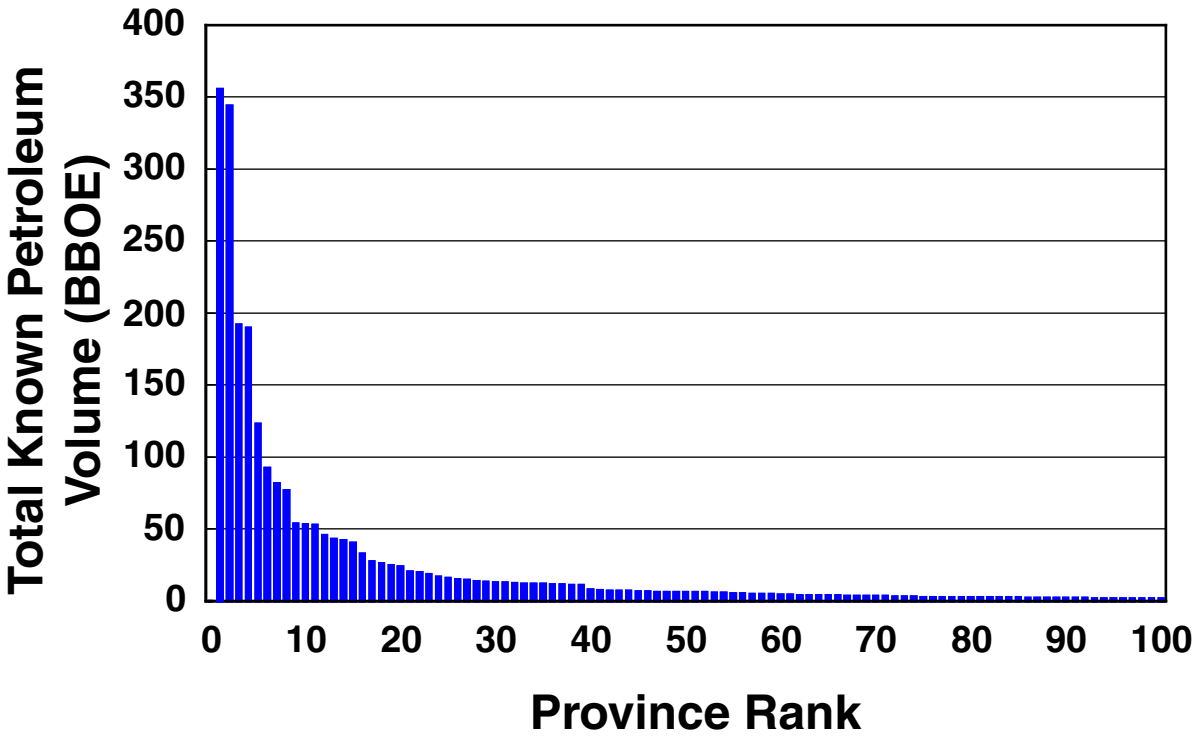

Figure RH-3. Histogram showing volumes of total known petroleum by the 100 top-ranked geologic provinces (exclusive of the U.S.). For identification of provinces by rank, see table RH-1 (from Klett and others, 1997).