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Plenary Session I: Resources

" **Estimates of Oil Reserves** "

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This presentation is a reduced version of a full paper available on IIASA site
The numbers of the graphs below are those of the full paper (100 graphs)

Table of Contents:

-Introduction

-culture of belief in growth, decline is politically incorrect
-Antoine de Saint Exupery wrote: « we do no inherit from our parents, we borrow from our children »
-two schools on reserves:
so-called "Pessimists" = mainly retired geologists or retired CEO, technical data

so-called “Optimists” = mainly economists or governmental agencies, political or financial data
-Reporting data on oil production or oil reserves is a political act.
-US poor practice to report only “Proved Reserves” and to omit probable reserves because the SEC
-90% of US reserve additions = revisions of past discoveries = leads to reserve growth concept
-rest of the world use proven + probable reserves
-technical data confidential, “scout” database very expensive
-missing barrels in production from IEA, impression of abundance = 10$/b 1998
-“Optimists” believe in technology but ignore what technicians say
-bad use of units
-oil was lately presented as minor compared to information and new economy

-1-what oil?
Oil could be
-crude oil 65 Mb/d,
-crude oil + condensate (at wellhead) 68 Mb/d
-crude oil + condensate + NGL (natural gas liquids) at gas processing plants
-petroleum 76 Mb/d crude oil +NGL + synthetic oil + refinery processing gains +other oils + stock withdrawal.
Oil supply is different from oil demand

CGES Mb/d	1998	1999	2000
supply	75.3	74	76.6
demand	73.8	75.2	76.1

In the US, the importance of the NGL (24%) and the processing gain (12%) versus the domestic production has to be noted.
Conventional covers usually primary and secondary recovery for porous and permeable reservoir, identified water contact and oil characteristic (light and medium gravity and not viscous oil).
Unconventional covers unusual reservoir characteristics, enhanced oil recovery (tertiary recovery), extra heavy oils (heavier than water), tarsands (defined by viscosity), tight reservoir, coalbed methane, geopressured aquifers, methane hydrates, oil shales (in fact mainly immature source-rock which should be classified as coal). Some include deepwaters (vary from author from 200 m to 1000 m), ultradeepwaters (over 2000 m), Arctic.
USGS define unconventional as continuous type accumulations where there is no water contact
-1-2-measures?
-1-2-1-volume or weight or energy
Oil could be given either in gallons, barrel, cubic meter, ton, exajoule (EJ= 10E18 J), Btu (quad= quadrillion Btu ≈ EJ)

In UK and France oil and condensate (in fact NGL) are given in ton, but in Norway oil, and condensate are in cubic meter (as Canada) but NGL in ton, in US oil and condensate are in barrel (condensate could be in barrel oil equivalent different from the measured volume). WEA reports gigaton and exajoule, IEA & WEC only gigaton.
The oil density varies between 740 and 1030 kg/m^3 (60°API to 6°API) and could be expressed in barrel per ton. But what is published is disturbing.
OPEC statistics give the conversion of barrel per ton and it is compared to the ratio taken from the production reported both in barrel and ton.

By country	1995	1996	1997	1998	1999	BP 1999
Algeria	7.7741	7.7741	7.7741	7.9448	7.9448	8.7
Indonesia	7.7600	7.7600	7.7600	7.2338	7.2338	7.7
IR Iran	7.3145	7.3145	7.3145	7.2957	7.2840	7.4
Iraq	7.4530	7.4530	7.4530	7.4127	7.4127	7.5
Kuwait	7.2622	7.2460	7.2460	7.246	7.2580	7.4
Libya	7.5876	7.5876	7.5876	7.5584	7.5584	7.6
Nigeria	7.3540	7.3540	7.3540	7.4114	7.4114	7.4
Qatar	7.6058	7.6058	7.6058	7.5898	7.6180	7.8
Saudi Arabia	7.3229	7.3229	7.3229	7.2843	7.2845	7.6
U A E	7.5964	7.5964	7.5964	7.5875	7.5532	8.2
Venezuela	6.9337	6.9488	6.9580	7.3104	7.1210	7.1
Average OPEC	7.3661	7.3671	7.3718	7.3677	7.3464	

OPEC values shows a false or virtual accuracy and political change (no change followed by sudden jumps) and BP values are quite different, as for example Saudi Arabia is not 7.3 b/t but 7.6 b/t, Algeria not 7.9 but 8.7, Indonesia not 7.2 but 7.7.

-1-2-2-Unit

The US is the only country in the world with Burma and Liberia to not use the International system of units (known as SI or metric system)

-barrel: it is not an official unit for oil!

-why 42 gallons? = The Weekly Register, an Oil City newspaper of late August 1866. « We, all producers of crude petroleum on Oil creek, mutually agree and bind ourselves that from this date we will sell no crude by the barrel or package, but by the gallon only. An allowance of two gallons will be made on the gauge of each and every 40 gallons in favour of the buyer. »
The Petroleum Producers Association finally adopted the 42 gallon oil barrel in 1872,by the Census Bureau in 1880 report and passed on in 1882 to the U.S. Geological Survey, U.S. Bureau of Mines and other agencies unto today.

-1-2-3-abbreviations

-Barrel: meaning of bbl?

Barrel is written by many as bbl, but also bl, b, but bw for water, bc for condensate, bo for oil and boe for oil equivalent. In all my papers, I write b, Mb (megabarrel) Gb (gigabarrel), as Gboe
I use also Gb/a where a is the SI symbol for year as « annum »

Most of oilmen use bbl without knowing what it means and why double b? The first b is for blue but there is disagreement on the meaning of this colour:
-colour of Standard of California to distinguish their barrels from other companies
-to identify the right barrel of 42 gallons within the range of 30 to 50 gallon barrels
-to identify the crude oil in blue barrel when the refined product was in red barrels (rbl)
But this practice is more than a century old and there is not one wooden barrel in any museum. Why to keep this obsolete abbreviation and this obsolete barrel when claiming that modern technology rules the oil industry

-Billion of cubic meter or cubic kilometer?

-1-2-4-prefix

thousand: US often M (but Y2K)
million: US often MM (but 128 MB RAM), UK m or mn (unlawful)
billion: US often B (but 10 GB hard disk memory)

-1-2-5-equivalence: 1MWh=0.2 toe or 0.08 toe?

The problem is that different energies can be compared as the necessary input (called primary energy) or as the resulting output (consumed energy). Heat can be in some cases the goal, but in other cases a nuisance that you have to be rid of. As most of electric plants have an efficiency of about 40%, the electric energy can be taken by some countries (and the WEC) as 1 MWh = 0.08 toe (ton oil equivalent) and by others (as France) as 1 MWh= 0.22 toe, as 1 toe = 42 GJ and as 1 MWh= 3.6 GJ = 3.6/42= 0.08 toe, but to produce 1 MWh of electricity 60 % of the oil energy is lost and 2.5 more oil or 0.08*2.5 =0.22 toe are needed.

-2-reports: what is published could be different from technical results!

-2-1-political versus technical data

Publishing data (usually single number by item) on a country or a company is a political act as it depends upon their image the author wants to give. The published data by Oil & Gas Journal (OGJ) is the basis of mainly other database as BP Review. The values come from an enquiry upon the national companies and agencies, but as it is published one or two weeks before the end of the year and the estimates are supposed to be for the end of the year, any serious national agency does not yet the result as they need few weeks or months to do properly the work. It is why many countries do not reply

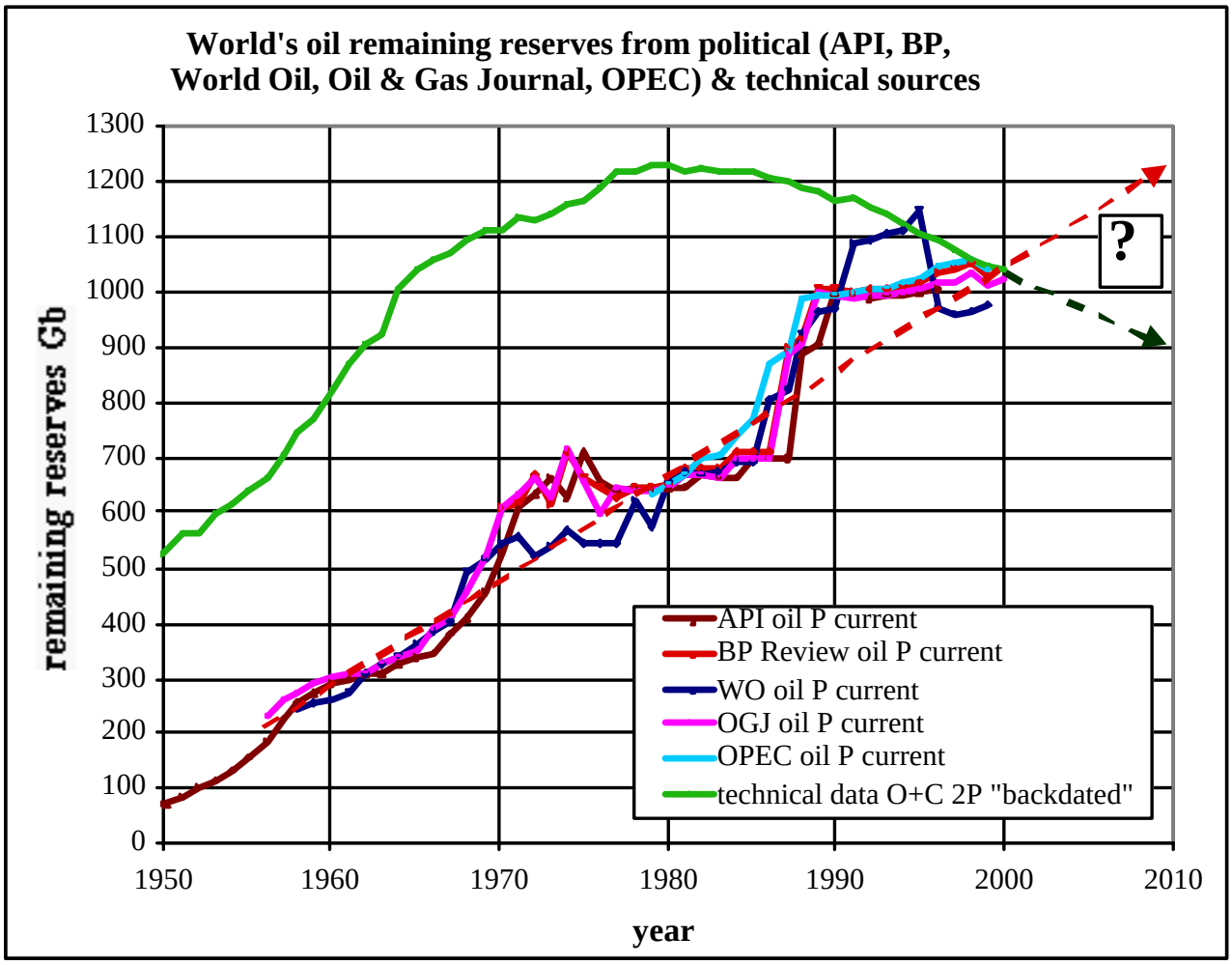
OGJ Dec20, 1999	end	1999	change from 1998		change %	
	O Gb	G Tcf	O Gb	G Tcf	O	G
78 countries	659	4309	0	0	0	0
27 countries	357	836	-18,2	1,3	-4,9	0,2
total	1016	5146	-18,2	1,3	-1,8	0,03
OGJ Dec18, 2000	end	2000	change from 1999		change %	
	O Gb	G Tcf	O Gb	G Tcf	O	G

81 countries	586	4025	0	0	0	0
24 countries	442	1253	12,4	133	2,9	11,9
total	1028	5278	12,4	133	1,2	2,6

For the last result as end of 2000, a large majority of countries (for oil 77% in number and 57% in reserves) show no change: it is a joke! And OGJ does not correct these values later on, when World Oil (WO) waits six months to issue its values and corrects it the following year.

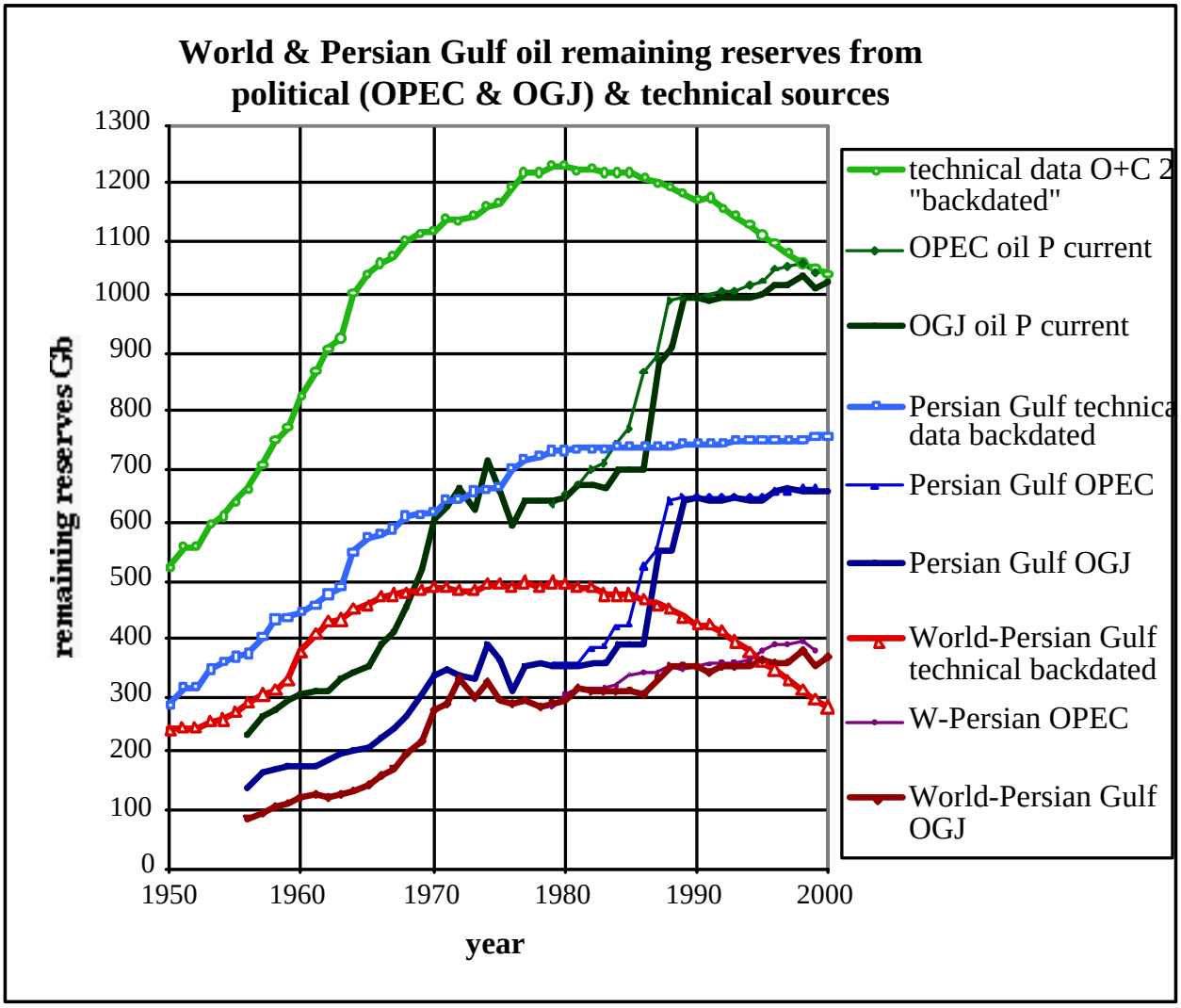
There are two kinds of data: the political reserves (so called proved) reported by OGJ, WO, BP Review, API (American Petroleum Institute), OPEC and the technical reserves (mean values) existing only in confidential database for the world.

Figure 2: Political reserves on the rise, technical reserves on the decline



The swing producers, Saudi Arabia, Kuwait, Iran, Iraq, Abu Dhabi increased their reserves as Venezuela by more than 300 Gb from 1985 and 1990 without any significant discoveries to justify those increases, but fighting for their quotas.

Figure 3: Technical: Persian Gulf steady, rest of the world declining



-2-2-false accuracy

any author giving more than 3 significant digits shows that he is incompetent in assessing accuracy and in probability.

For proved remaining oil reserves at end of 1999

Oil & Gas Journal 1 016 041.221 Mb

World Oil 978 868.2 Mb

BP Review 1 033.8 Gb

The sum of the country proved reserves is not the world proved reserves.

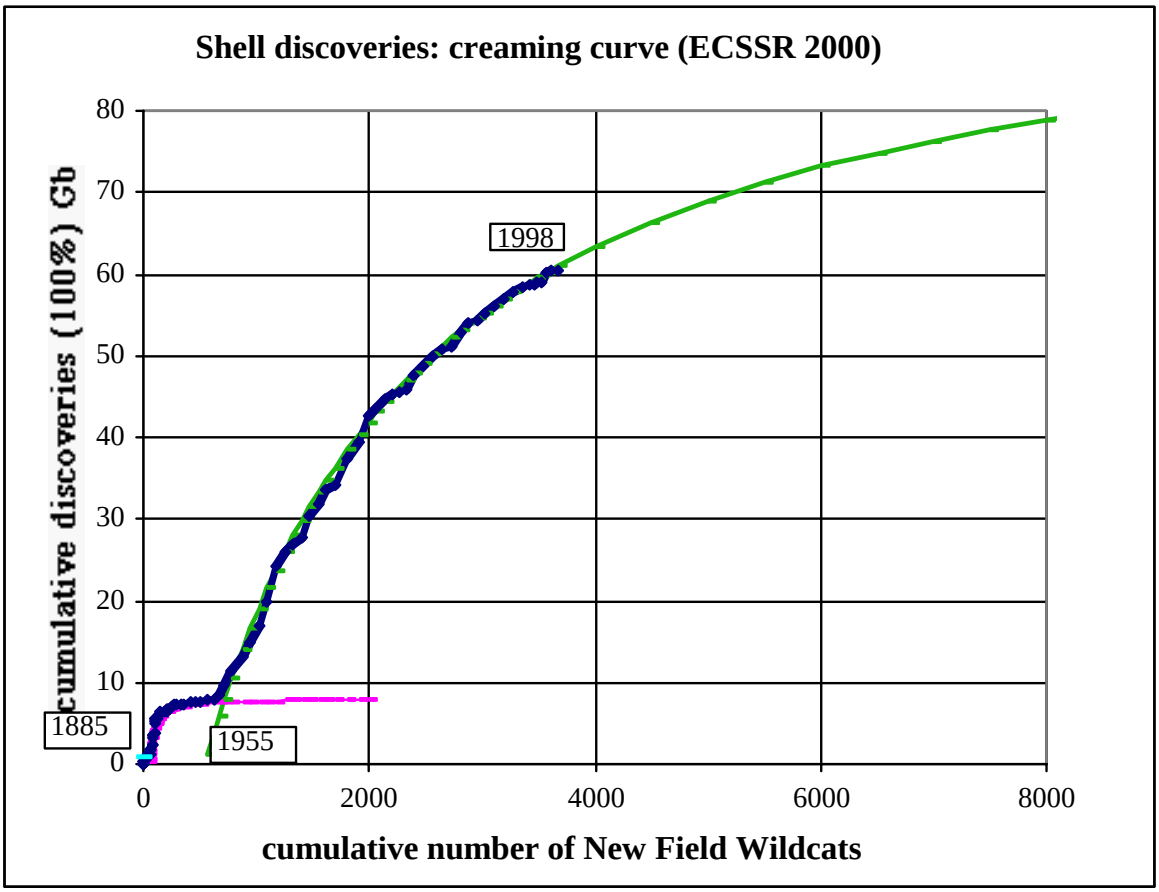
Only the sum of country (or field) « mean » reserves represents the « mean » reserves of the world (or basin).

In summary, any conclusion based on the political data is unreliable and only conclusions from the technical data have to be considered.

-3-Assessments

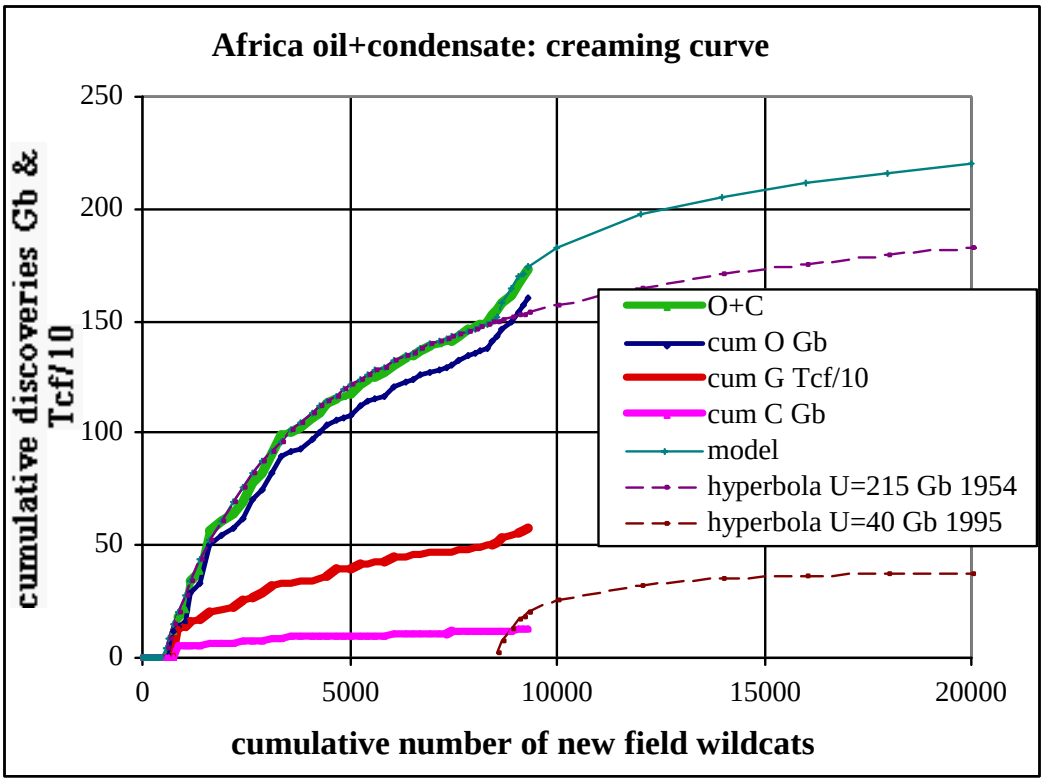
-3-1-Creaming curves: cumulative discoveries in volume versus cumulative number of new field wildcats.

Figure 4: Shell creaming curves: two cycles



Creaming curves are an efficient way to assess the ultimate of a Petroleum System (defined by the source-rock which generates the oil concentrated in the fields) when combined interactively with a size-rank fractal display modelled with a parabola (Laherrere 1996, 1999).

Figure 5:



The FSU reserves, which have been estimated with a Russian classification (presented by Khalimov in 1979 WPC), are now described by the same Khalimov (1993) as grossly exaggerated. Figure 6:

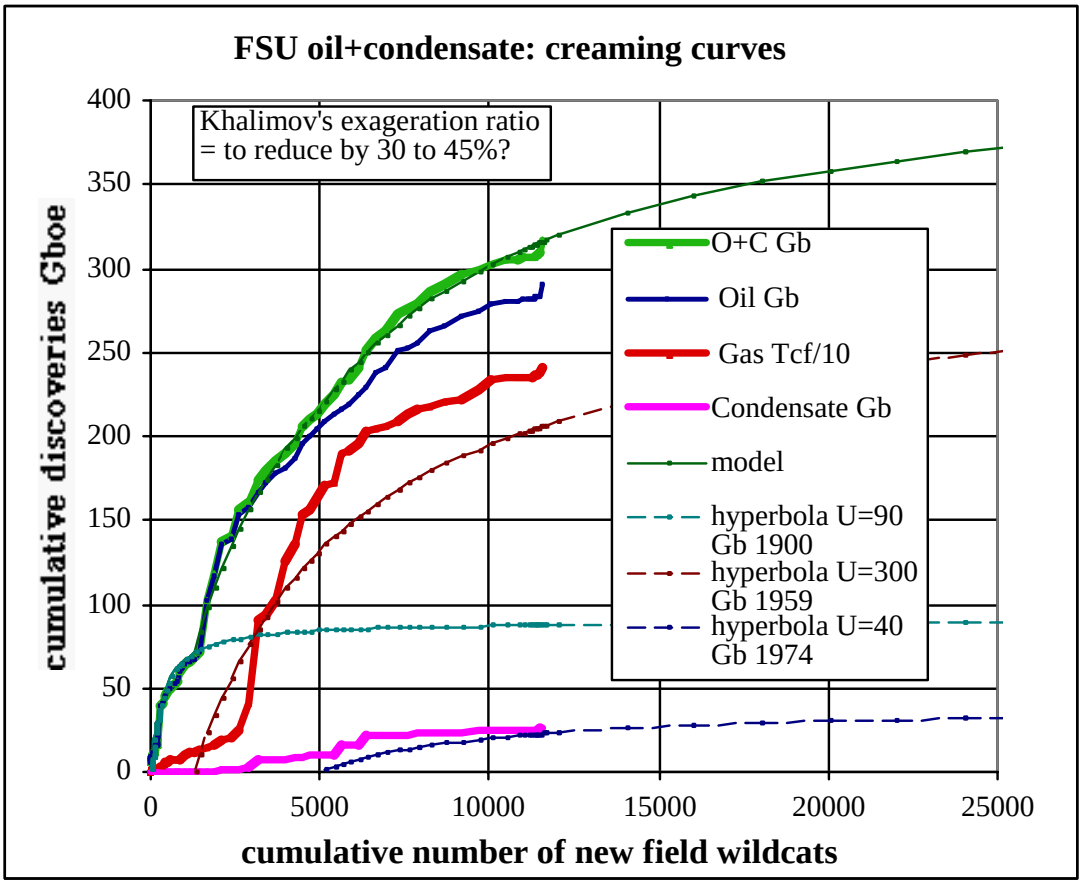


Figure 7:

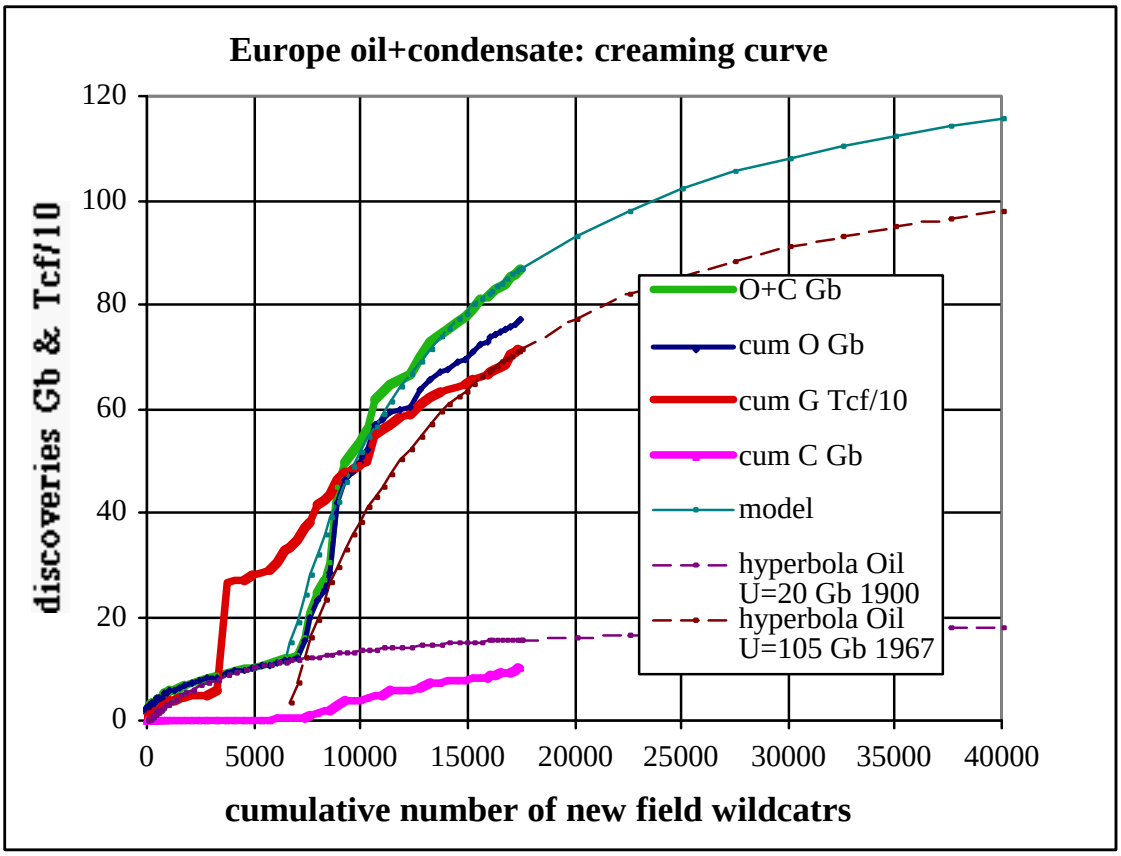


Figure 8:

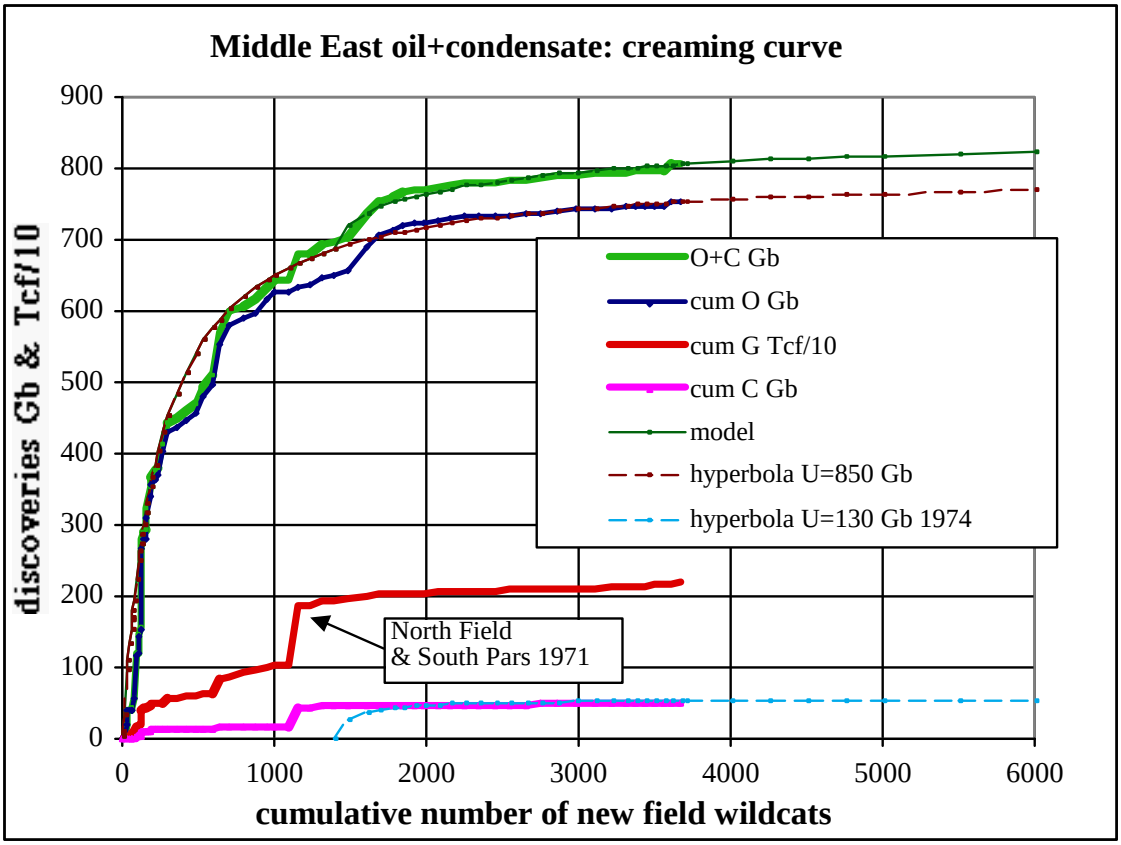


Figure 9:

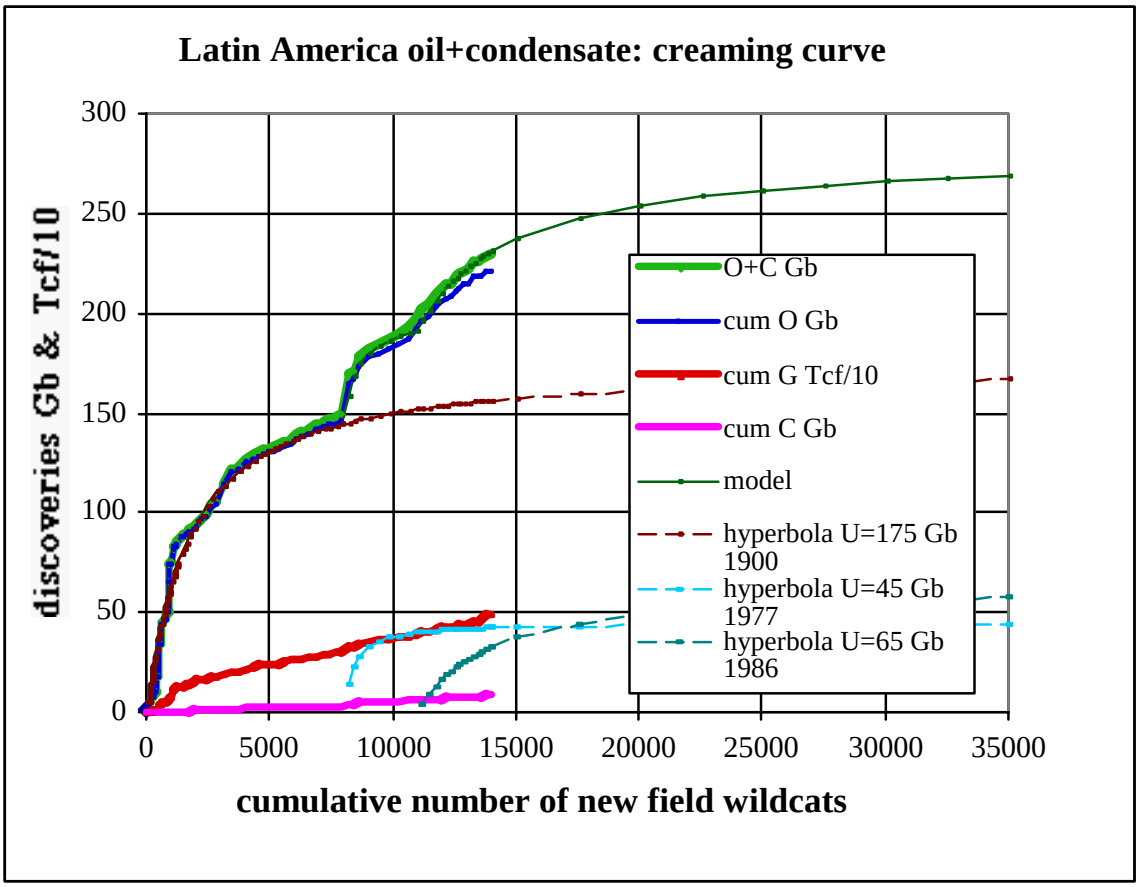
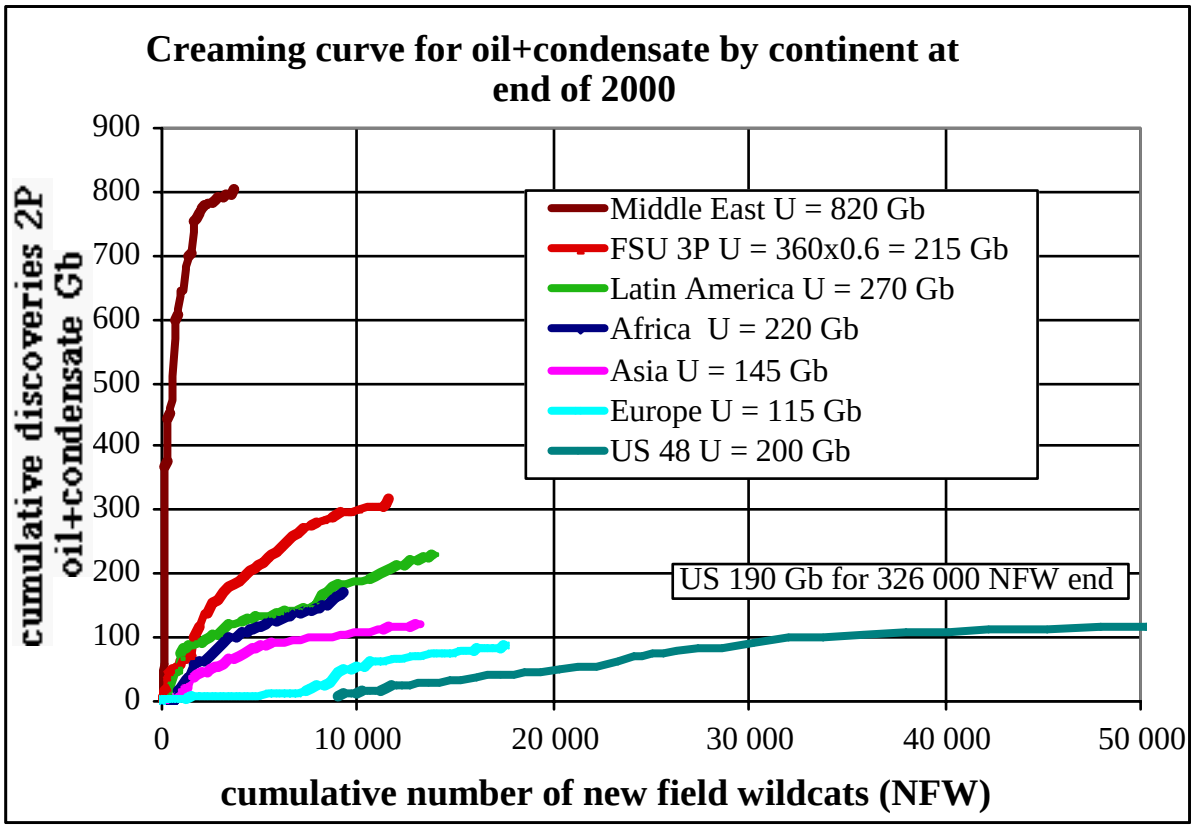


Figure 10:

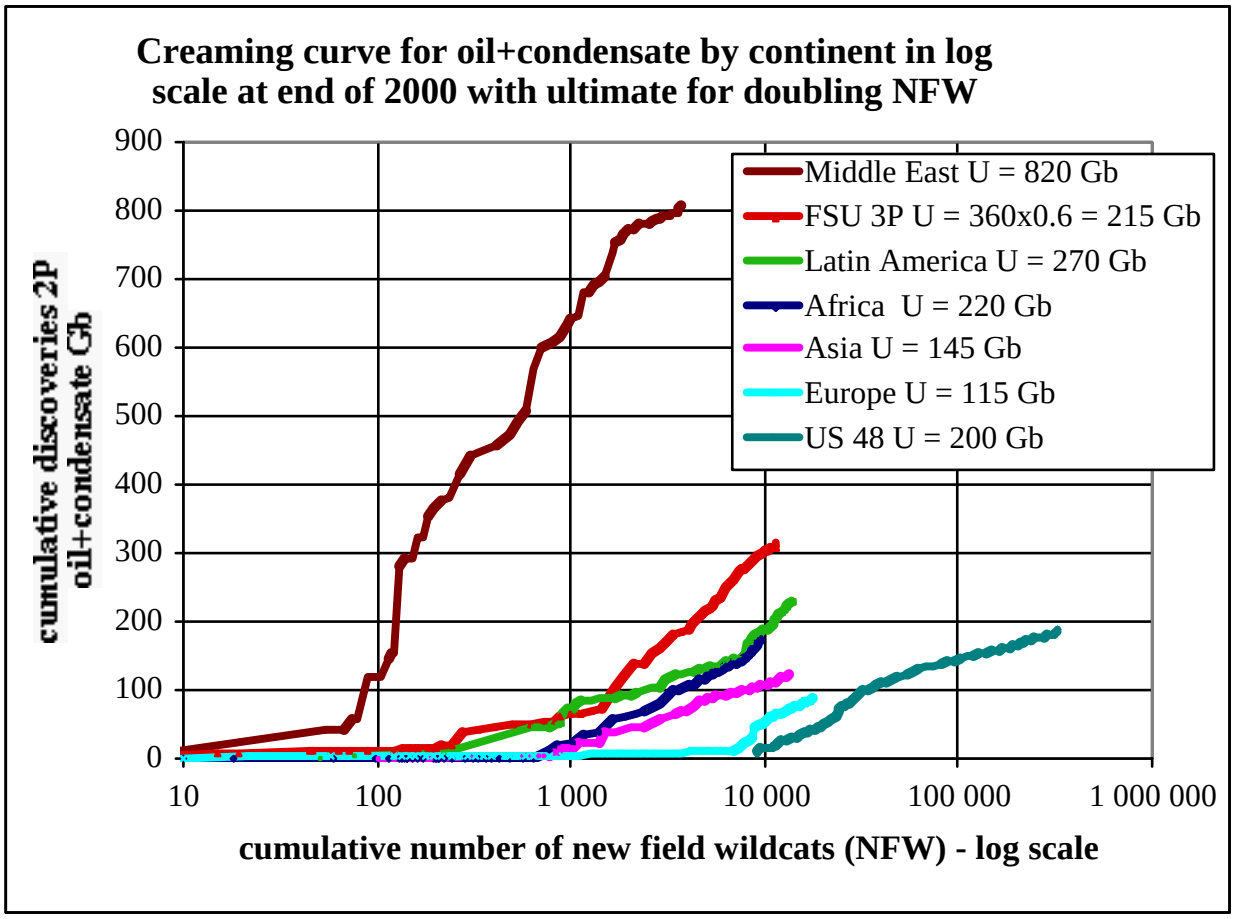


The ultimate of each continent for doubling the number of NFW.

continent	ultimate O+C Gb

Middle East	820
Latin America	270
US +Canada	250
Africa	220
FSU	215
Asia	145
Europe	115
world	2000

Figure 11:



-3-2-Correlation annual discovery and annual production:

Figure 13:

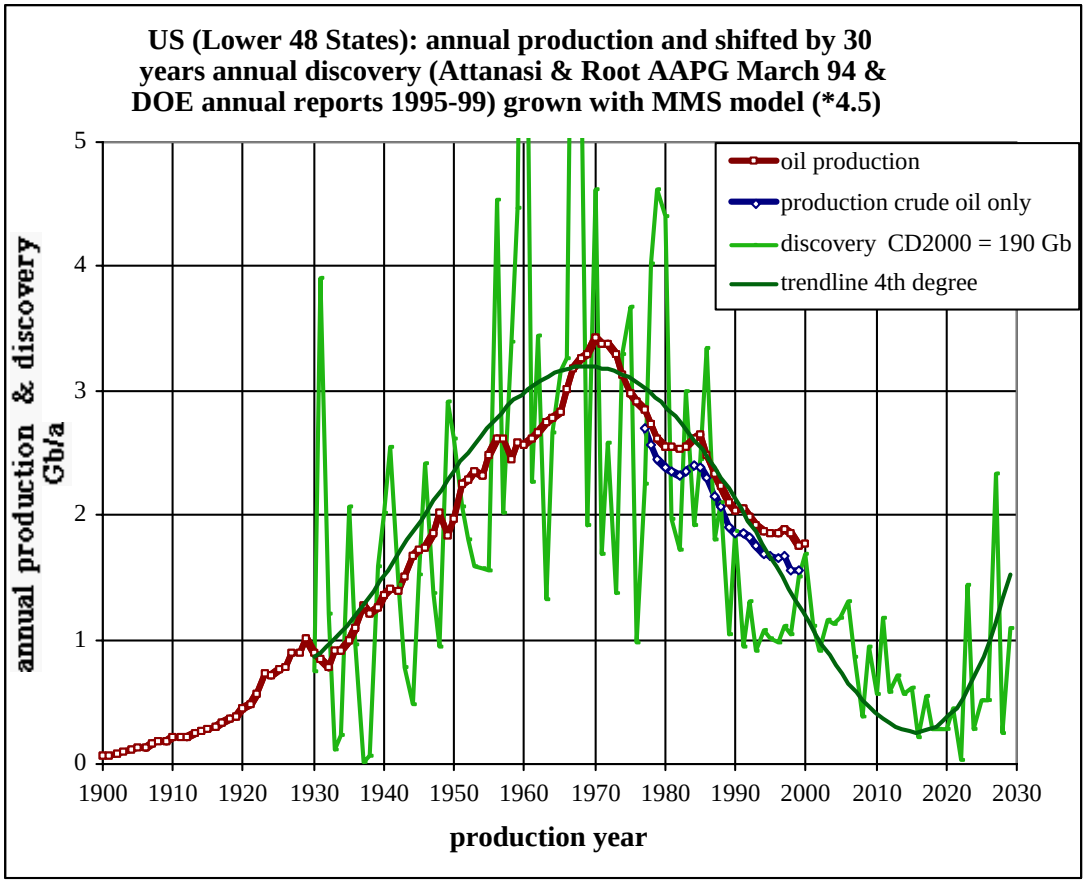
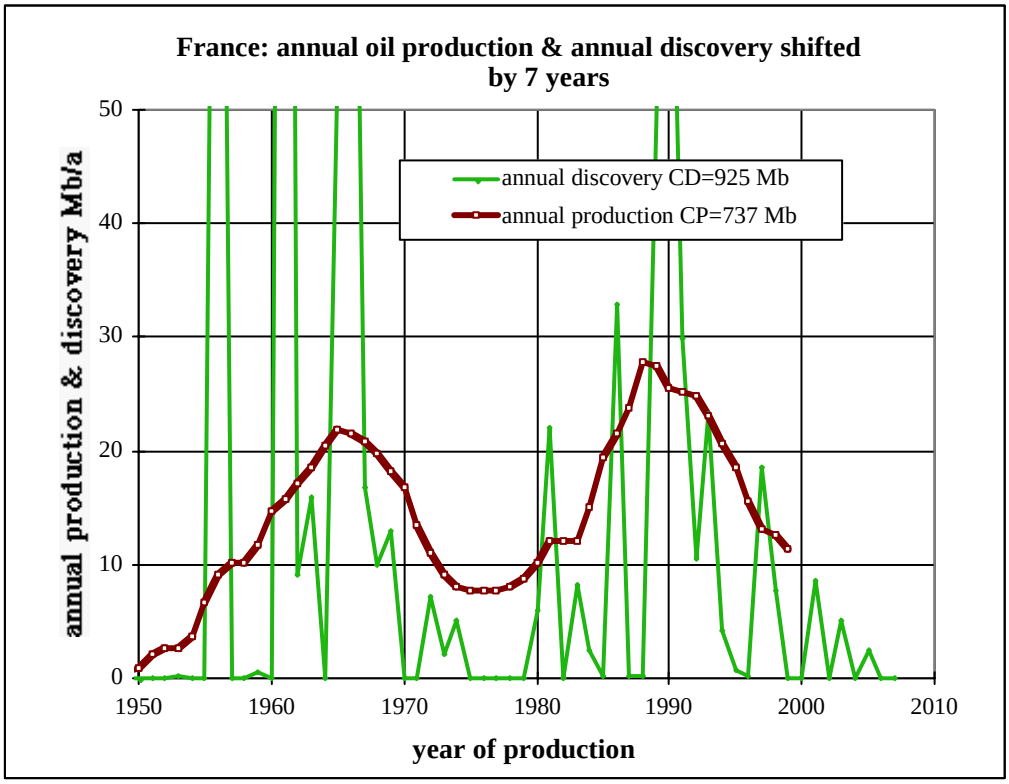


Figure 14: France: two clear cycles of discovery and production



But the Russian classification corresponds to proven +probable+possible (or 3P) as quoted by Khalimov (1993). Figure 15:3P reduced to 2P

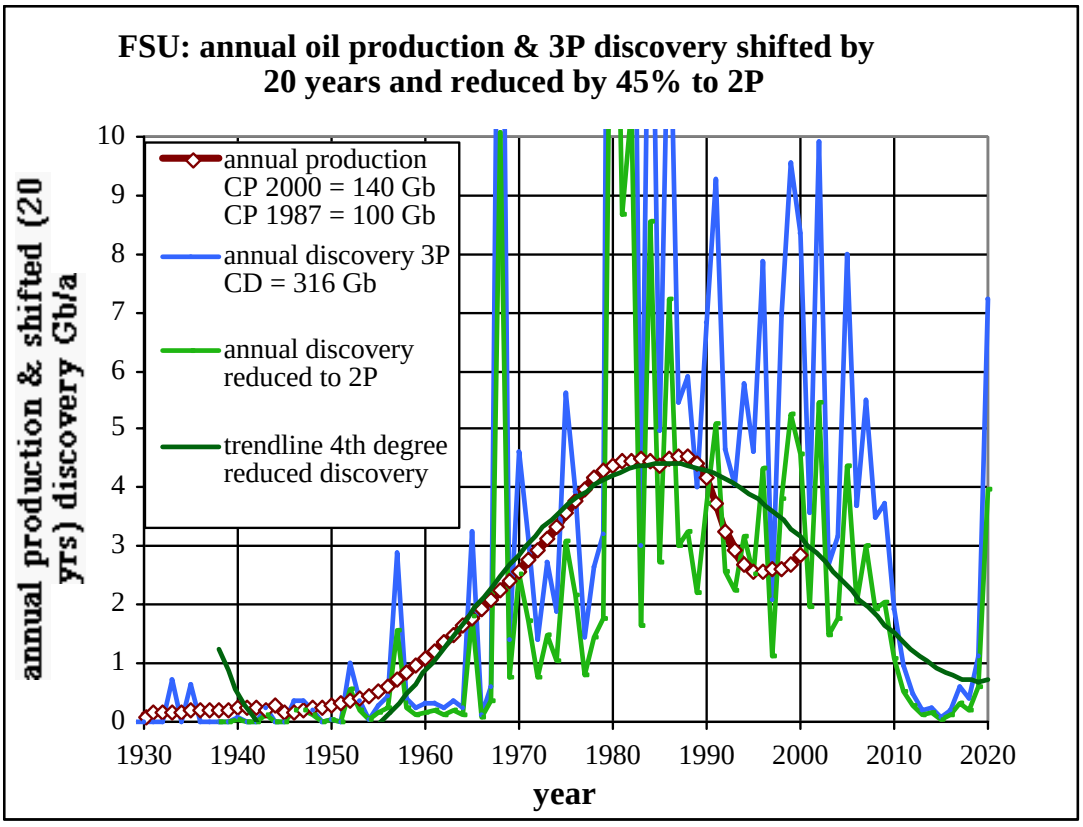
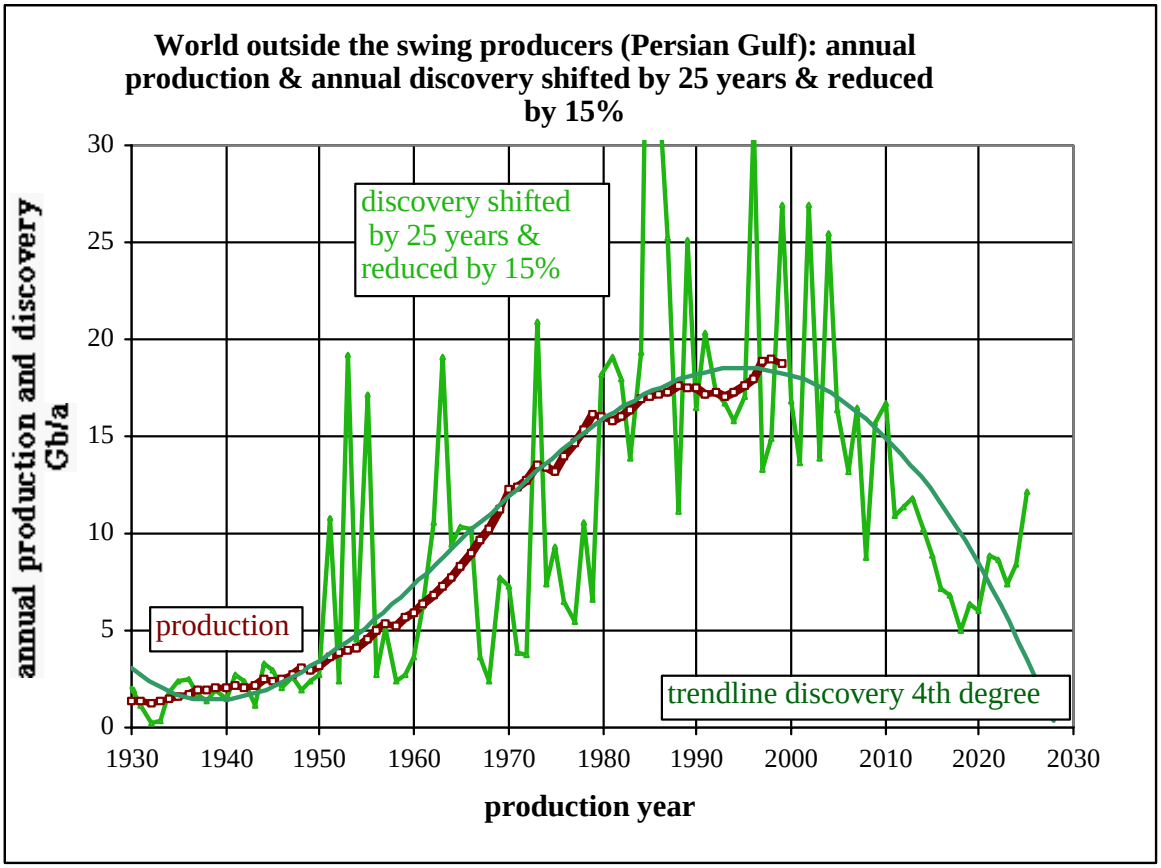


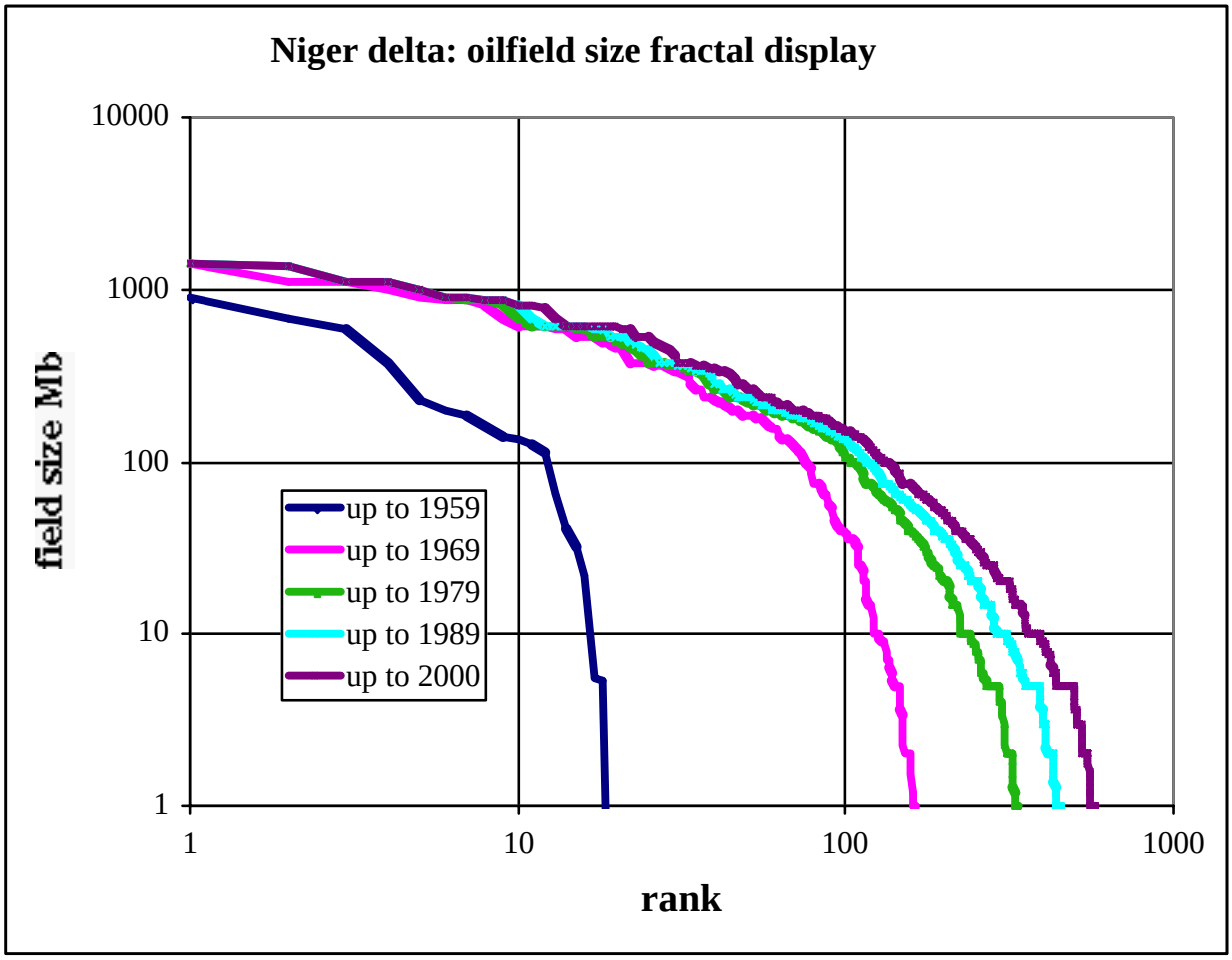
Figure 16: shown in WEC 2000 "Energy for tomorrow's world –Acting Now



-3-3-Parabolic fractal display:

One of the best displays is the fractal distribution of field size-rank in a log-log format. When the distribution is natural as it is in a Petroleum System the fractal displays follow a curve (Laherrere 1996, 1999) (and not a straight line (or power law) as claimed by Mandelbrot). This parabolic fractal is found for urban agglomerations, earthquake (the Ritcher-Gutenberg, power law, is a rough approximation), galaxies, species, . A fractal distribution corresponds to auto-similarity, quite frequent in nature, but as auto-similarity is not perfect, the fractal is not linear, but curved.

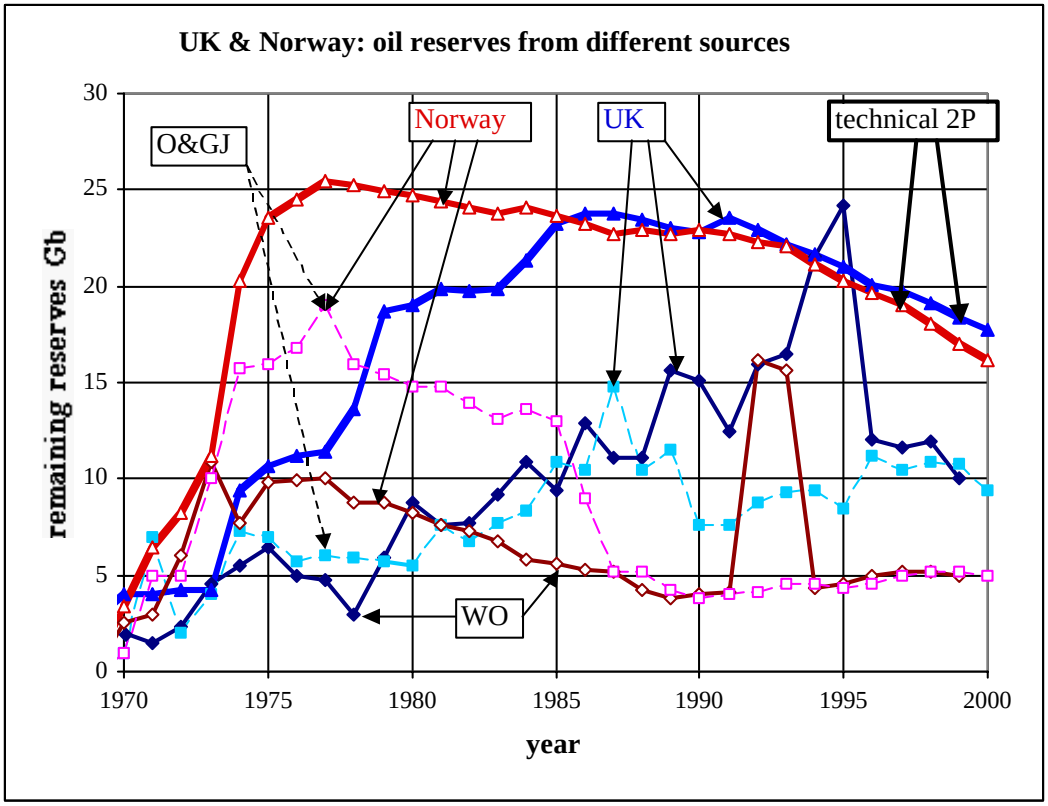
Figure 17: evolution of the distribution towards the ultimate



-4-Examples of reserve & production data from countries

-4-1-North Sea: UK & Norway

Figure 19: the reporting of remaining reserves in UK & NW is a mess!



Looking at the status of the UK and Norway, the proven+probable values for oil +condensate and the number of oilfields are as follows:

Status 2001	UK O+C Gb	UK nb	UK % Gb	UK % nb	NW O+C Gb	NW nb	NW % Gb	NW % nb
developed	31,7	276	89	52	26,3	64	83	33
undeveloped	3,9	254	11	48	5,3	128	17	67
Total	35,6	530	100	100	31,6	192	100	100

Only 52% of the number of discoveries are developed in UK (89% of the reserves), and 33% in Norway (83% of the reserves).

Figure 20: UK has two cycles, when Norway has only one cycle

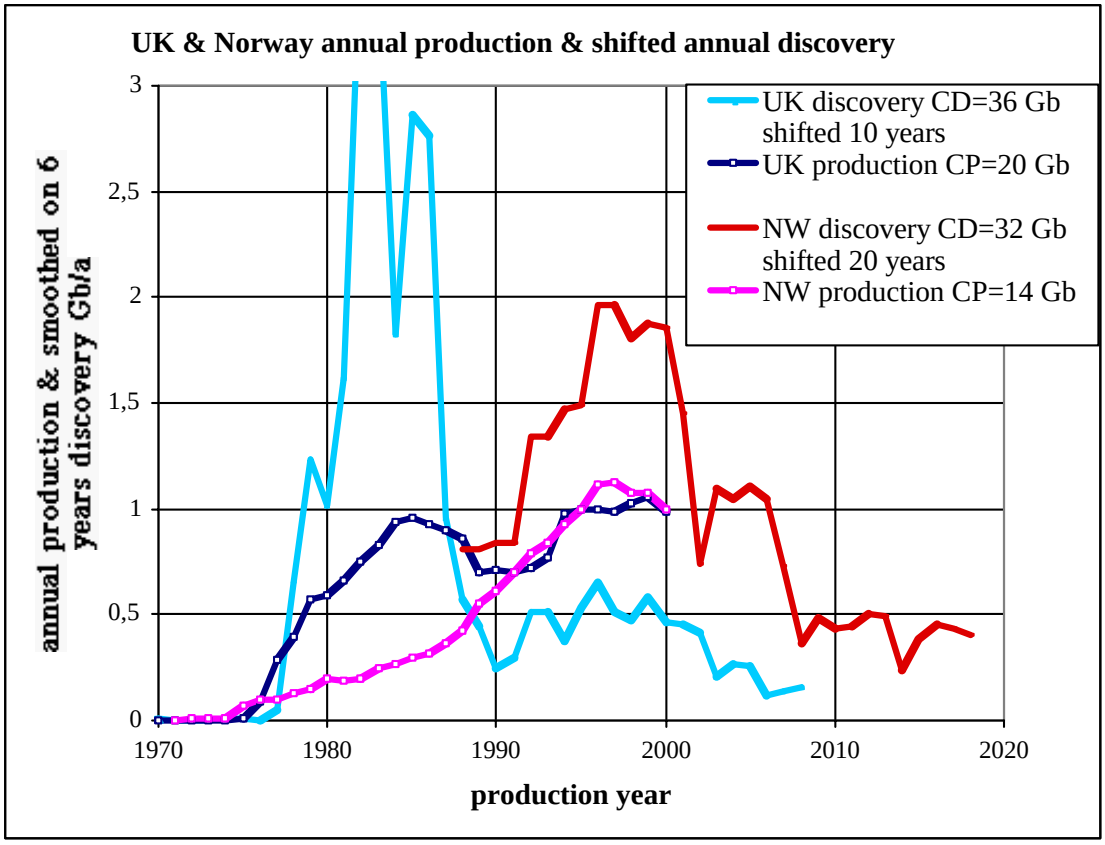
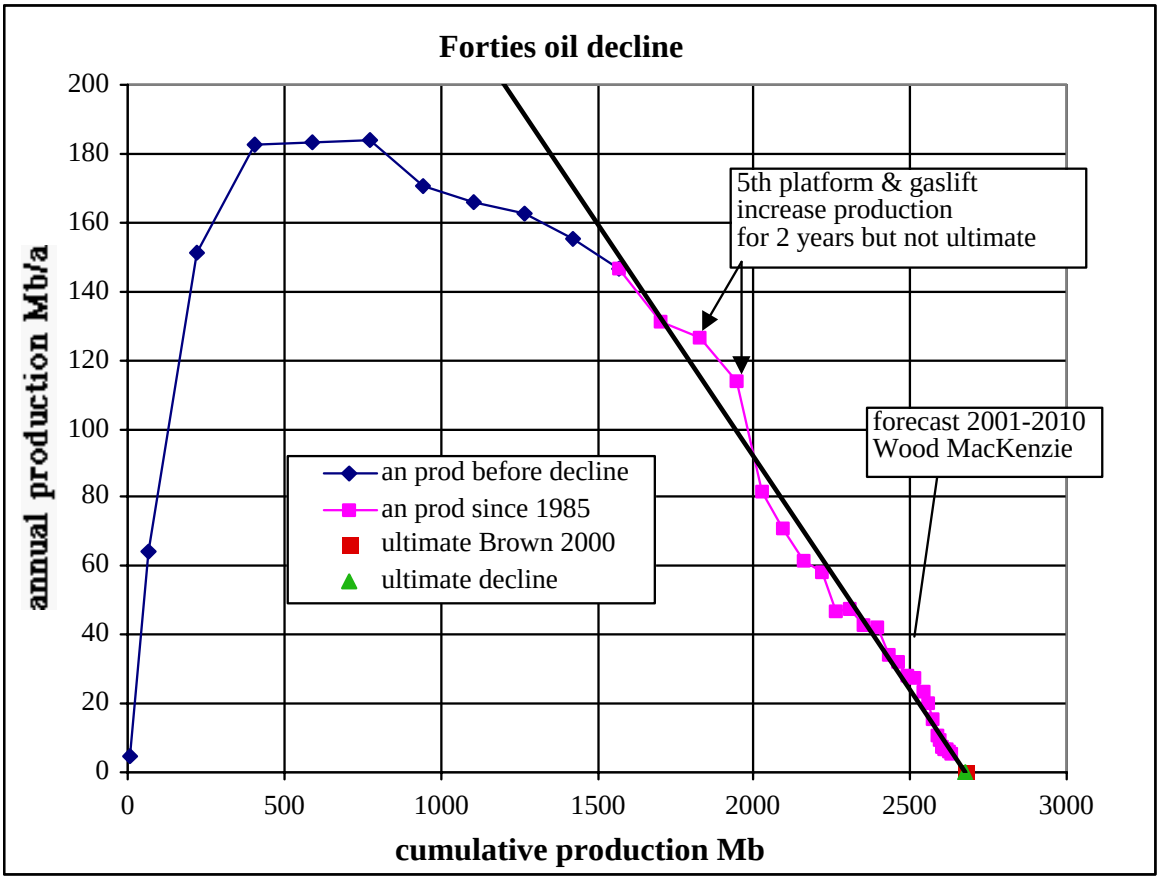


Figure 21: the oil decline is constant except for 1987 & 1988 because gaslift



-4-2-Venezuela

Figure 23: erratic political reporting

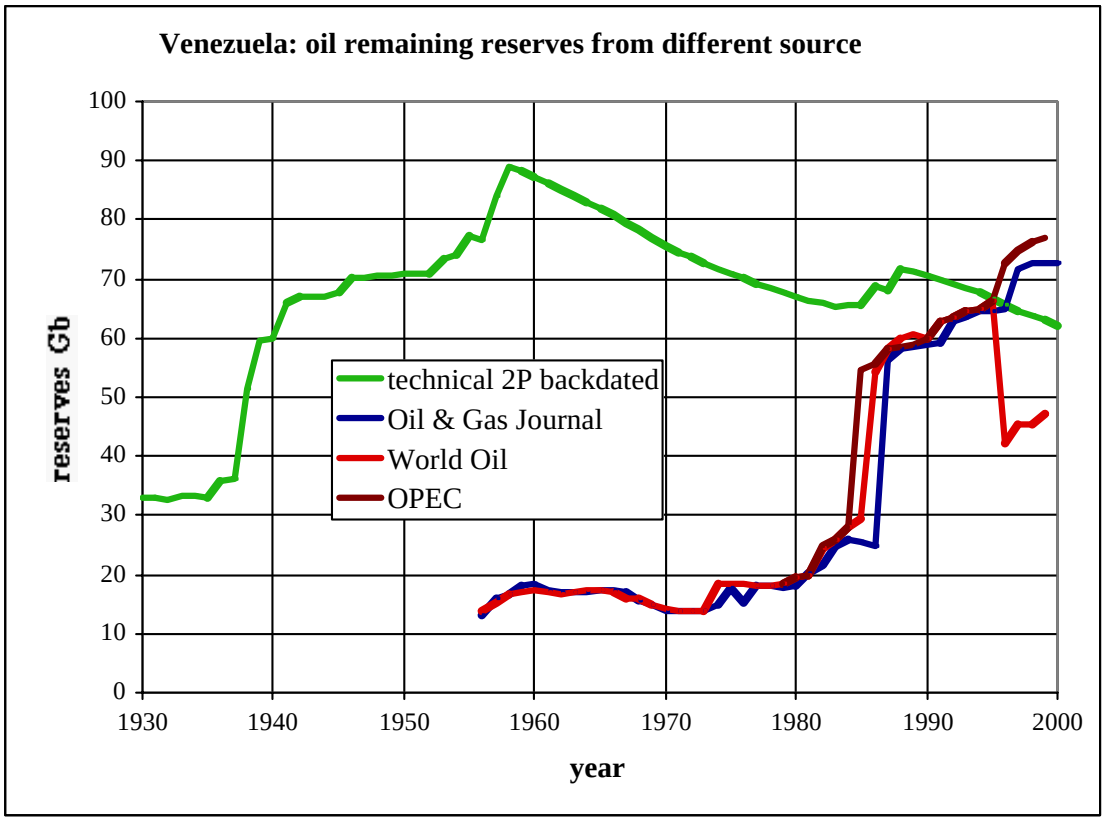
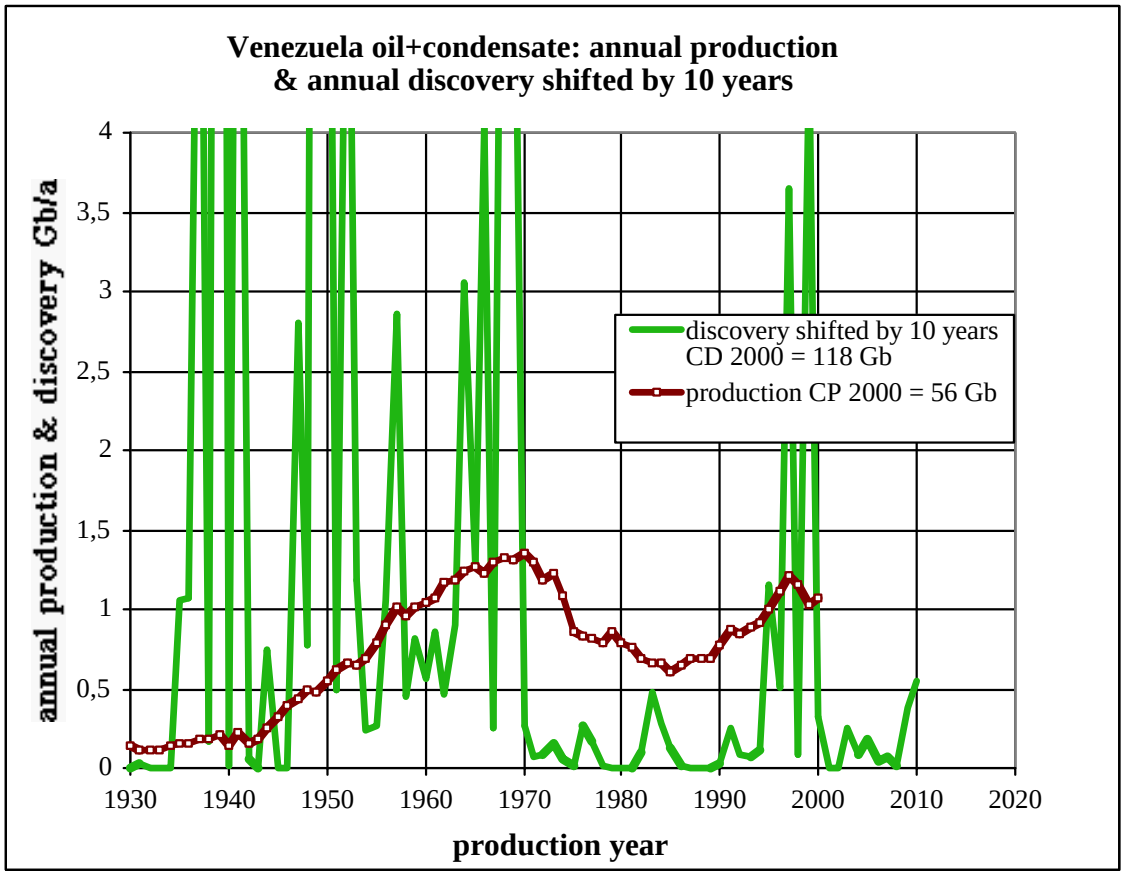


Figure 24: two cycles for conventional, quid unconventional?



-4-3-Mexico

Figure 25: after the financial crisis was solved, reserves went down

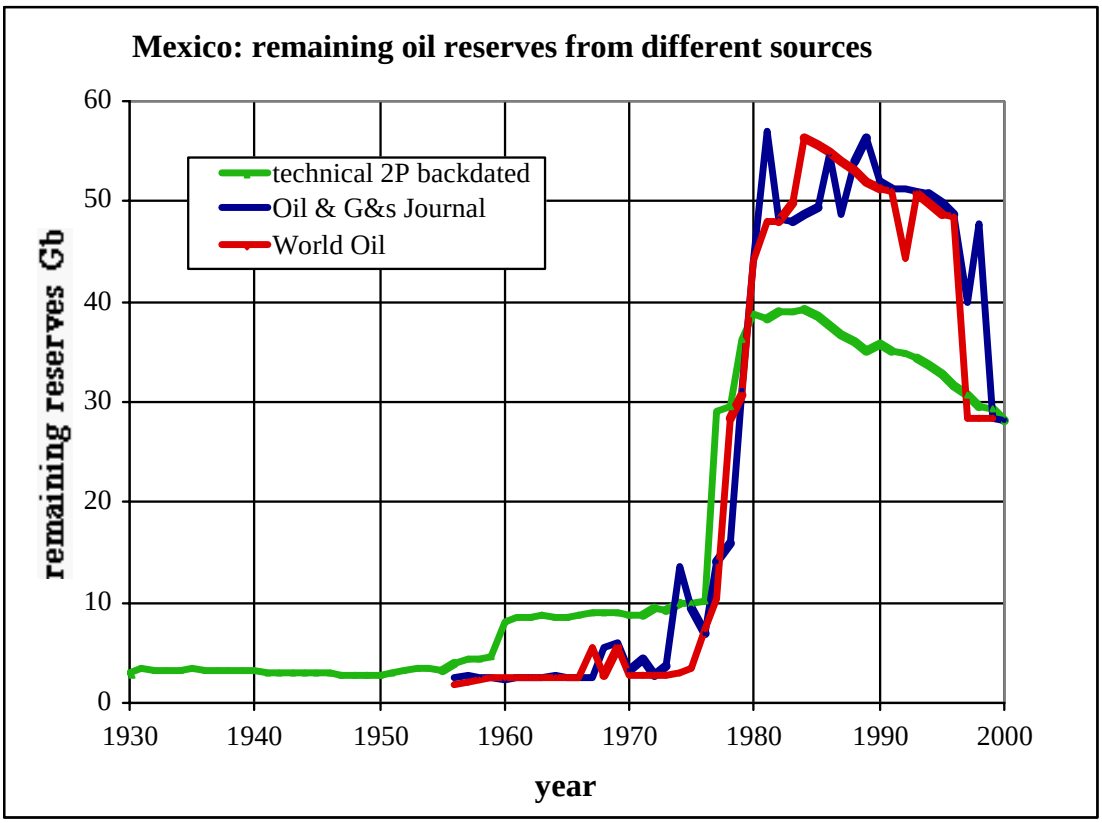
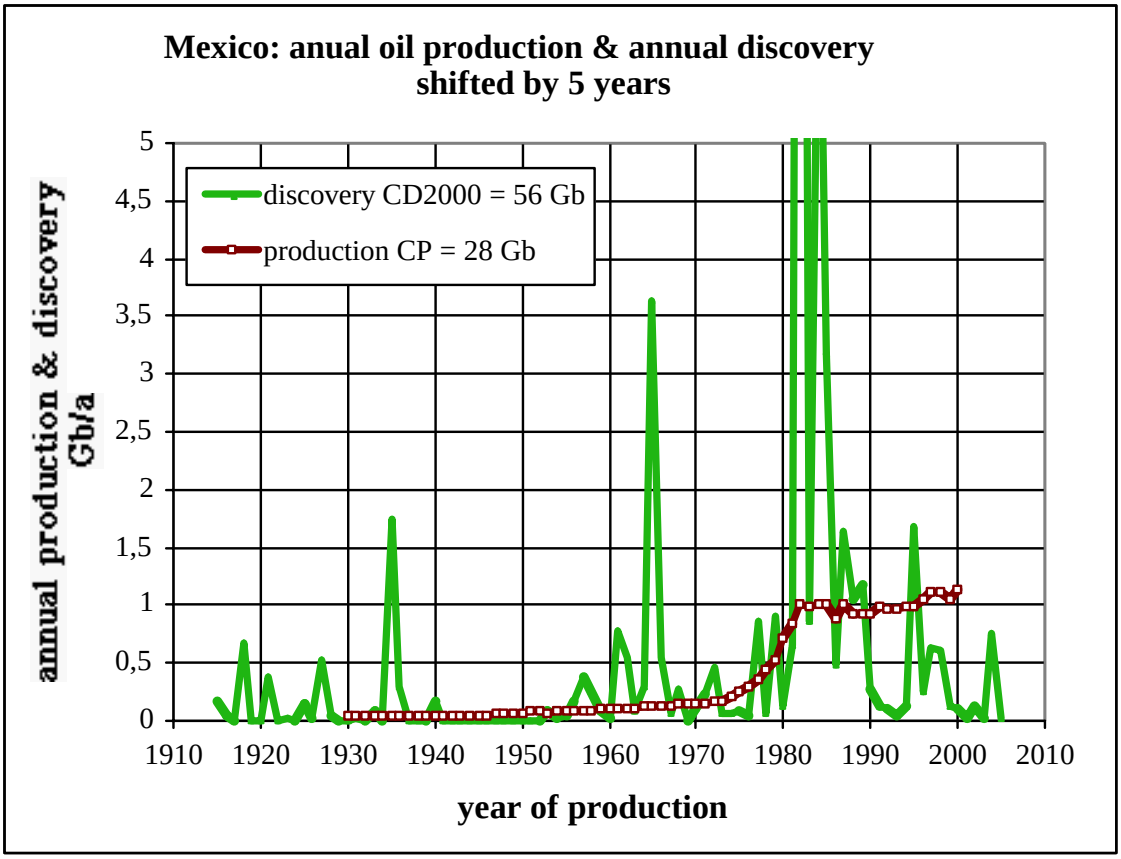


Figure 26: Cantarell is a supergiant oilfield



-4-4-Colombia

The last large discovery Cusiana was overestimated when discovered (press release by Triton for the stock market 3 Gb when it was estimated 1.5 Gb by BP and 1 Gb by Total), the last scout is 0.95 Gb (but 1.6 Gb last year).
Figure 30:

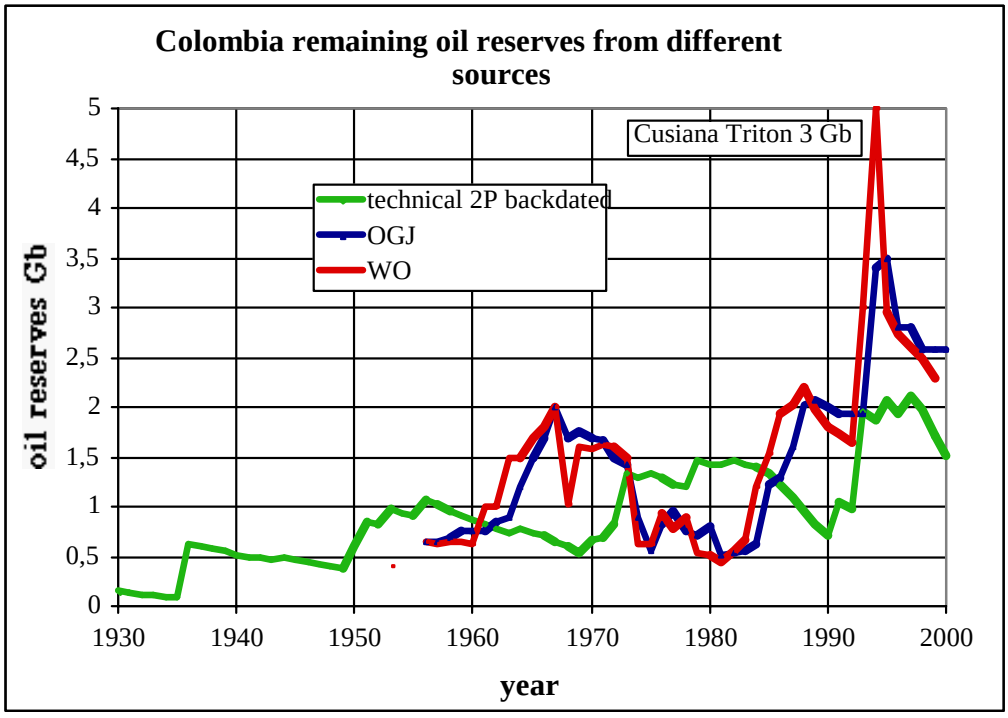
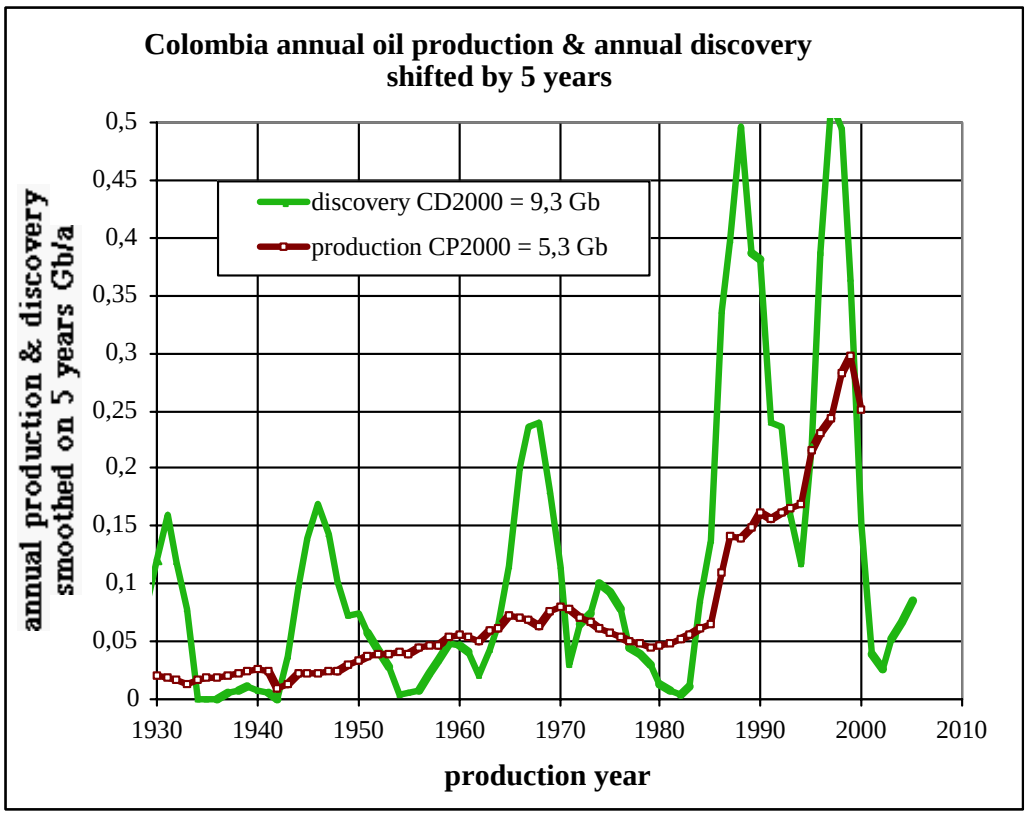


Figure 31: several exploratory cycles



-4-5-Nigeria

Figure 35: exploratory up and down because civil wars

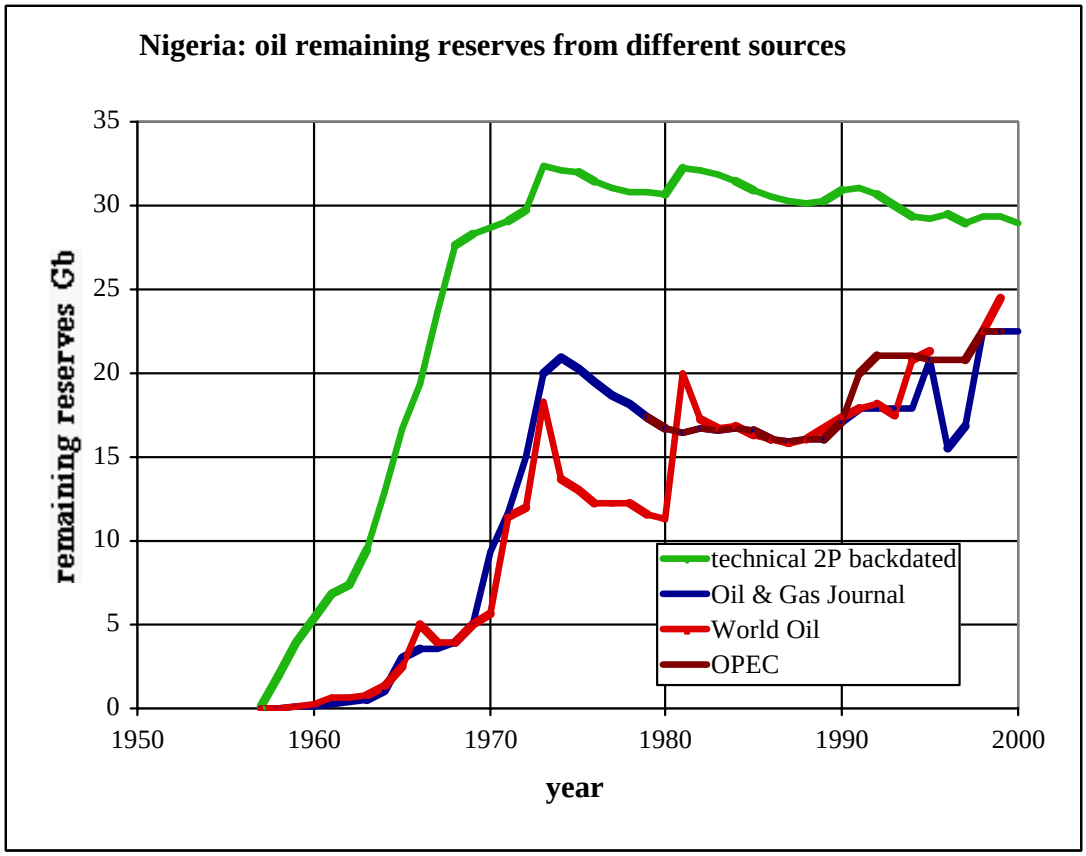
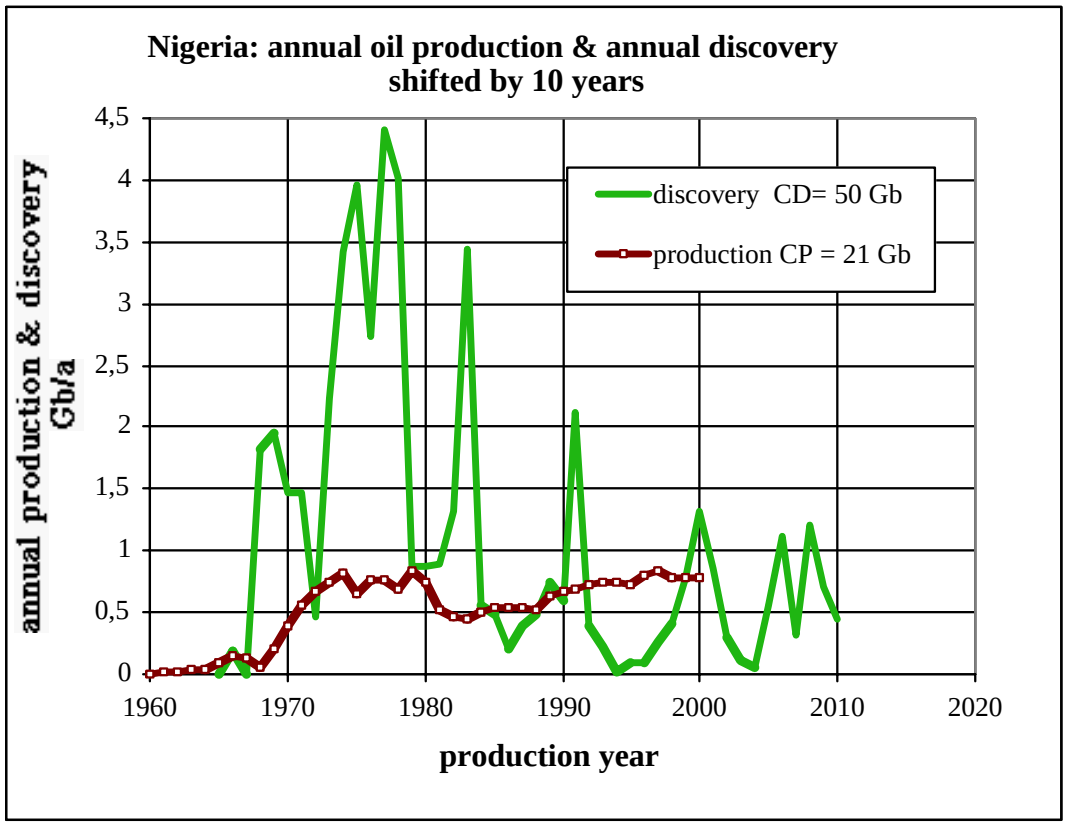


Figure 36:



-4-6-China

Figure 38: divergent political data

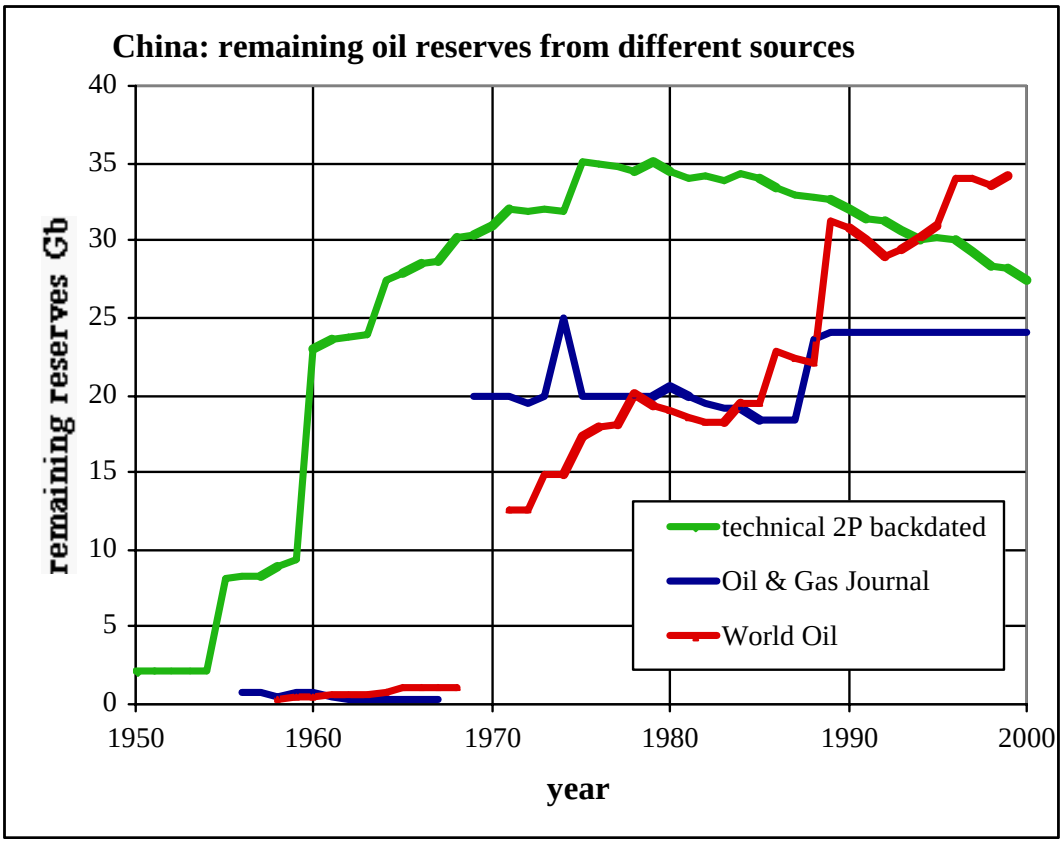
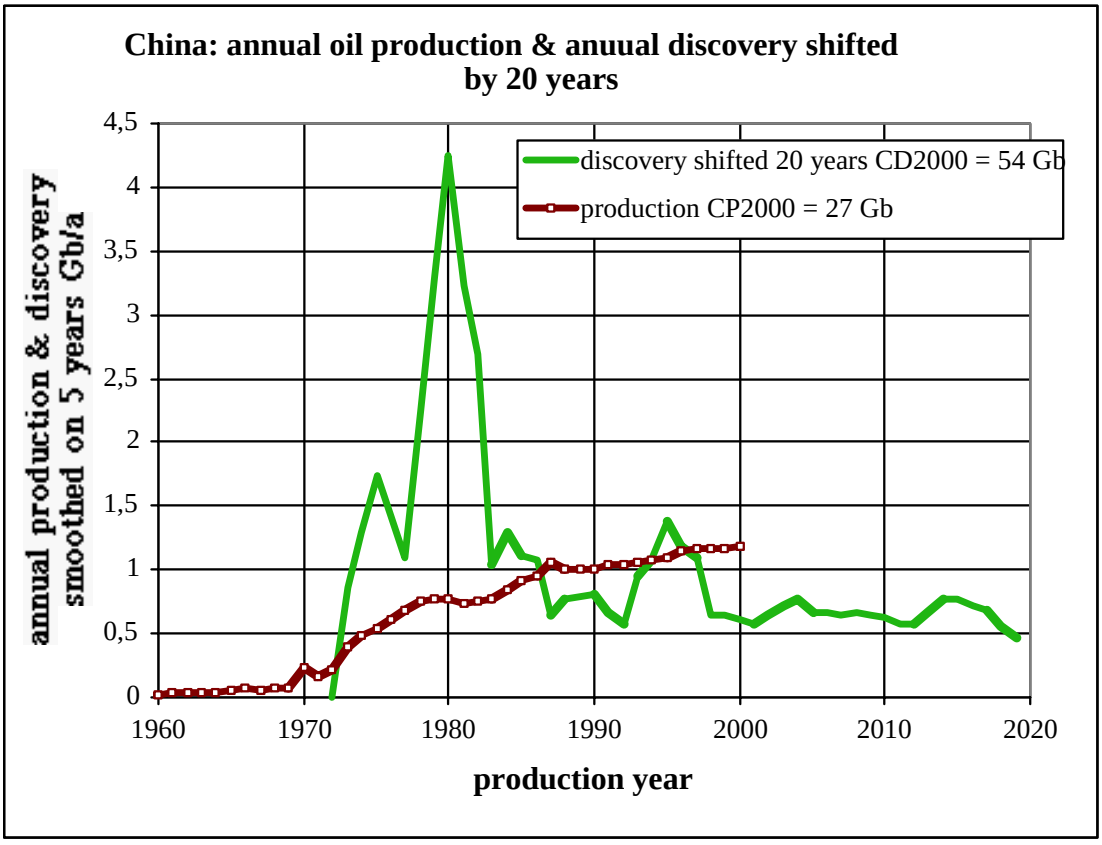


Figure 39: Daqing is a supergiant oilfield



-4-7-FSU

USSR Deputy Oil Minister Khalimow presented the Russian classification of reserves at the 1979 WPC in Bucharest as a well-conceived approach. But in 1993 (AAPG 77/9), Khalimow qualified this classification by stating: "The resource base [of the former Soviet Union] appeared to be strongly exaggerated due to inclusion of reserves and resources that are neither reliable nor technologically nor economically viable". Gochenour (1997) found that the Russian reserves of five Russian companies (the two largest being Lukoil & Yukos), with total reserves of 49.4 Gb, are estimated with the US definition at 26.4 Gb, which are only 53% of the Russian estimate.

Figure 41: World Oil went to Russian classification and back to US practice

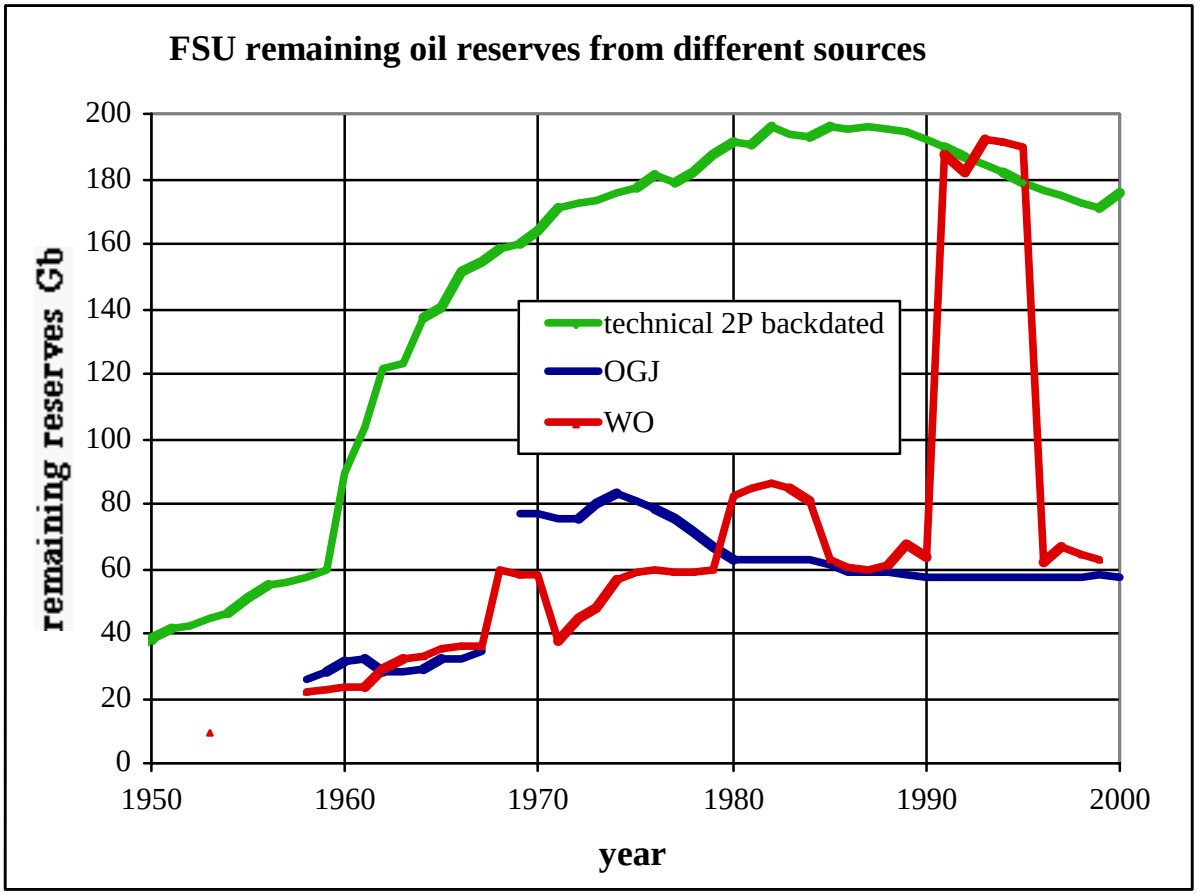


Figure 43: Samotlor largest oilfield is overestimated by 8 Gb

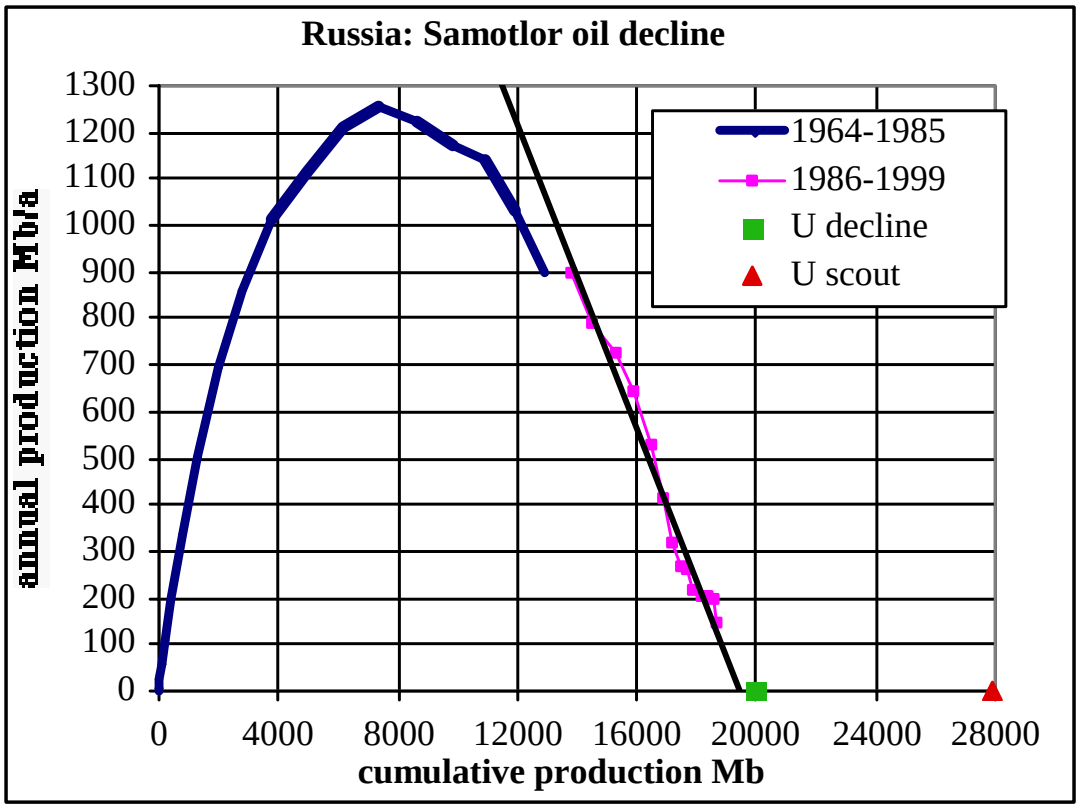
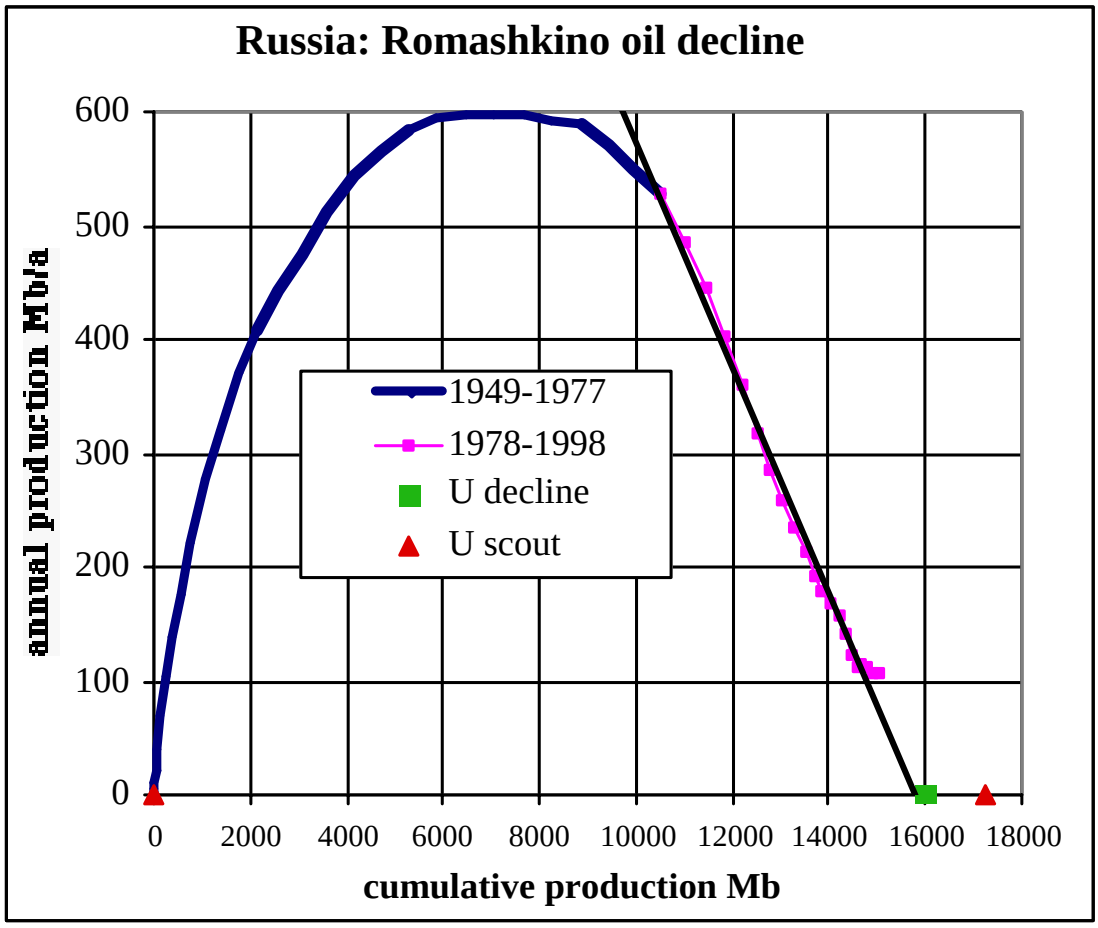


Figure 44: Romashkino, second largest is overestimated by 1.5 Gb



-4-9-Angola

Figure 48: World Oil moves to 2P values

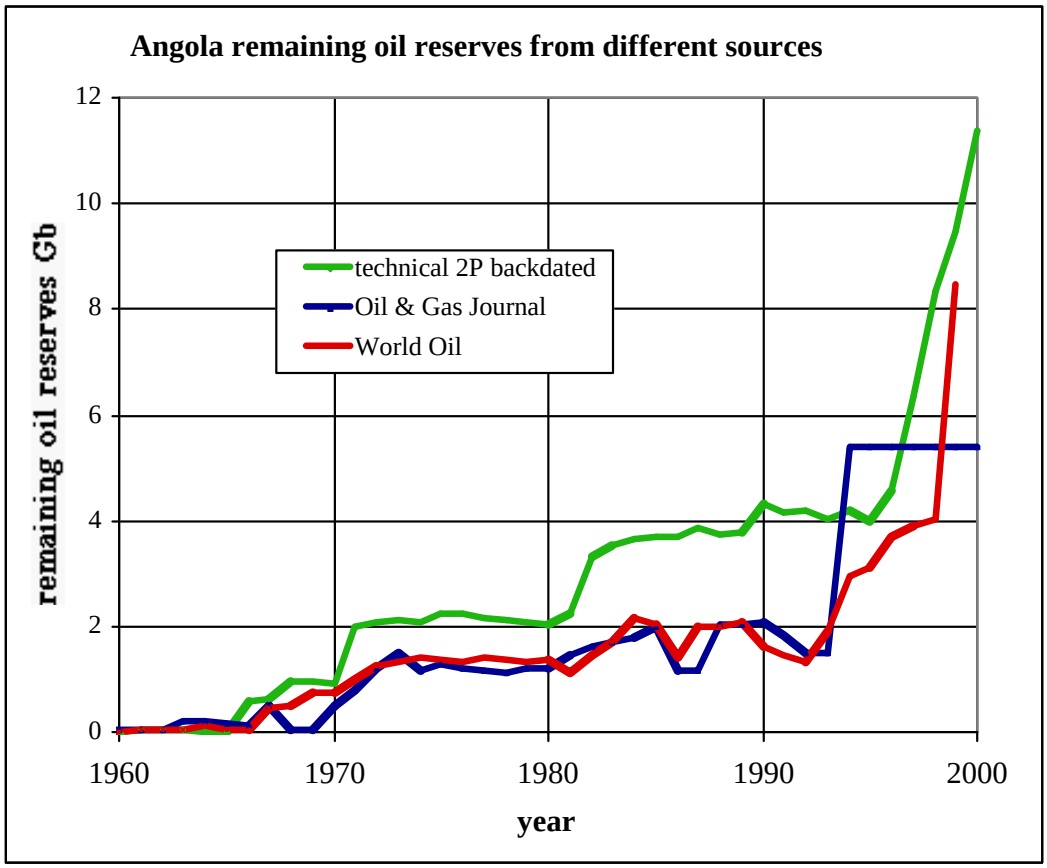
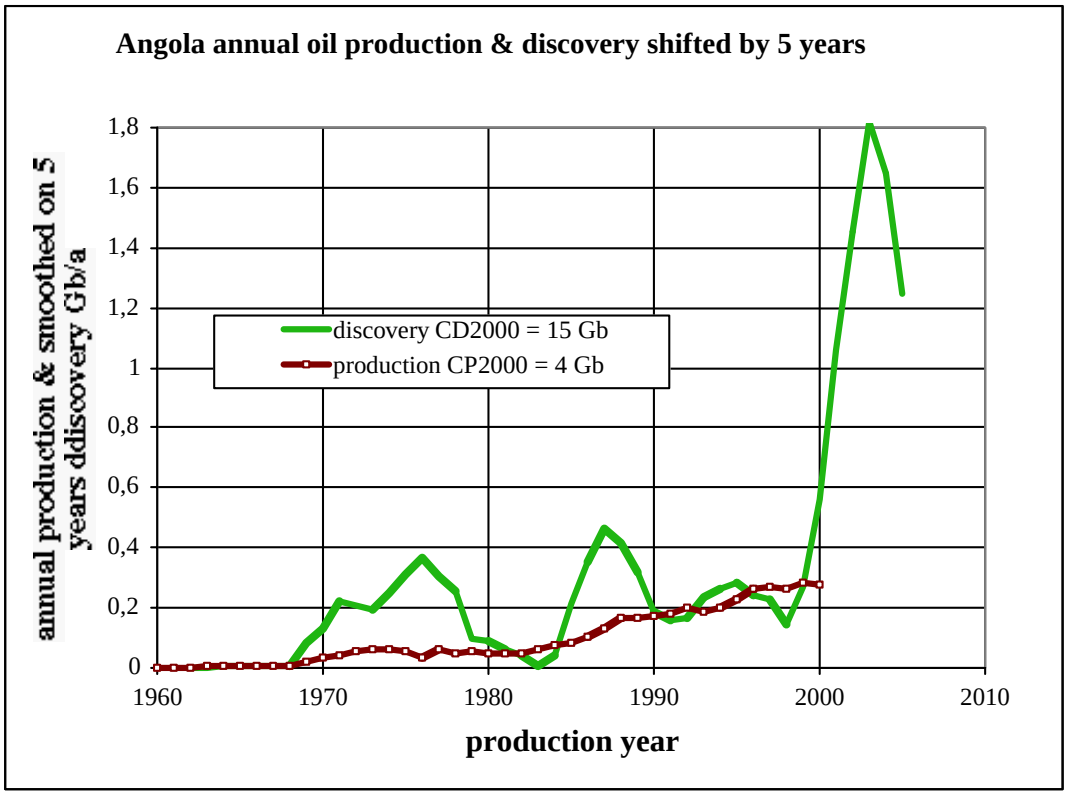


Figure 49: several cycles and deepwater is the largest



-4-10-Algeria

Figure 51: Russian influence in OGJ values around 1970

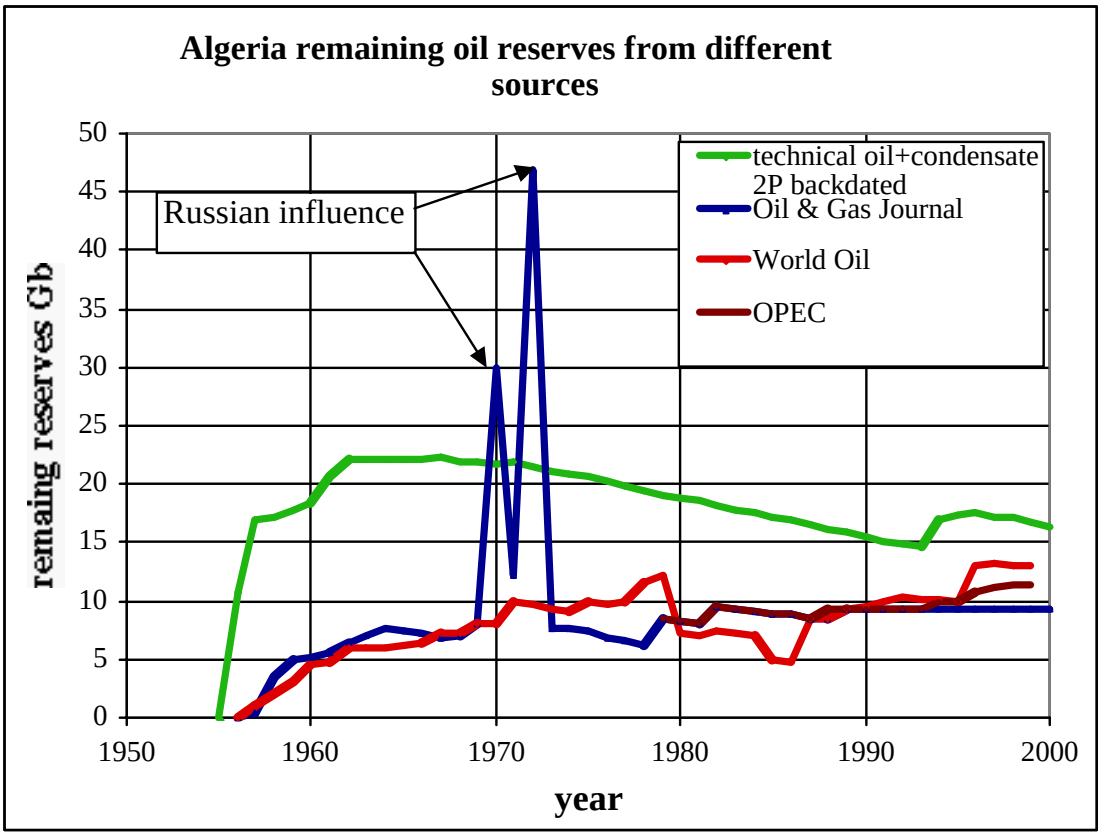
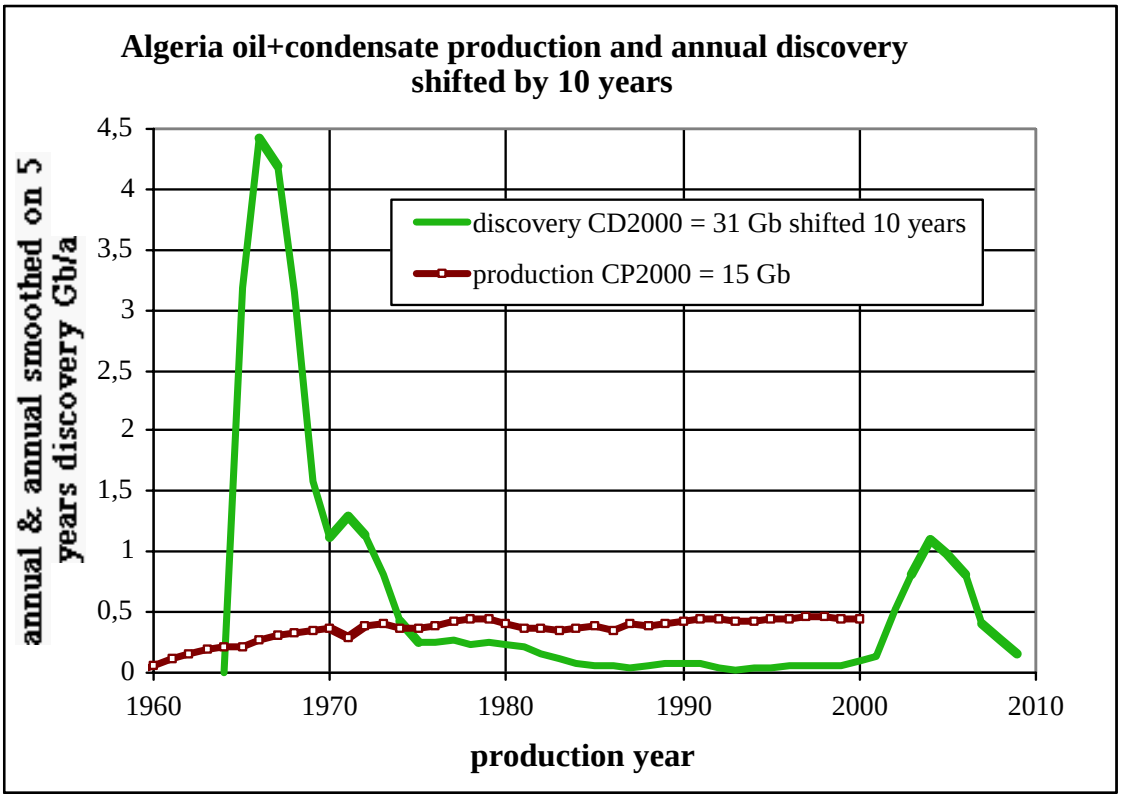


Figure 52: last cycle with Berkine long time after first exploration



-5-Reserve growth

Recovery factor; mainly geology Figure 57:

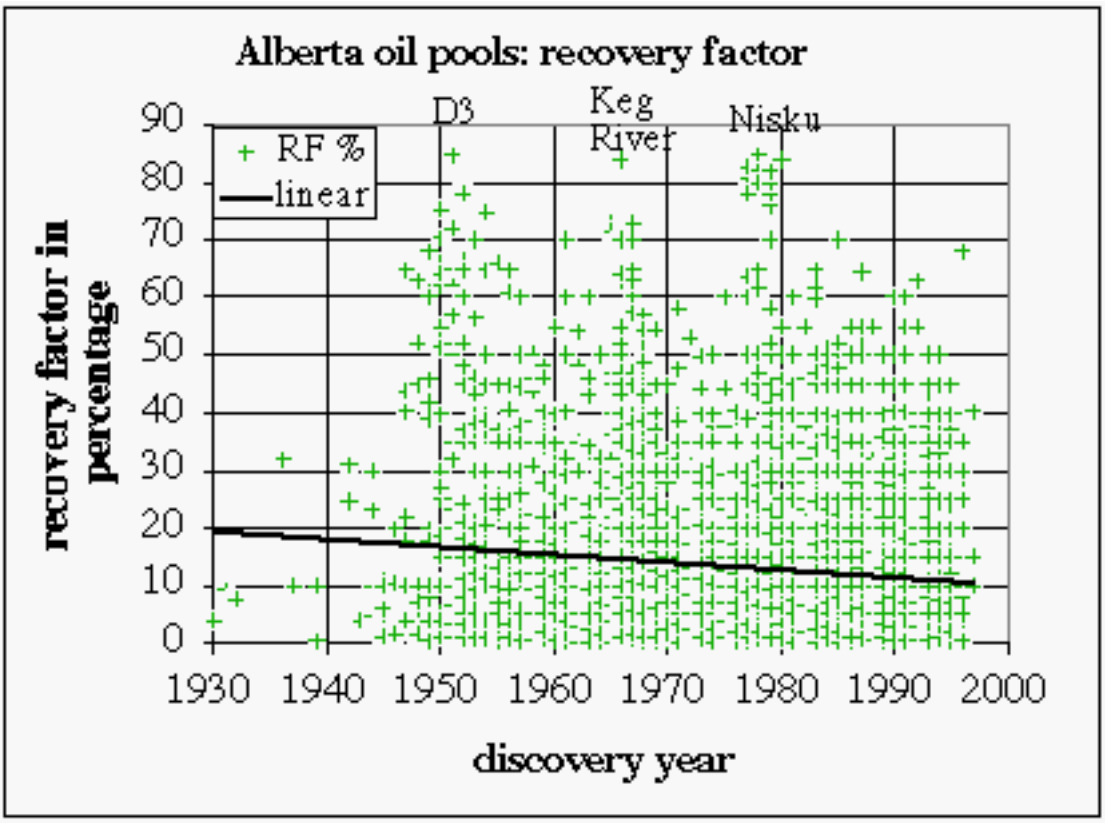
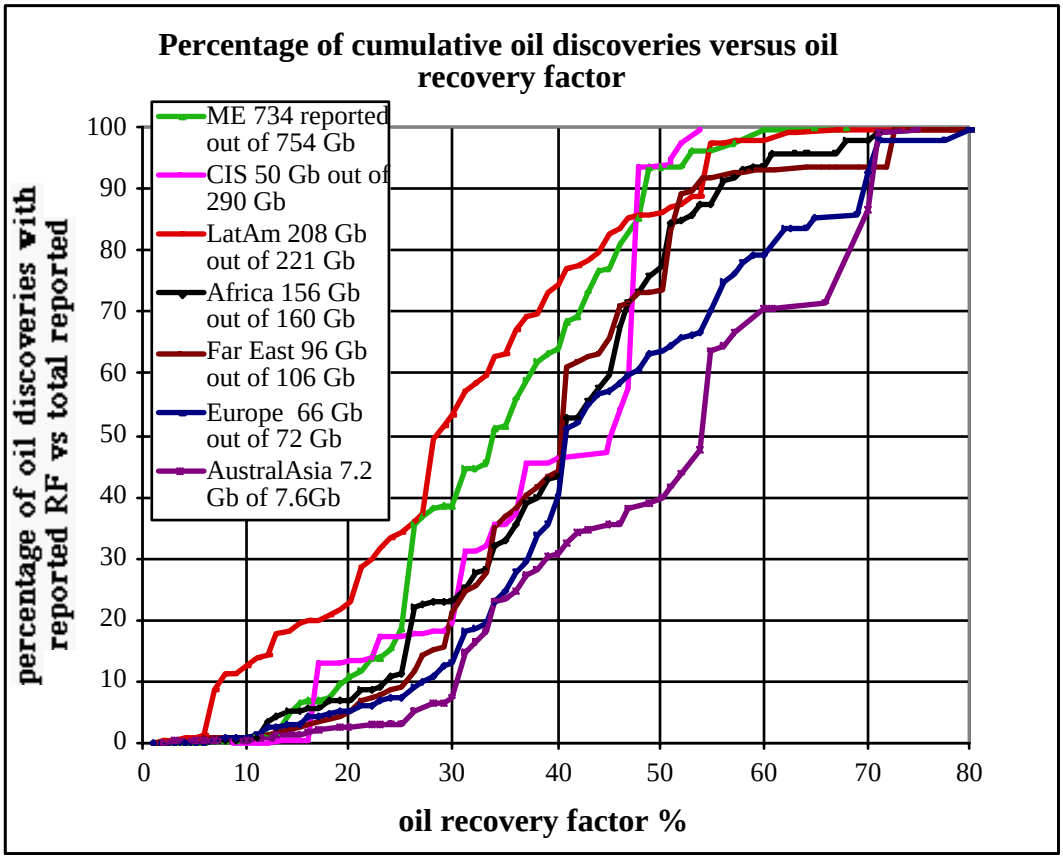
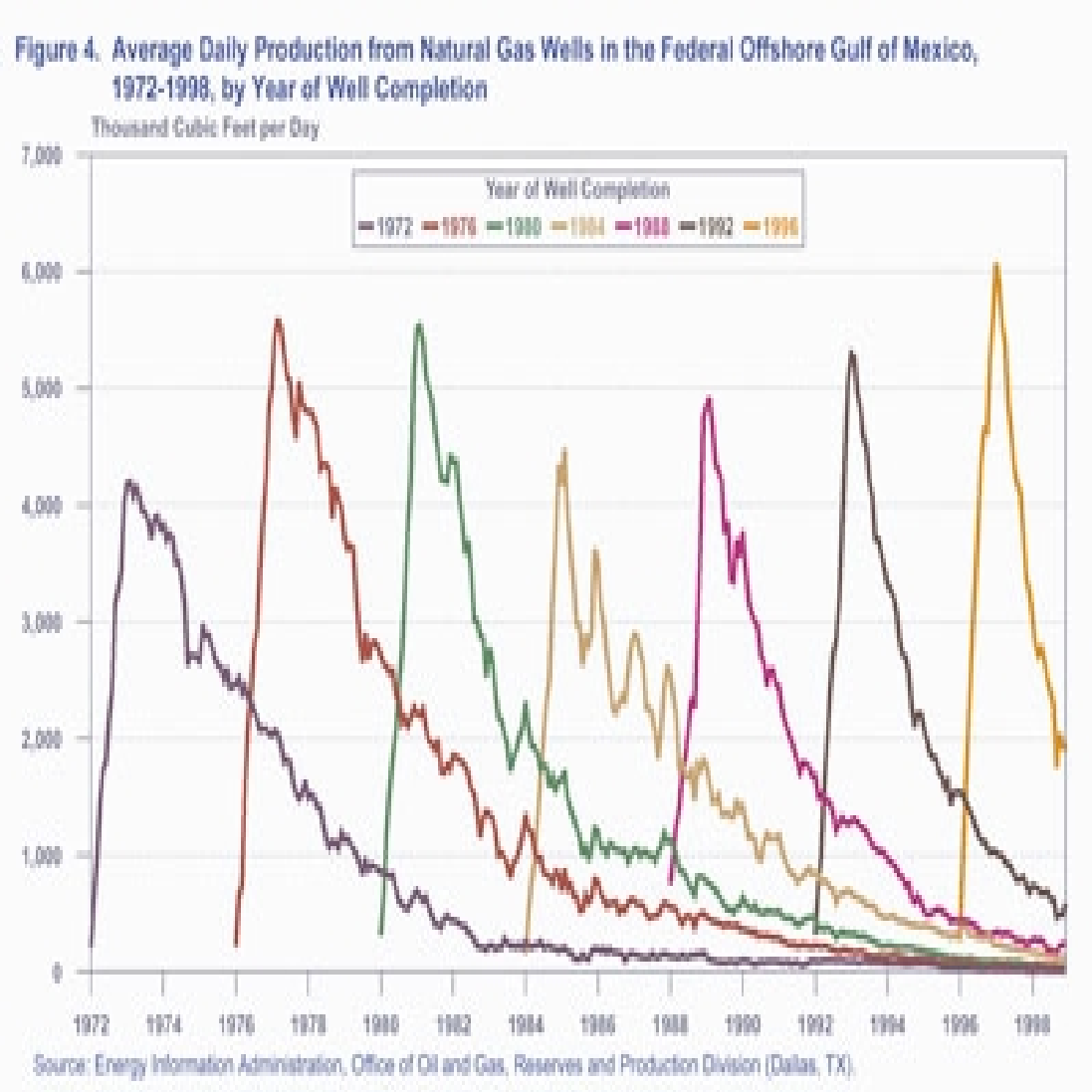


Figure 59:



-5-3-Technology: impact on reserves: little on conventional, large on unconventional

-Conventional: to produce cheaper and faster. Figure 65: GOM depletion



-Unconventional: technology progress is a « must » to increase the reserves. Orinoco heavy oils with cold production (no steam) with horizontal wells with pumps just above the reservoir.

Figure 69: small negative reserve growth to come for those 9 UK oilfields

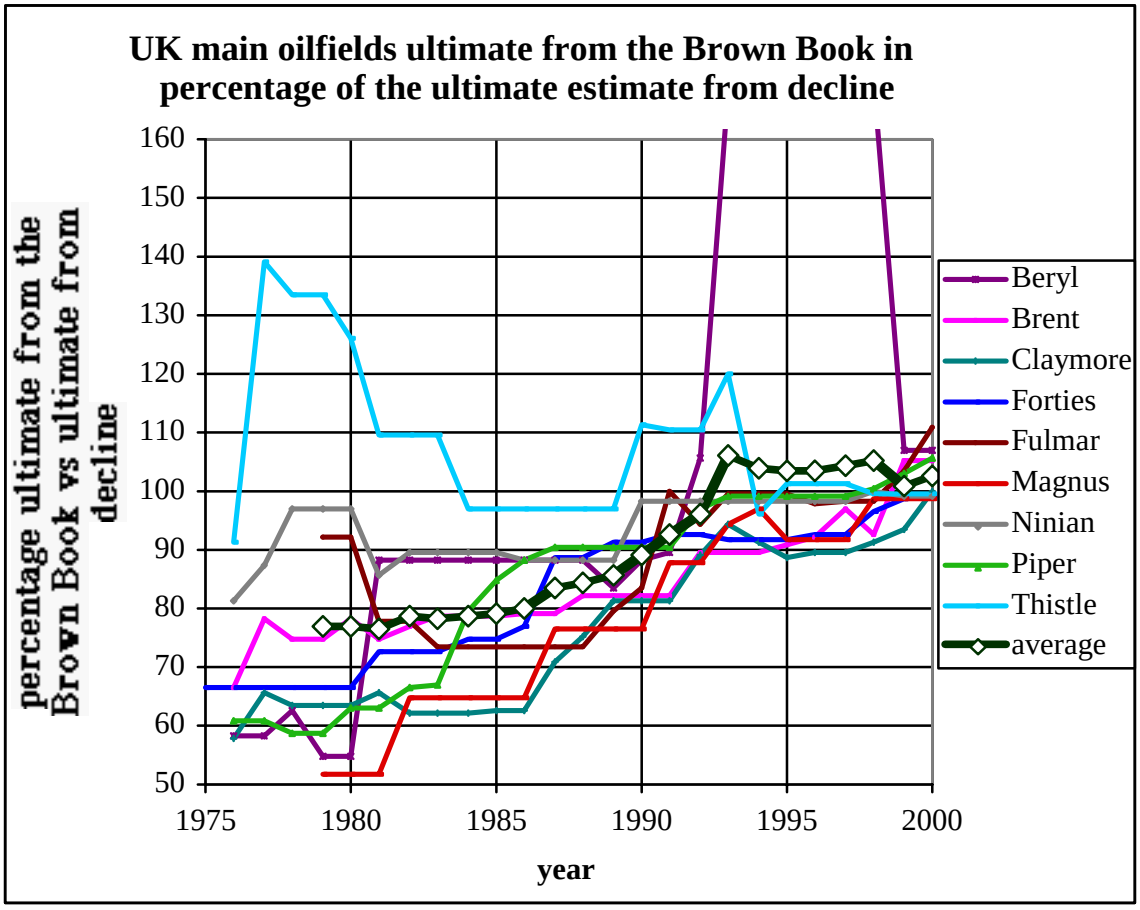
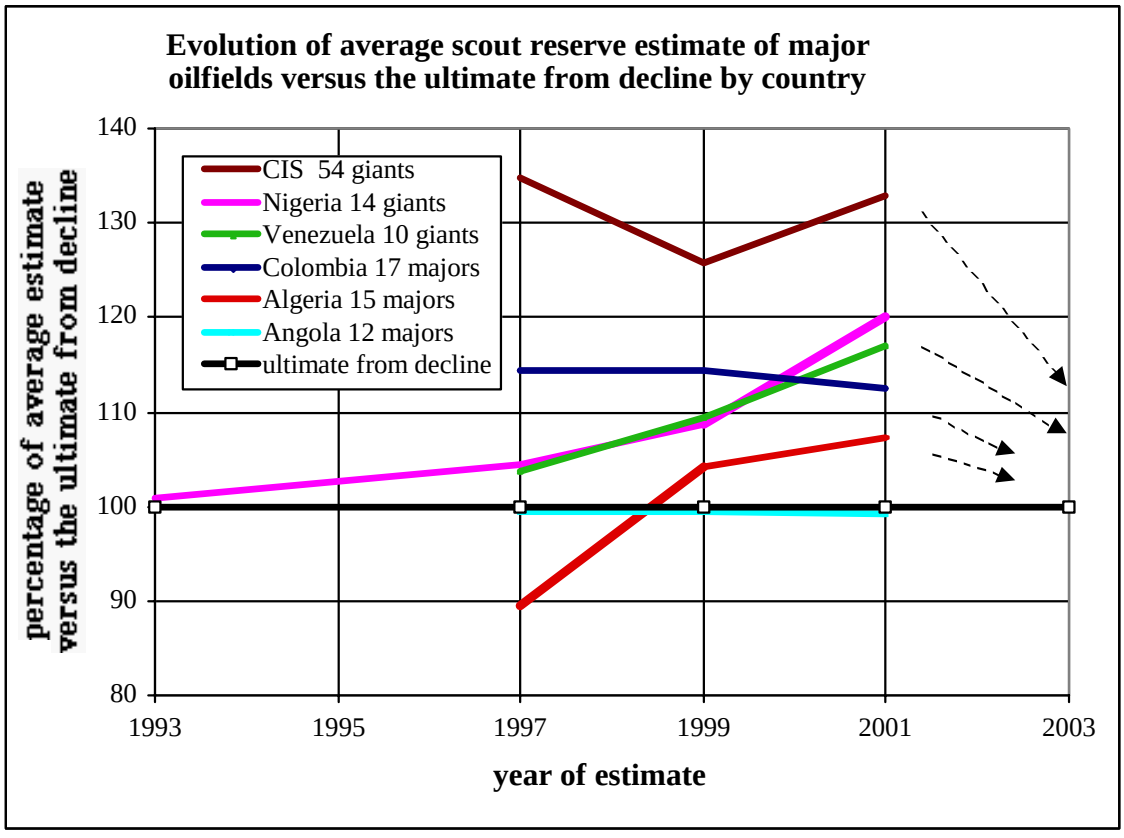


Figure 71: large negative reserve growth is to come for all except Angola!



-7-Ultimates

-7-1-Retired oil geologists group

Our ultimate estimate involves more than seven years of study by four retired exploration geologists: Alain Perrodon, who was the first to introduce the term Petroleum System, Gerard Demaison, who quantified generation of a Petroleum System, Colin Campbell and myself.

We are also in very close contact with two famous US retired geologists: Walter Youngquist (Geodestinies 1996) and Buzz Ivanhoe (Hubbert Centre at the Colorado School of Mines).

The four reports totalling 1250 pages from 1994 to 1998 are:

-Laherrère, J.H. A.Perrodon, and G.Demaison 1994 " Undiscovered Petroleum Potential"; Petroconsultants Report 383p March

-Laherrère J.H., A.Perrodon, and C.J.Campbell 1996 "The world's gas potential" Petroconsultants Report July, 200p, CD-ROM

-C.J.Campbell C.J.& J Laherrère 1995."The world's oil supply -1930-2050", Petroconsultants Report 650p, CD-ROM

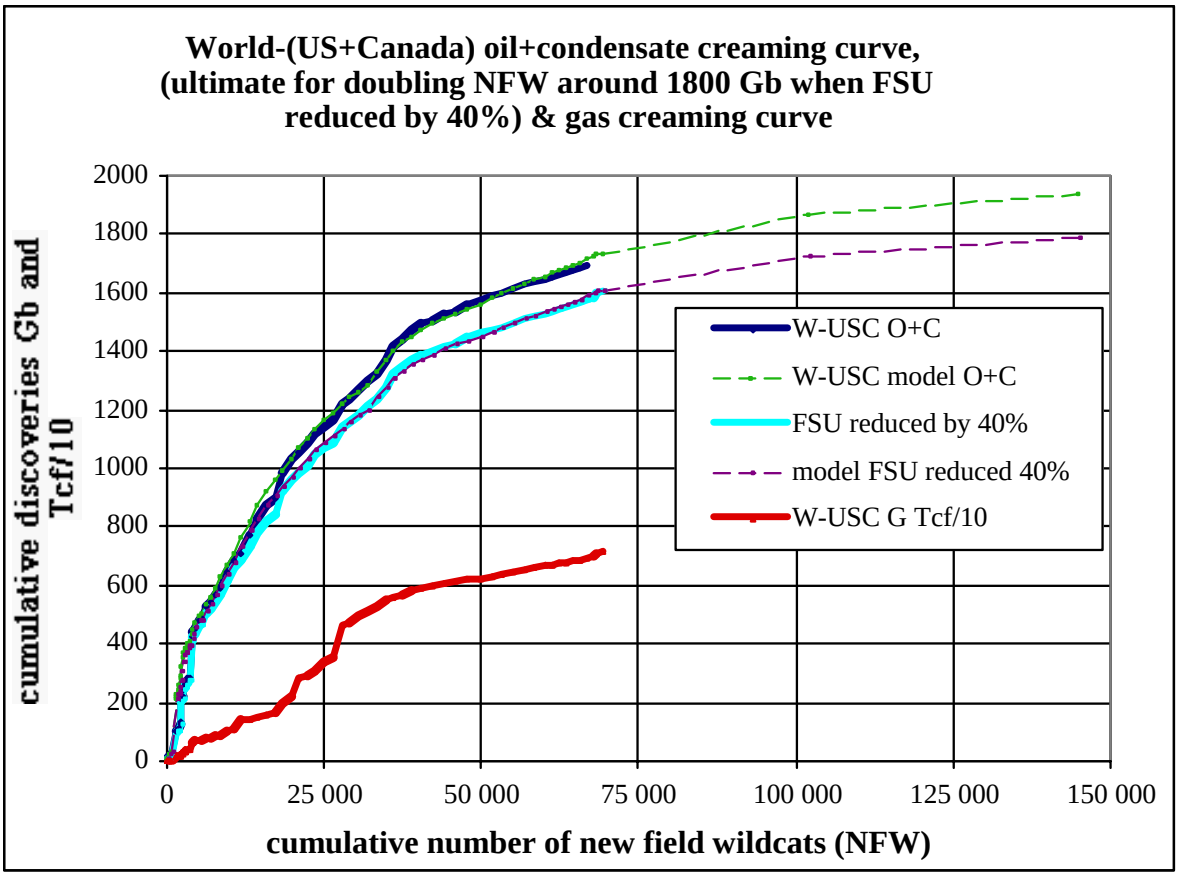
-Perrodon A., J.H. Laherrère and C.J.Campbell 1998 "The world's non-conventional oil and gas"; Petroleum Economist March report 113p

Our ultimate is as follows:

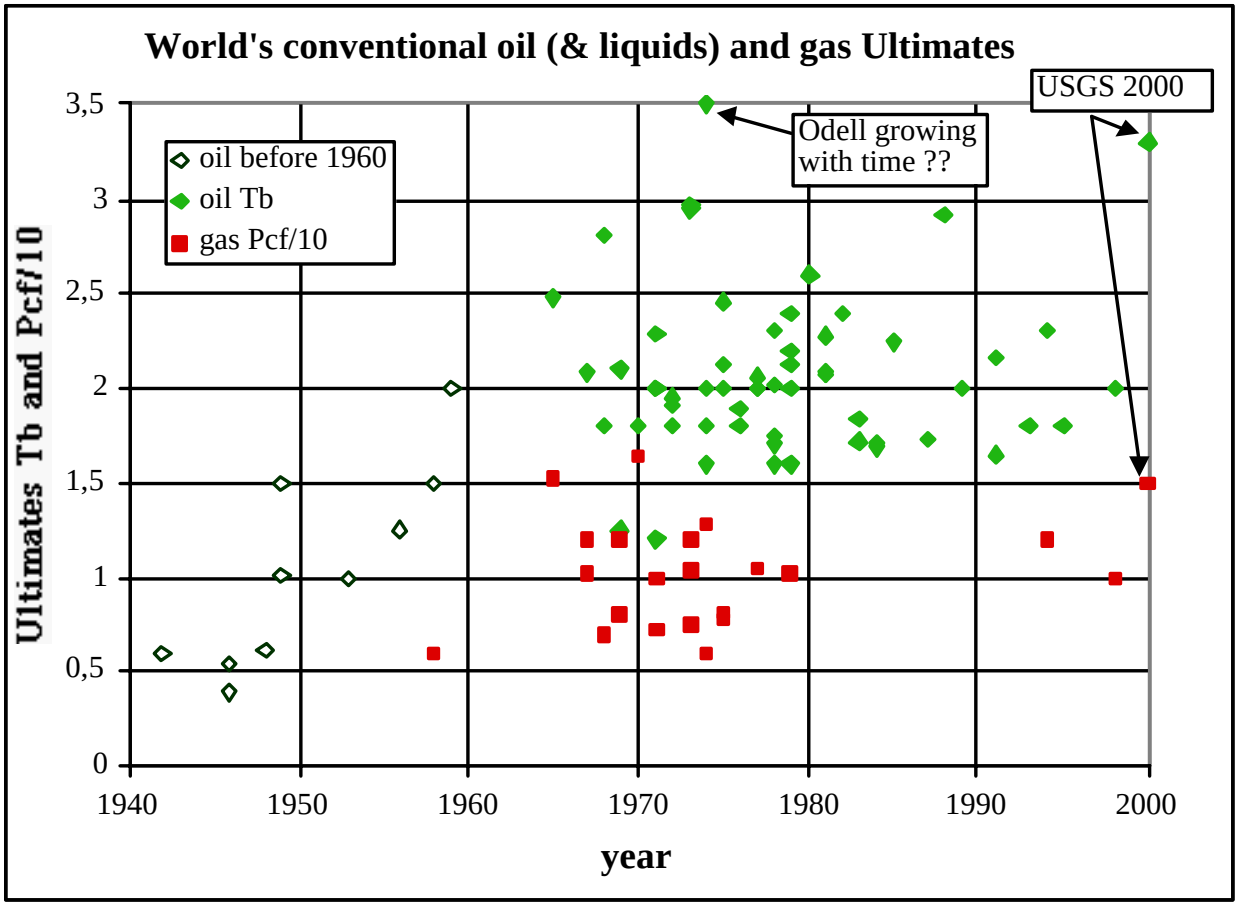
Perrodon et al 1998	mini	mean	maxi
Conventional oil	1 700	1 800	2 200
Conventional gas liquids	200	250	400
Non-conventional liquids	300	700	1 500
Ultimate liquids Gb	2 300	2 750	4 000
Conventional gas	8 500	10 000	13 000
Non-conventional gas	1 000	2 500	8 000
Ultimate gas Tcf	10 000	12 500	20 000

Our ultimate of 2000 Gb for oil +condensate estimated in 1998 is confirmed (+or- 10%) by the update with 2001 data of the creaming curve giving 1800 Gb for the world outside US+Canada and with an ultimate for US+Canada of 250 Gb.

Figure 72:



-7-2-Evolution of ultimates Figure 73:



-7-3-USGS world assessment 2000

-good by defining the geography of the Petroleum Systems with the help of the oil industry

-assessment of undiscovered potential left to lonely academic USGS geologists because confidentiality, with no access to well data and seismics, fairly old data on reserves (1995 & 1996)

-US assessment is still the 1995 study, but they apply to the rest of the world the US practice of reserve growth when the definition of data is completely different: P for US and Canada, 2P for the rest with 3P in FSU.

-main assumptions filled up by one geologist on one sheet of paper giving number and size of undiscovered fields. The distribution of the unit is done through many pages of Monte Carlo simulation.

There is much more computing than geology!

The five largest undiscovered provinces are given as:

Mesopotamian Foredeep Basin	61 Gb
West Siberian Basin	55 Gb
East Greenland Rift Basins	47 Gb
Zagros Fold Belt	45 Gb
Niger Delta	40 Gb

My comments on this report: « Is the USGS 2000 assessment reliable? » was in the WEC Cyber oil conference of May 2000.

-7-4-others:

Robertson Research International Ltd. (RRI)

The world's undiscovered liquids is about 440 Gb, compared to USGS 2000 of 939 Gb, but RRI did not mention any reserve growth when USGS 2000 adds 730 Gb, giving an addition of 1670 Gb for the next thirty. This is 50 Gb/a, which is implausibly more than three to four times what was discovered annually over the last ten years.

Robertson commented the USGS 2000 report as: << We are surprised at the USGS outcome.<<

Shell International:

Ged Davis in the BBC "the Money programme" of Nov.8, 2000 « The last oil shock » estimates the undiscovered oil at 250-260 Gb, about one third of USGS estimate and not far from our estimate (200 Gb). He added that the improved recovery would add about the same volume.

-8-Forecasts **-8-1-Oil price forecasts:** Figure 79:

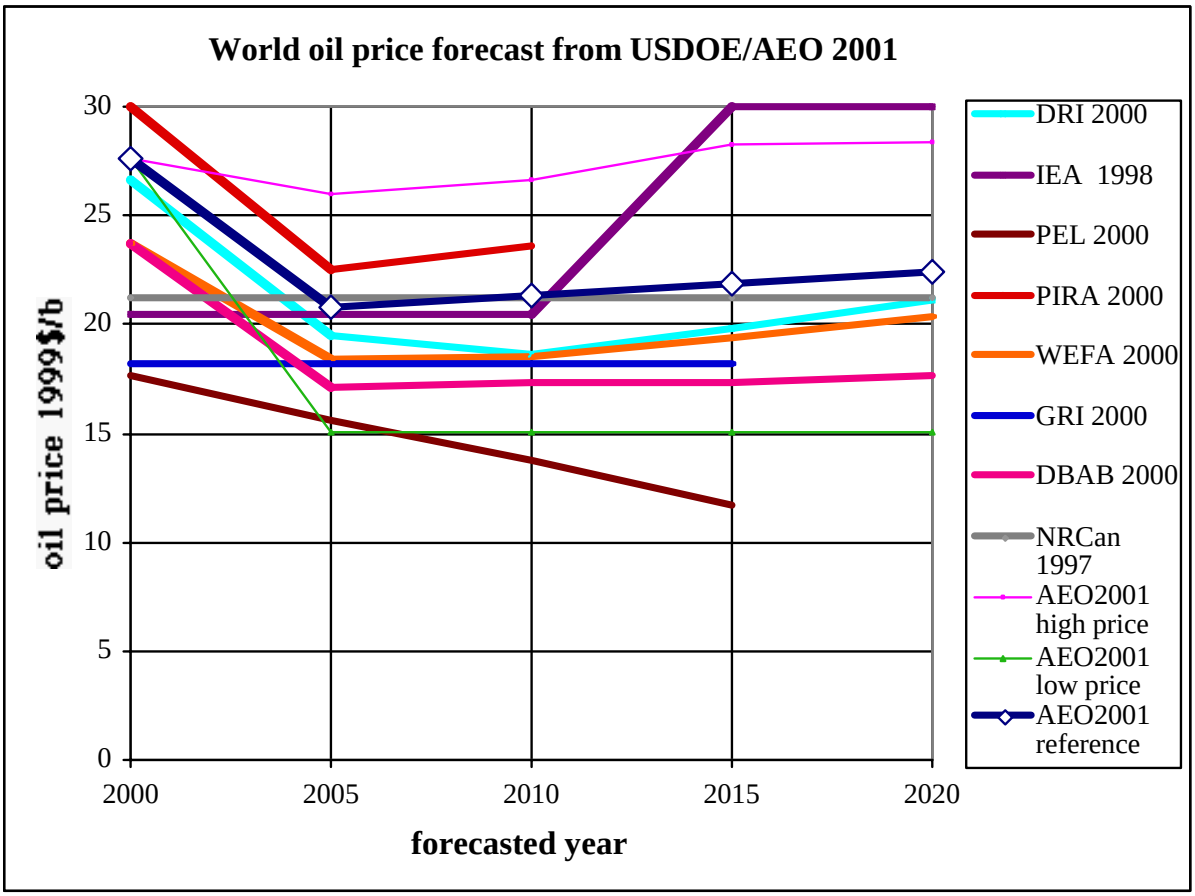

World oil price forecast from USDOE/AEO 2001
oil price 1999$/b
30
25
20
15
10
5
0
2000
2005
2010
2015
2020
forecasted year
DRI 2000
IEA 1998
PEL 2000
PIRA 2000
WEFA 2000
GRI 2000
DBAB 2000
NRCan 1997
AEO2001 high price
AEO2001 low price
AEO2001 reference

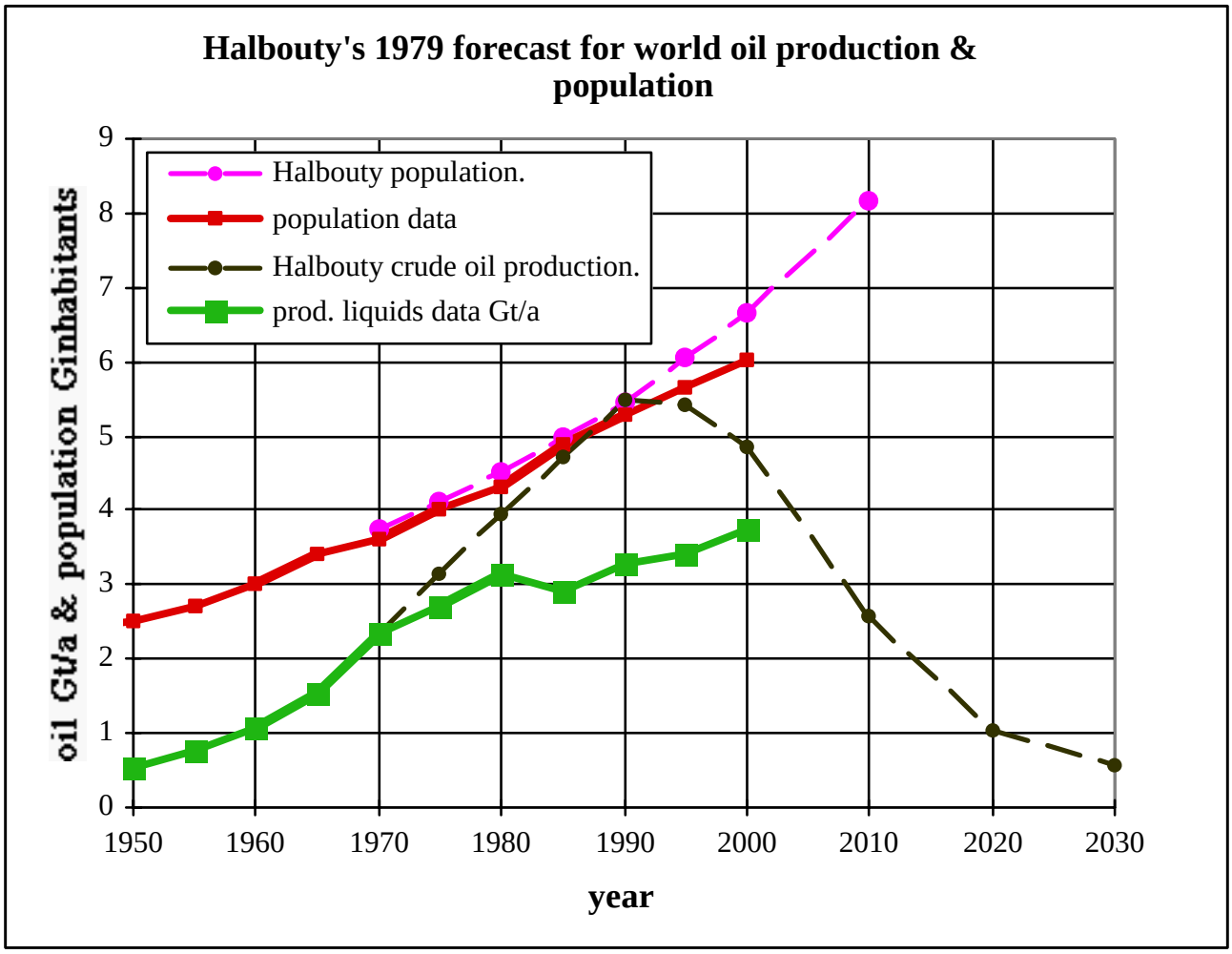
Figure 81:

If it will take a long time to check if the forecast in volume is right, it is easier for forecasts on oil price. The consensus between official agencies is that in 2002 the oil price will be quite lower than the goal of OPEC to get 25$/b.
If oil price stays at 25$/b in 2002 it will show the failure of the official forecasts. It will not be a surprise as the last oil shock (27$/b in 2000) was not forecasted by any agency or any economist.
The only people in 1998 to speak about « The end of cheap oil » was us (Scientific American March 1998) and Franco Bernabe, CEO ENI before retiring (« Cheap oil: enjoy it when it lasts » Forbes June 15, 1998) and Mike Bowlin CEO ARCO after having sold his company to BP (« last days of the oil age » Feb.1999). Finally in mid 2000 John Browne CEO of BP announced that BP now means « Beyond Petroleum ».

-9-Future production

-9-1-Past forecast: Halbouty–Moody 1979:

Figure 84: Halbouty now an “Optimist” was a “Pessimist” for 2000 in 1979!



-9-2-USDOE long term forecast

John Wood from the USDOE/EIA in his long term study

Figure 87: Wood gives our view to compensate for USGS estimate

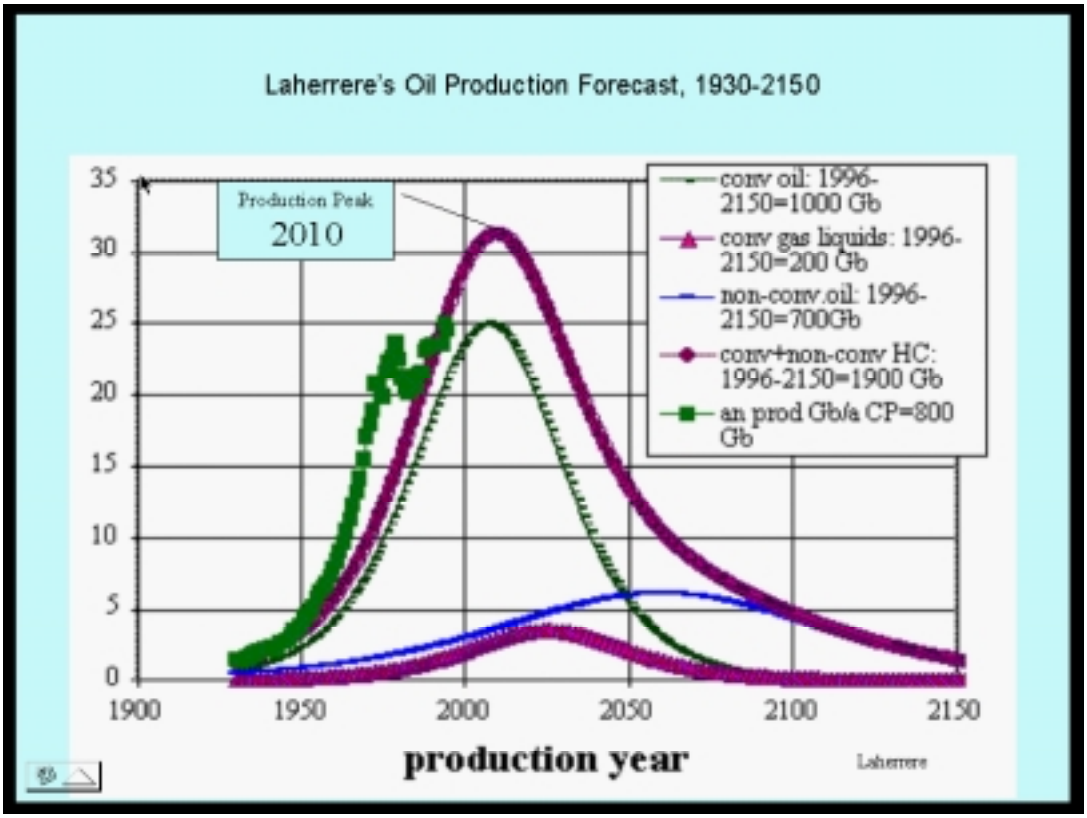
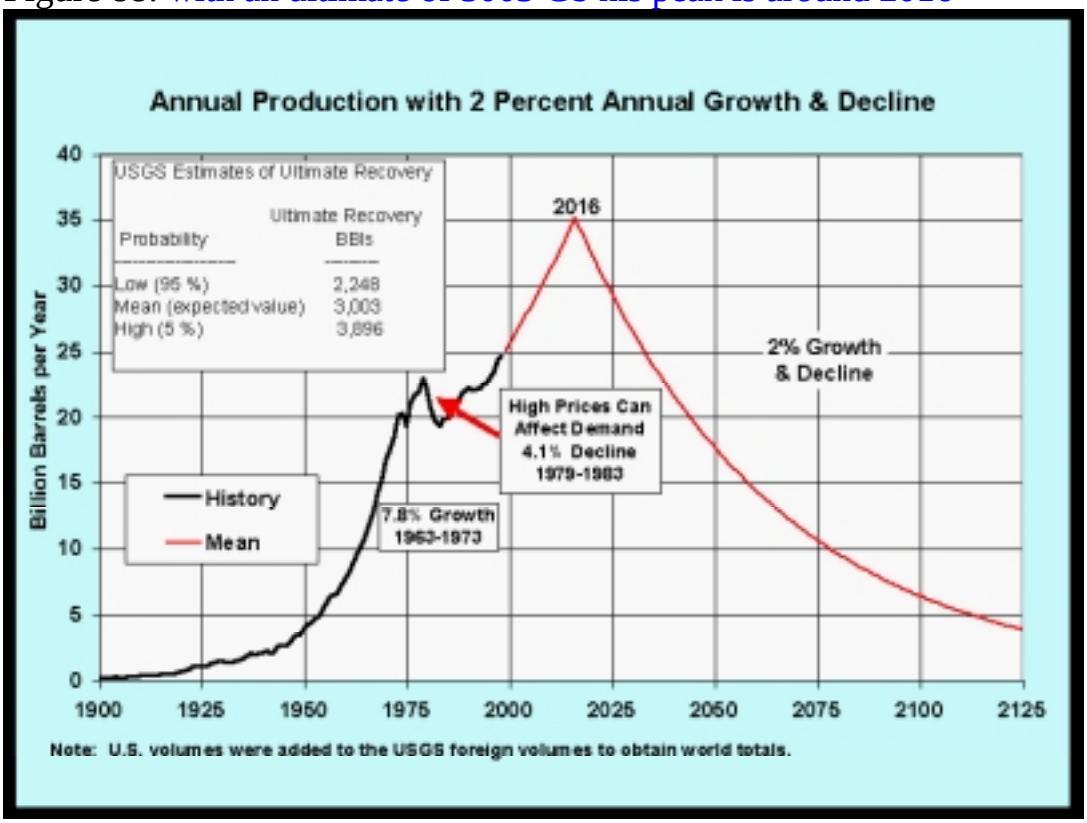
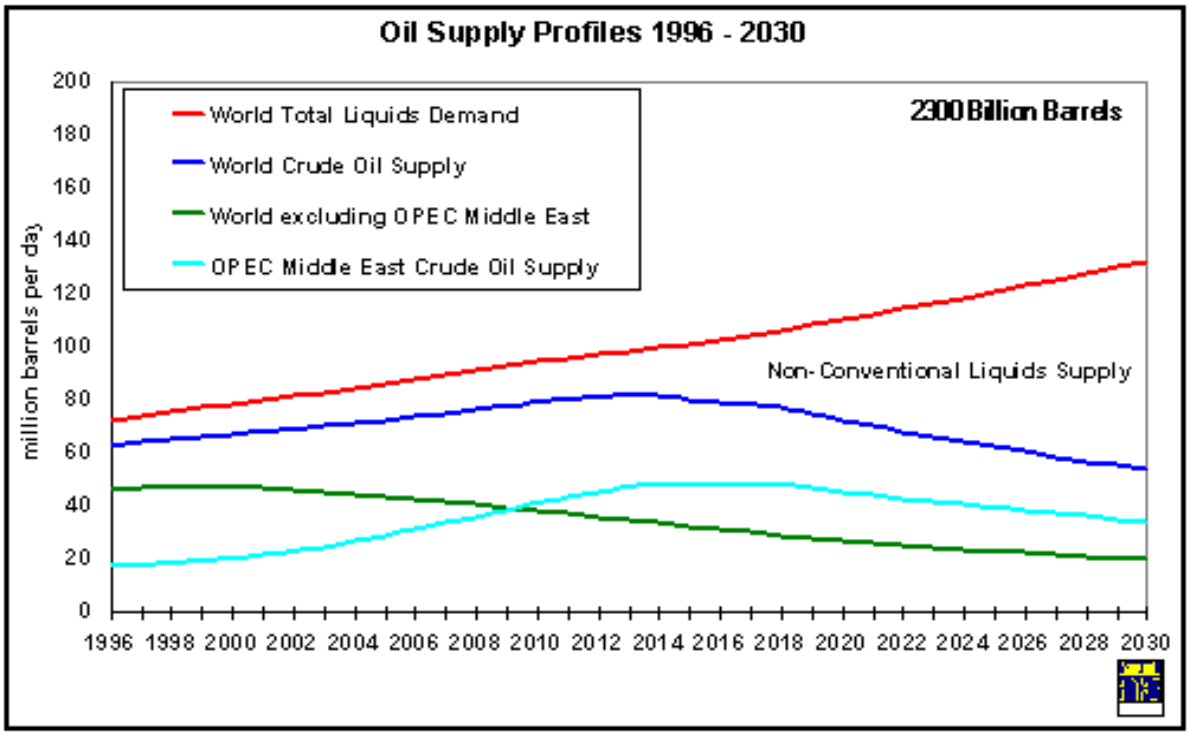


Figure 88: with an ultimate of 3003 Gb his peak is around 2016

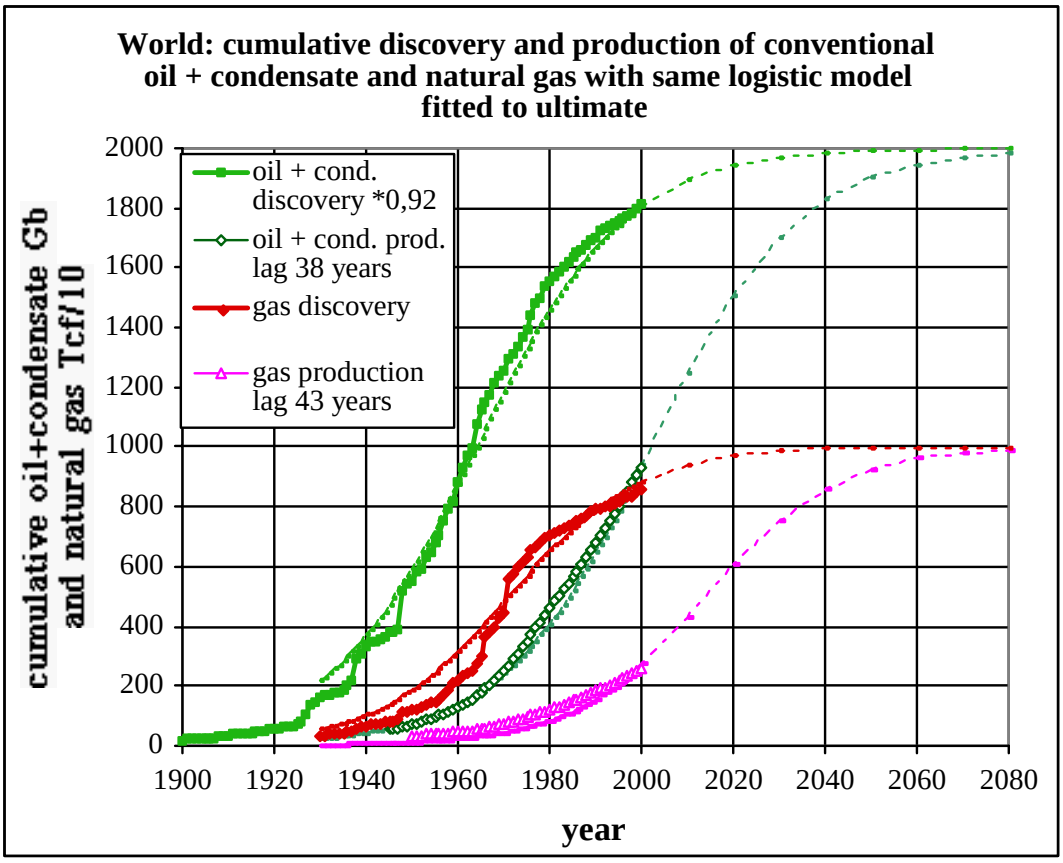


-9-3-IEA 1998 forecast « World Energy Prospects to 2020

Figure 89:In 2020 unidentified unconventional oil is needed to fill the demand!

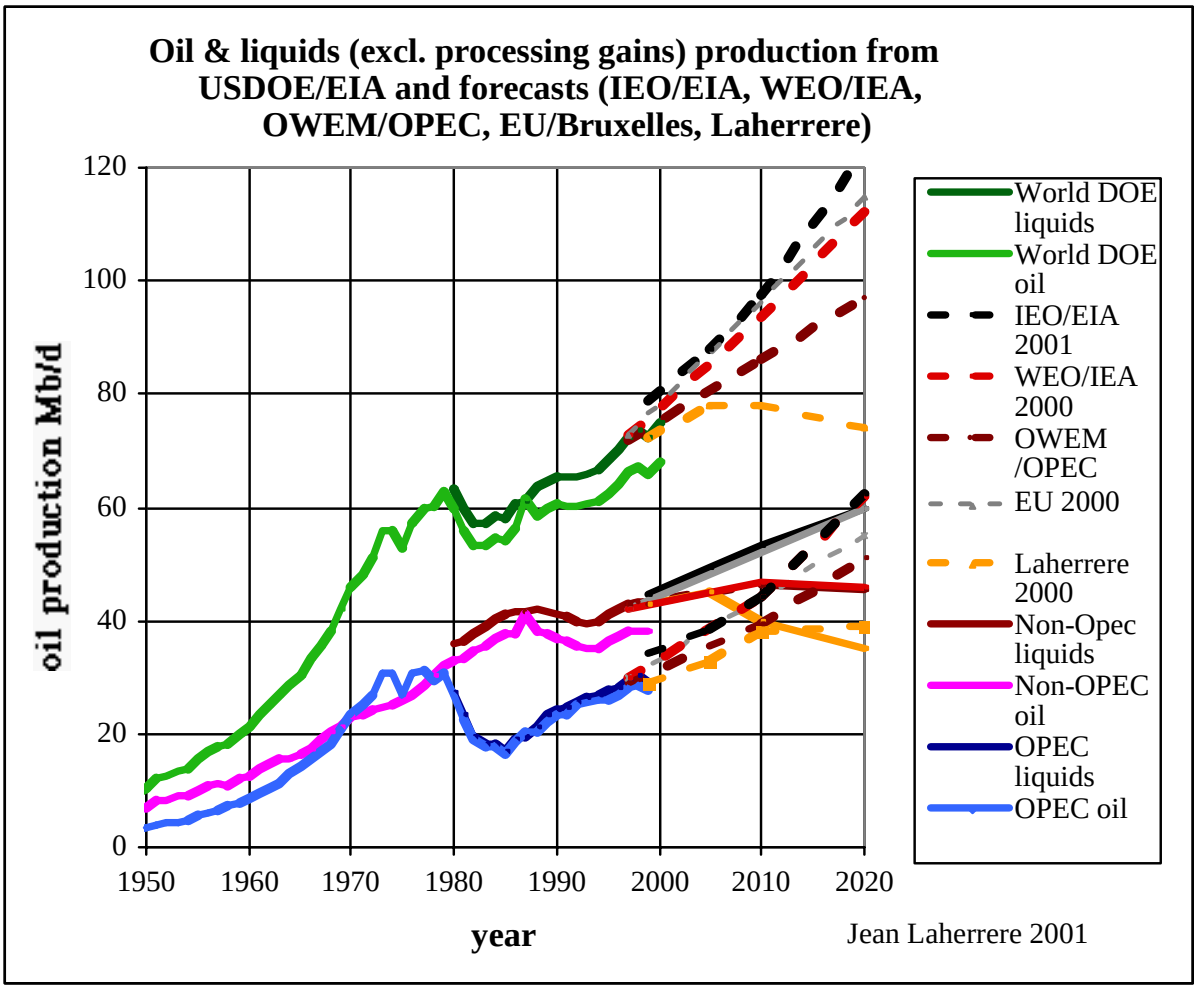


-9-4-My forecast Figure 90: the conventional ultimate of 2000 Gb and 10 000 Tcf fits the present cumulative discovery & production



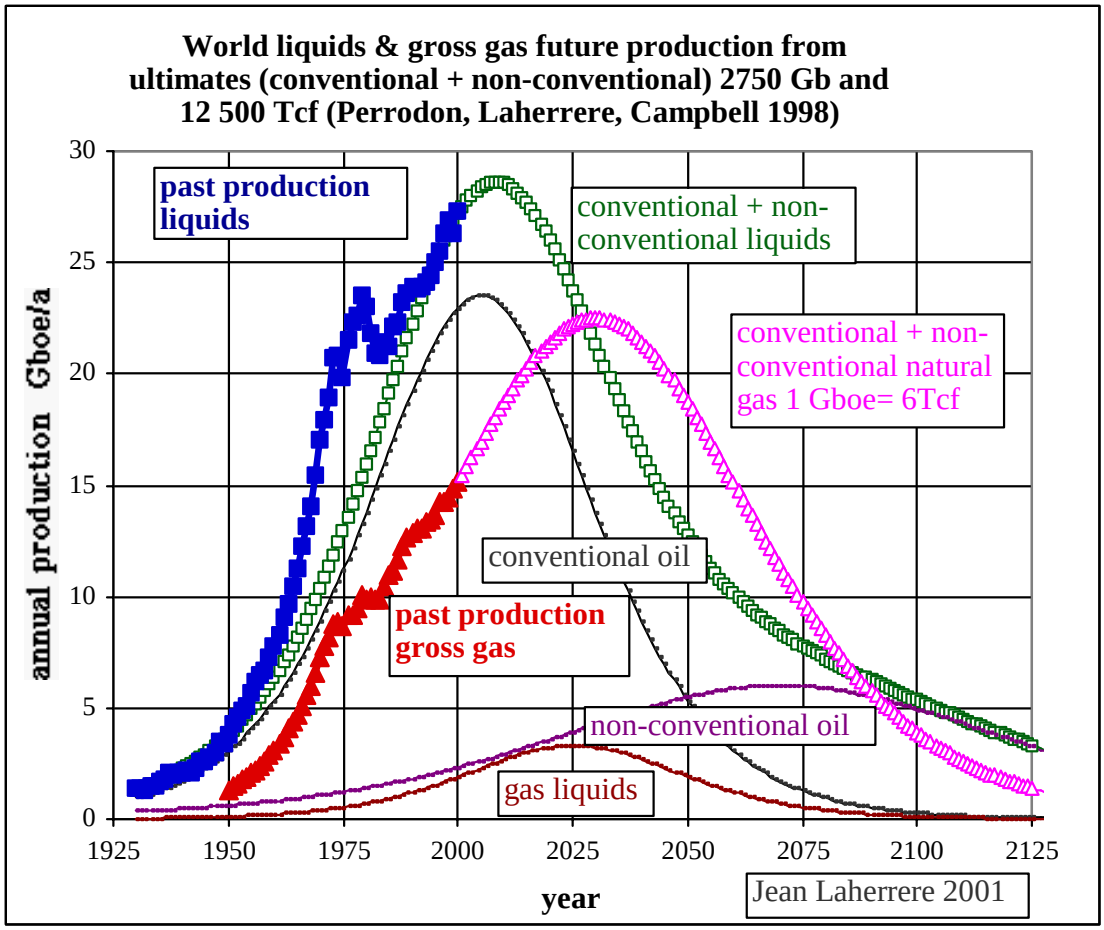
-9-5-Comparison different forecasts

Figure 92: the range of forecasts is large, mine is quite different

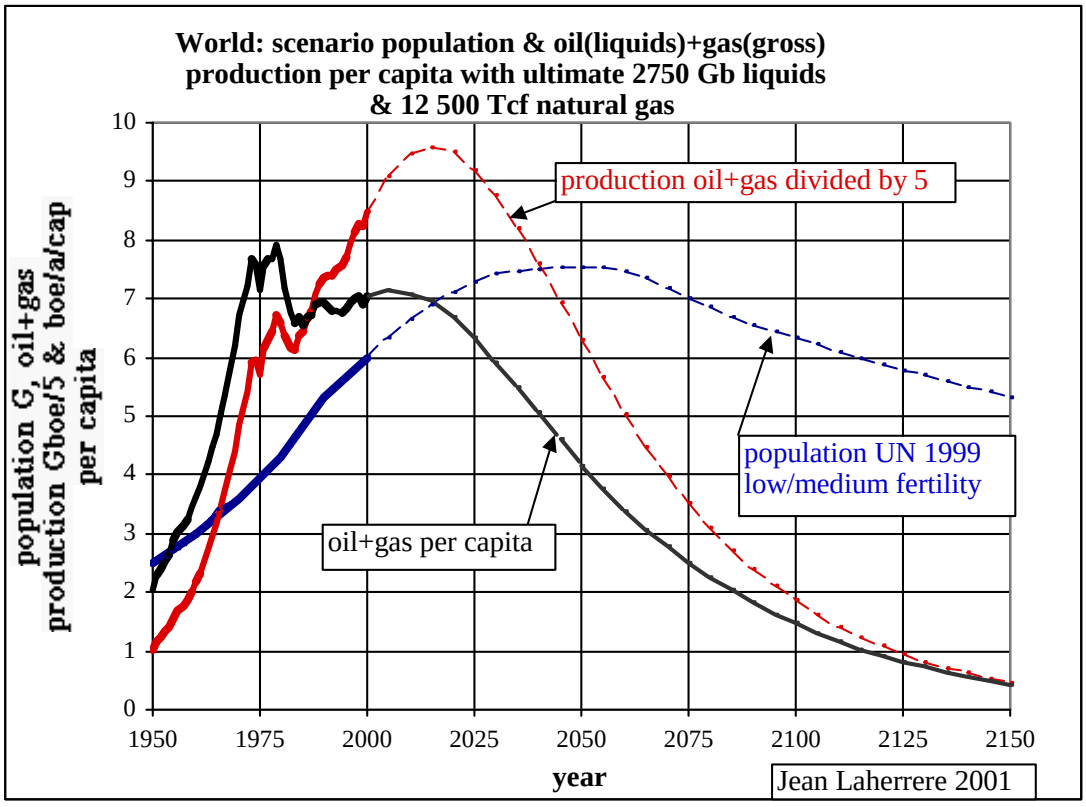


In Oil & Gas Journal April 30, 2001 A.M. Bakhtiari & F. Shahbudoghou (National Iranian Oil Co) "IEA, OPEC oil supply forecasts challenged" write "Obviously the IEA's WEO and OPEC's OWEM forecasts for 2010 and 2020 are too optimistic, given the present status of global oil reserves and actual production capacities."
So the technician as us or from NIOC consider that the official forecasts are unlikely to be reached.

-9-6-Global forecast oil &gas conventional and unconventional



-9-7-Global forecast per capita Figure 94:



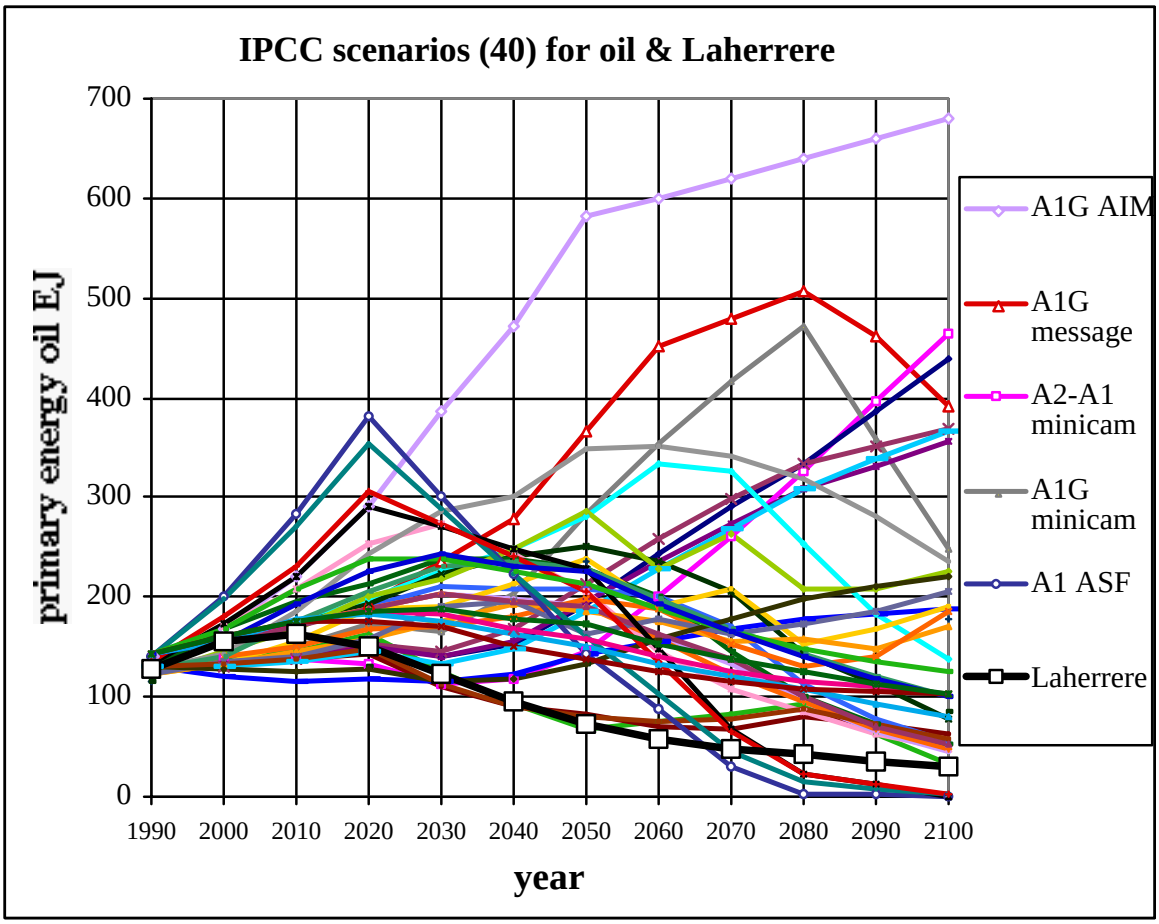
-10-Impact on climate change: IPCC scenarios

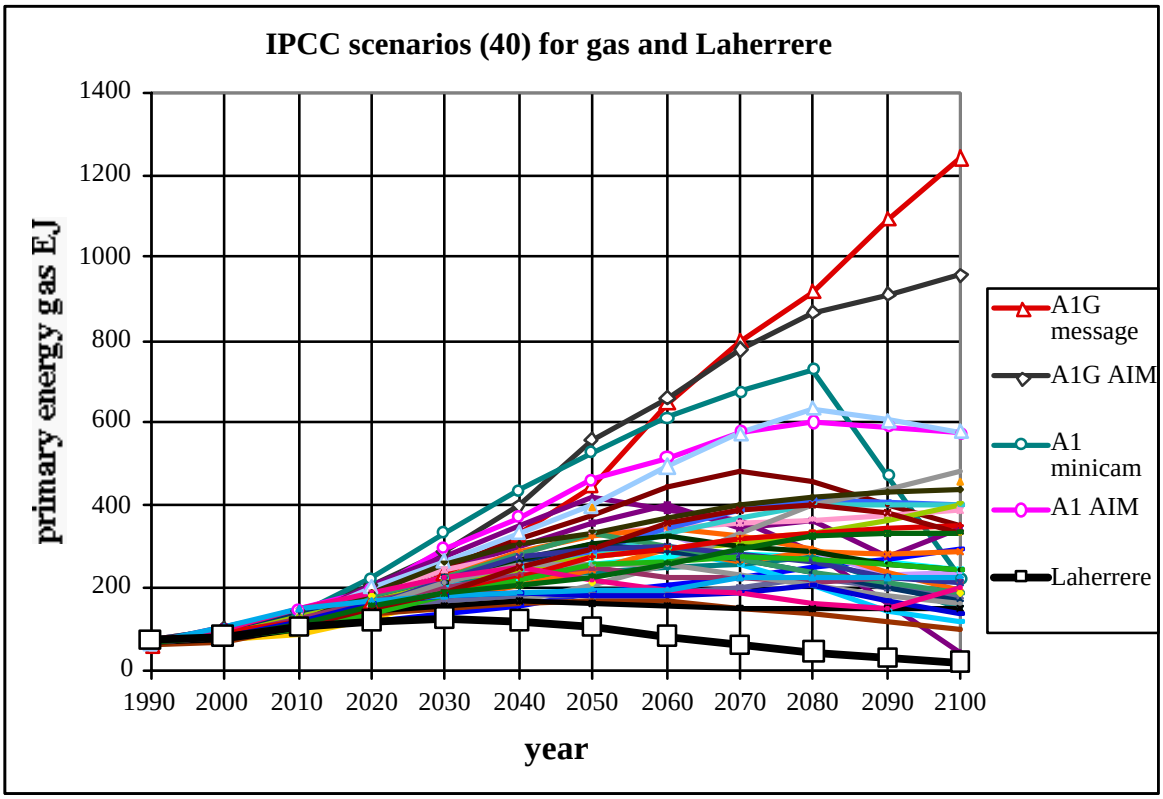
The assumptions of the IPCC 2000 are as follows, compared to the World Energy Assessment (United Nations and World Energy Council)

	IPCC 2000 Emission scenarios						World Energy Assessment		
	A1FI	A1B	A1T	A2	B1	B2	growth A high	growth B middle	growth C ecology
population	G								
1990	5,3	5,3	5,3	5,3	5,3	5,3	5,3	5,3	5,3
2020	7,6	7,5	7,6	8,2	7,6	7,6			
2050	8,7	8,7	8,7	11,3	8,7	9,3	10,1	10,1	10,1
2100	7,1	7,1	7	15,1	7	10,4	11,7	11,7	11,7
per capita	**per**	**year**							
primary	energy	GJ							
1990	65	65	65	65	65	65	72	72	72
2020	90	90	80	70	80	70			
2050	160	150	140	90	90	90	103	83	60
2100	290	310	290	110	70	130	159	125	75
GDP	k$1990								
1990	4	4	4	4	4	4	4	4	4
2020	7	7	8	5	7	7			
2050	20	20	20	7	15	10	10	7	7
2100	75	75	80	15	50	20	26	17	19
CO2 fossil	fuels	tC							
1990	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,1
2020	1,5	1,6	1,3	1,3	1,3	1,2			
2050	2,7	1,8	1,4	1,5	1,3	1,2	1,2	1,0	0,5
2100	4,3	1,8	0,7	1,9	0,7	1,3	1,1	0,9	0,2
CO2 concentration		ppm							
1990	350	350	350	350	350	350	358	358	358
2020	410	415	410	410	410	405			
2050	565	530	500	530	480	470	460-510	470	460
2100	960	705	570	840	540	610	530-730	590	460

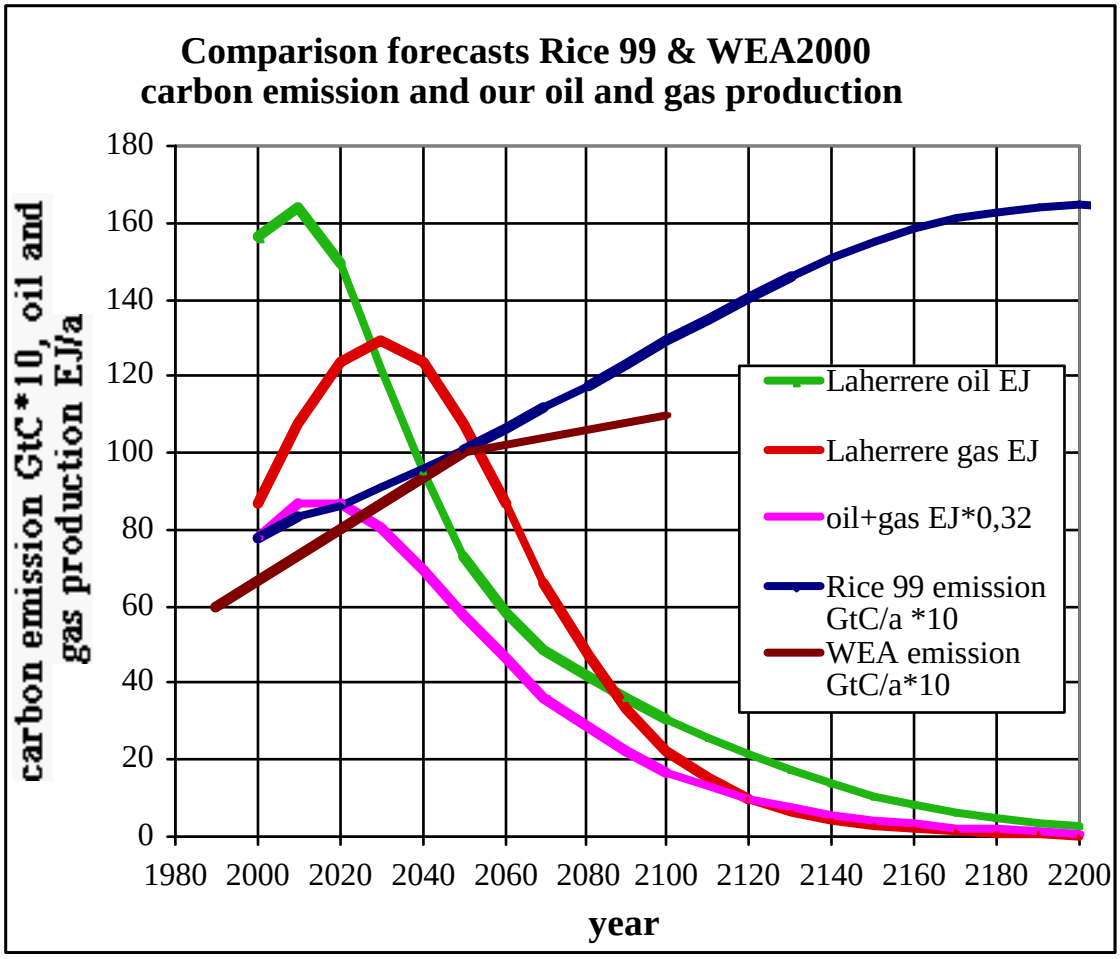
-10-3-primary energy for oil and for gas

Figure 95 & 96:The 40 IPCC scenarios cover a large range but outside ours





Yale University model Rice 99 and WEA 2000: Figure 97:



Conclusions:
-consuming society needs growth and only high energy price can change behaviour of consumption and life

-goal of the oil companies is to make profit and not to publish data, keeping every information confidential because competition
-government agencies follow the policy of every government that promises that tomorrow will be better and counts on growth to solve all future problems.
-future oil and gas demand is overestimated assuming cheap prices and large resources.
-three different and parallel worlds in the estimates of oil reserves.
-not “pessimists” and “optimists”, but
-geologists free to speak when retired, with large experience and access to confidential technical data,
-« academic writers » who talk about future miracles from the technology (but refuse to listen to technicians) and rely on published data which are mainly political,
-“theoretical writers” who deal only with theories and wishful thinking, and reject facts as confusing.
-oil industry follows archaic and poor practice in reporting data for production or reserves because confidentiality, conservatism and fear of the impact on the stock market.
-forecasts are as unreliable as the basic data. However data on past discoveries and production shows that oil and gas liquids will peak before 2010 and that natural gas will peak around 2030.
-IPCC assumptions on oil and gas up to 2100 are mainly unrealistic, based on cheap and abundant hydrocarbons.
It is important as a matter of urgency that the oil industry and the governmental agencies start to realise that the main priority now is to improve the world database.
The ideal is to find an organisation, which is apolitical, that consumers, and producers can trust. I do not see any organisation that complies with the necessary qualities. IIASA could one possibility, but it has to show that it can do it.