



Update on US GOM from MMS, EIA and Scout Data

Posted by [Luis de Sousa](#) on June 19, 2009 - 10:17am in [The Oil Drum: Europe](#)

Topic: [Geology/Exploration](#)

Tags: [deepwater](#), [gulf of mexico](#), [jean laherrère](#) [[list all tags](#)]

This is a guest post by [Jean Laherrère](#) on the current knowledge of the deepwater Oil and Gas reserve at the Gulf of Mexico. In this first installment of the series Jean looks at data recently made public by the MMS and compares it to previously published information from the EIA and scout companies.

In a coming installment Jean will discuss the recent [Methane Hydrates](#) findings announced in the region.

Update: *The graph on Commulative Discovery for over 400 meters deep was corrected; originally showing the oil curve reaching close to 12 Gb, the correct figure is around 7 Gb. Thanks to [ace](#) for his diligent scrutiny.*



For those not familiar with it, MMS stands for [Minerals Management Service](#), the Federal agency that manages the United States' natural gas, oil and other mineral resources on its outer continental shelf.

[Ace](#) did an update on the Gulf of Mexico (GOM) on the 9th of February, 2009 ([TOD 5081](#)), but MMS has released in May of 2009 several reports:

- [Gulf of Mexico oil and gas forecasts: 2009-2018](#) MMS 2009-012;
- [Deepwater Gulf of Mexico 2009](#) MMS 2009-016 (updating [Deepwater Gulf of Mexico 2008: America's offshore energy future](#) MMS 2008-013);
- [Estimated oil and gas reserves, Gulf of Mexico OCS, December 31, 2005](#) MMS 2009-022;

This article uses this data from the MMS and compares it with the EIA's and scout data.

What is deepwater?

Definitions of its limit in water depth vary from 656 to 1500 ft (200 to 457 m). Royalties vary with water depth: 0-200m, 201-400 m, 401-800m, over 1000m. Deepwater is defined as >200m in the Outer Continental Shelf Deep Water Royalty Relief Act of 1995, and the MMS, being a federal agency, is obliged since 1993 to use the Système International units. The Energy Policy Act of 2005 has introduced new royalty suspension categories: 1600-2000 m (5249 to 6562 ft) and > 2000 m (6562 ft).

But in MMS's technical reports, to please the industry, deepwater is defined as >1000 ft (305 m) and ultra-deepwater as > 5000 ft. For the EIA deepwater is > 200 m. For the IHS the frontier data for the GOM is over 400 m.

Past production

In 2007 oil and gas from the GOM represented respectively 25% and 14% of the US internal production.

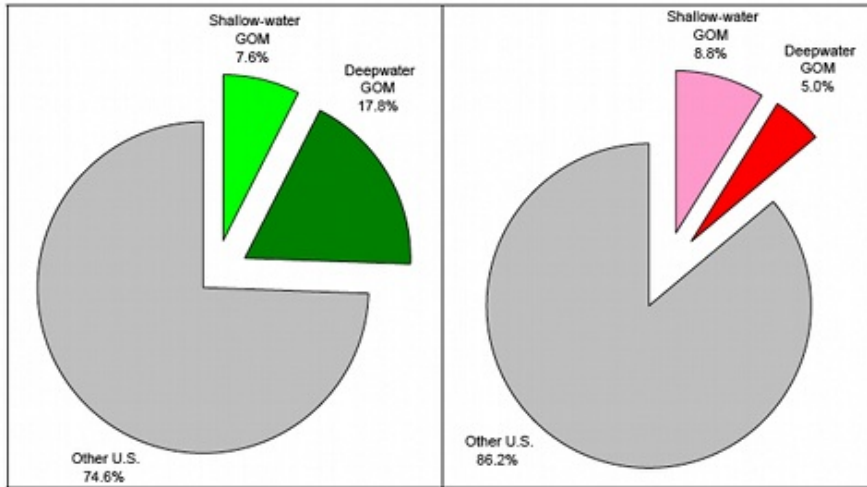
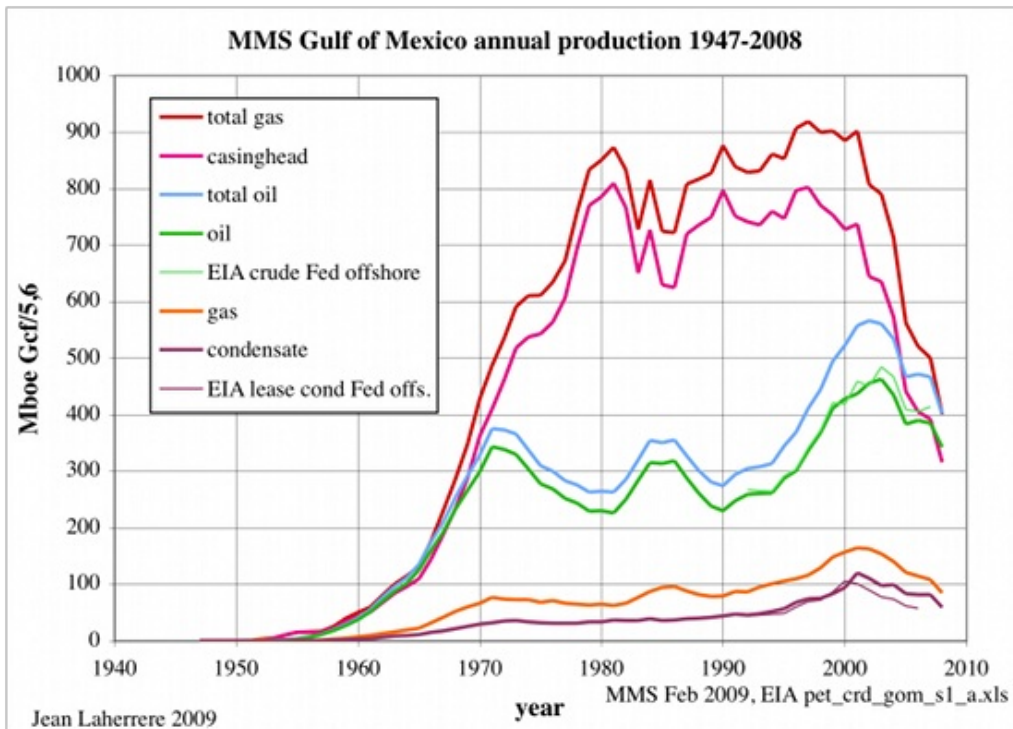


Figure 24a. Estimated U.S. oil production in 2007.

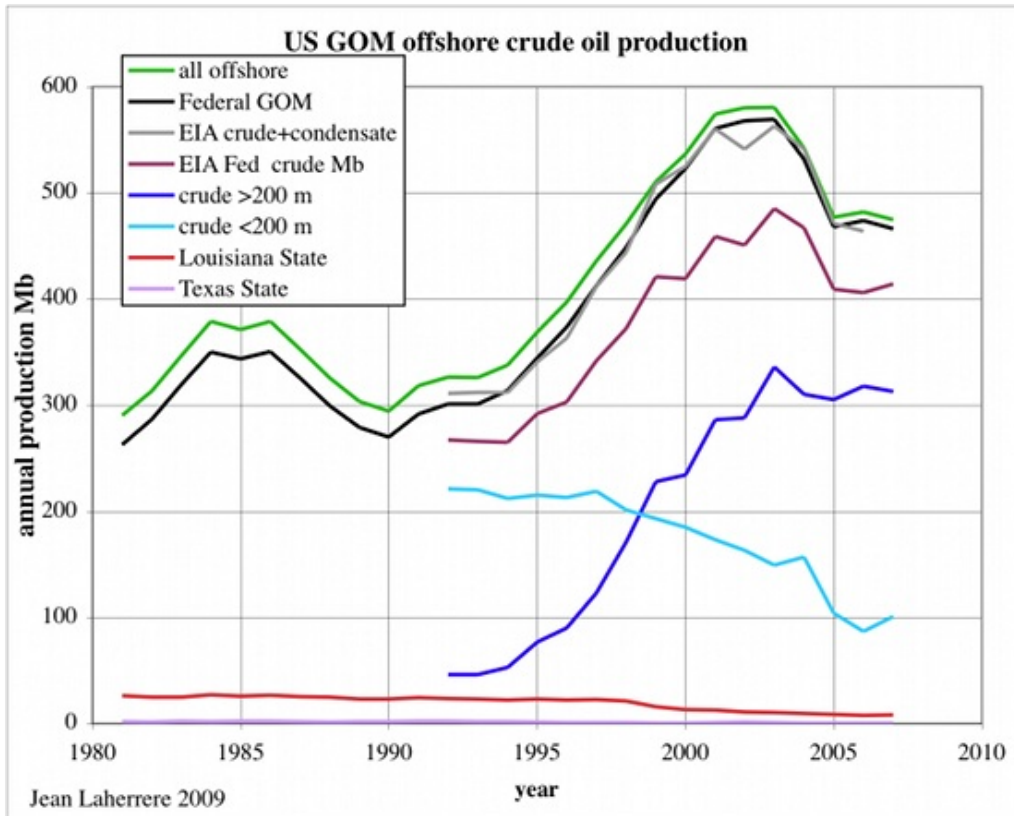
Figure 24b. Estimated U.S. gas production in 2007.

What was the past production in the GOM?

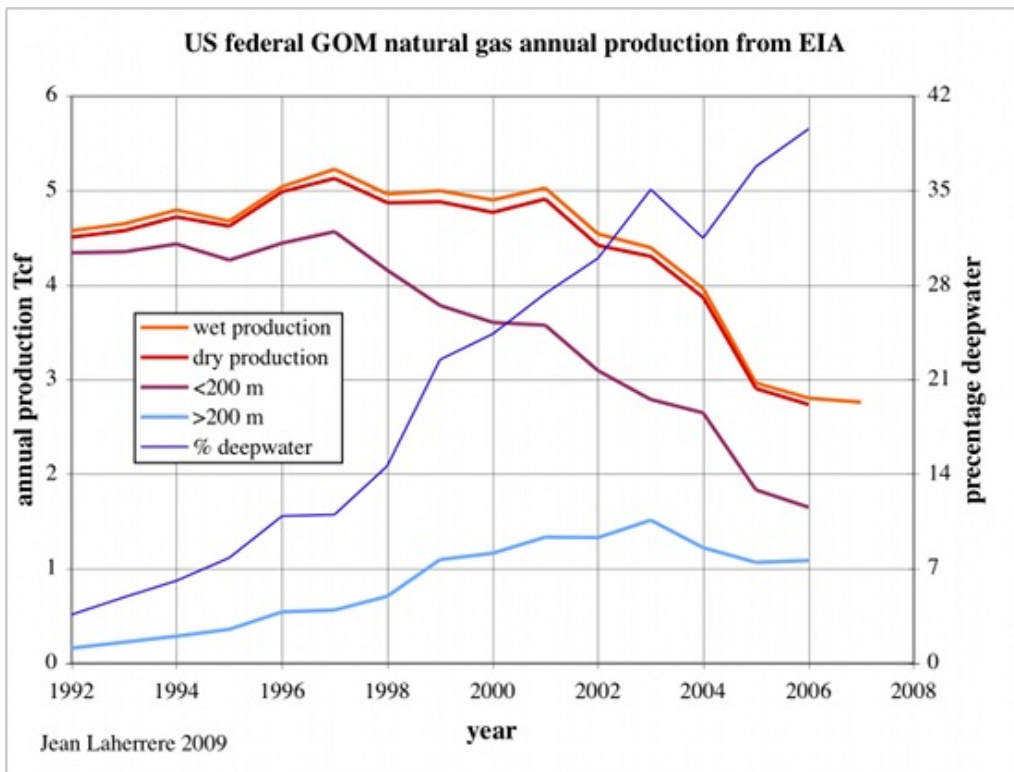
Natural gas (1 boe = 5.62 kcf) production displays a bumpy plateau from 1980 to 2000, while oil peaked in 2003.



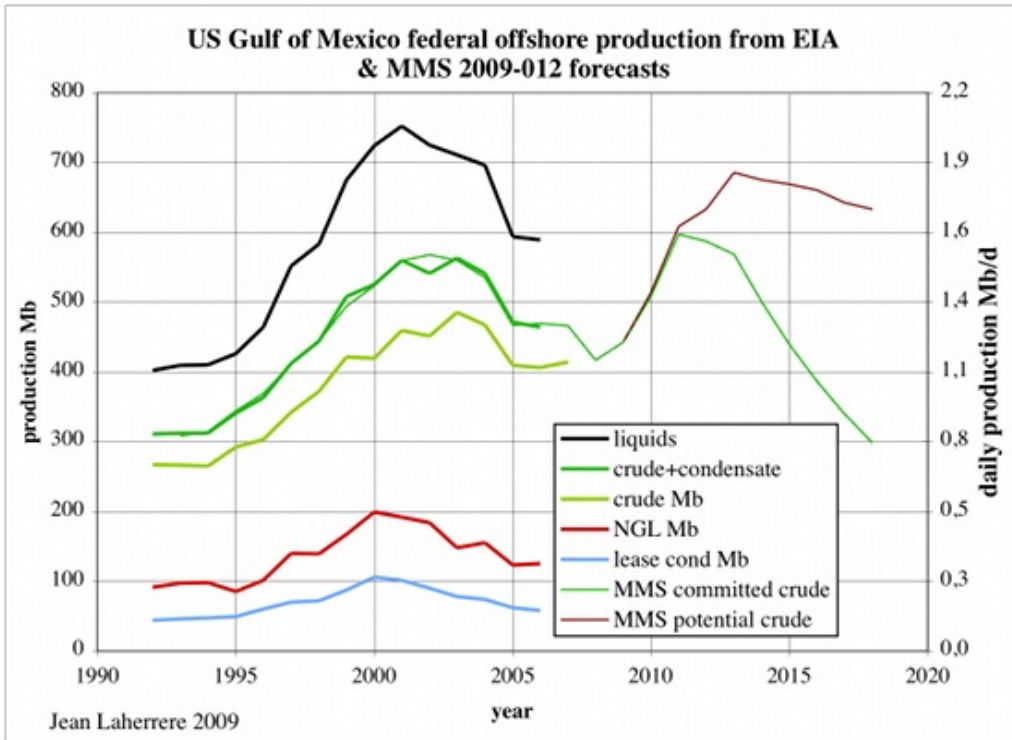
The state (Louisiana & Texas) oil production is negligible in front of federal production; deepwater production reached 76% of the total in 2007.



GOM natural gas production is declining (in 2005 Katrina worsened it). Deepwater represented 40 % of this production in 2006.

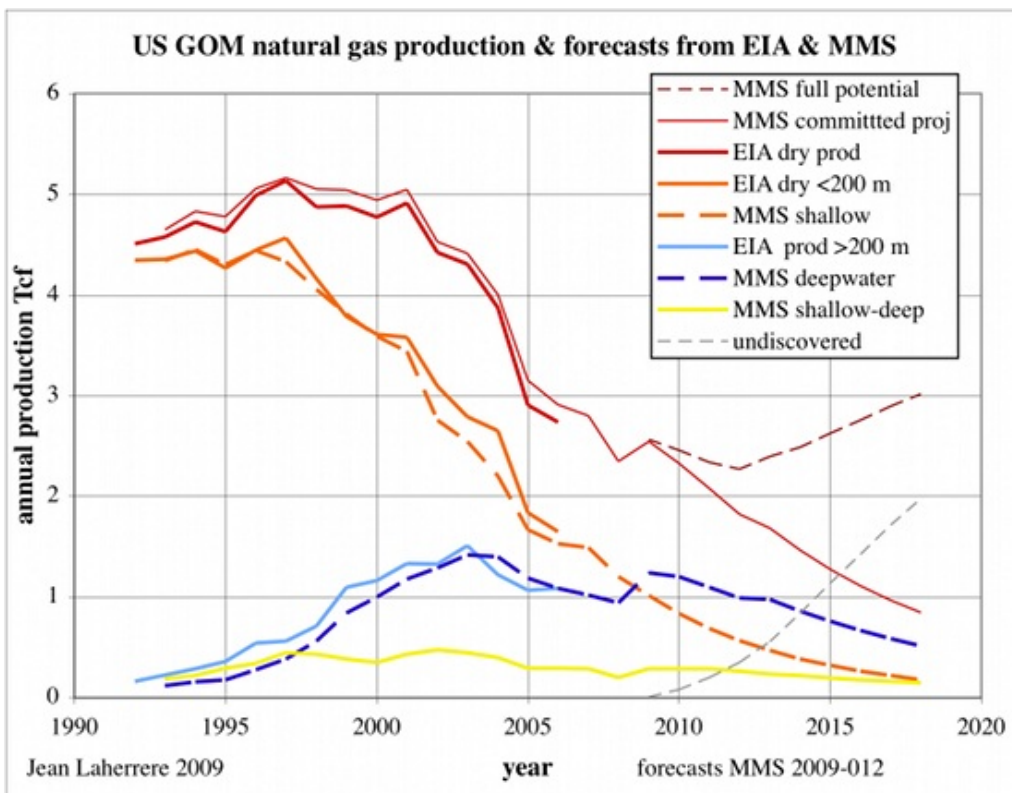


MMS forecasts production using industry committed projects for the short term and undiscovered estimates (full potential) for the middle term.



A new peak is forecast for oil around 2012.

MMS forecasts a natural gas decline for the next 10 years from industry committed projects.



A possible increase can take place if a large undiscovered volume comes about, but the creaming curve (see below) does not look too good, with only one dominant discovery cycle trend (except for a recent deep gas cycle).

Reserves

In MMS2008-013, MMS reports the annual discovery in Mboe from 1965 to 2006 with a breakdown by water depths (<1000 ft in yellow) in Fig. 41, but also in Fig. 45, which includes industry data. For 2006 there are only deepwater discoveries, with 1.5 Gboe reported in Fig. 41 and over 2 Gboe in Fig. 45; for 2007 discovery looks quite poor (wait for next year's reporting!).

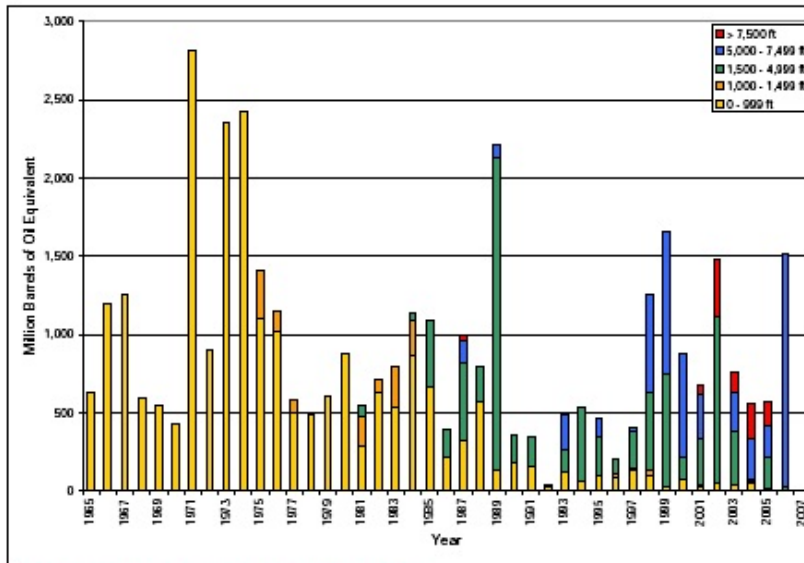


Figure 41. Proved and unproved reserve additions.

Fig. 44 of the same report shows that deepwater discoveries peaked in 2001 in number, but in 2006 in volume.

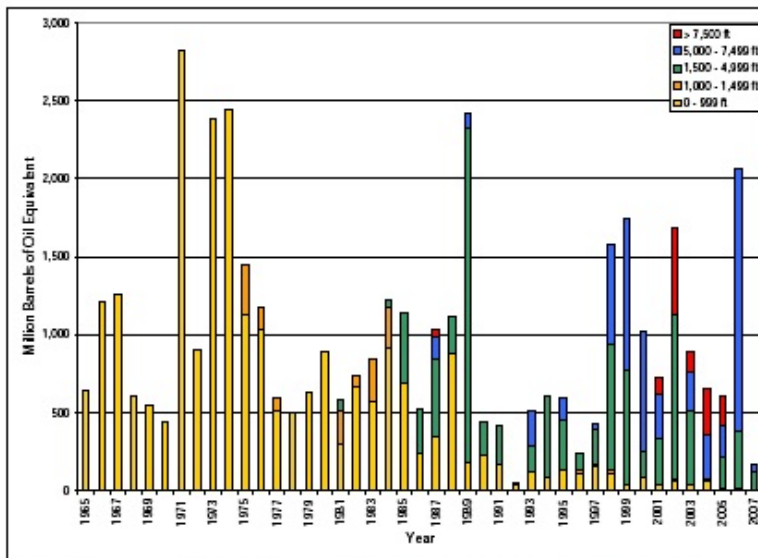


Figure 45. Barrels of oil equivalent added (reserves, known resources, and industry-announced discoveries).

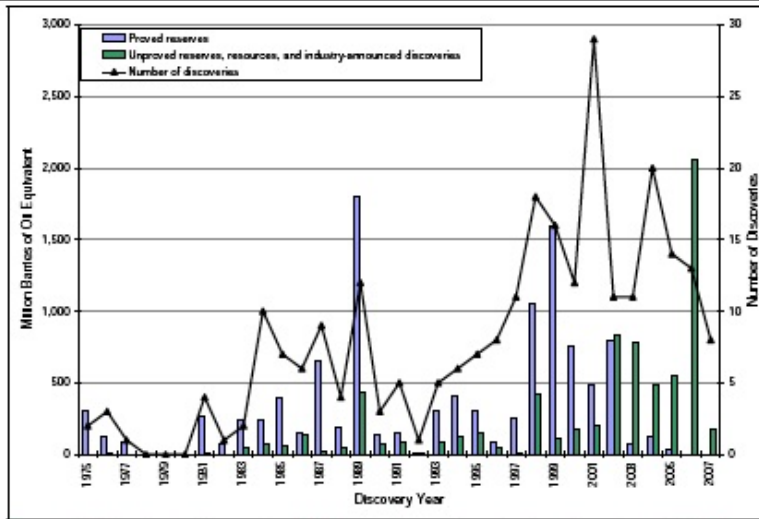


Figure 44. Number of deepwater field discoveries and new hydrocarbons found (MMS reserves, MMS resources, and industry-announced discoveries).

But in MMS2009-012, Fig. 22 is different for the last 10 years, in particular 2003.

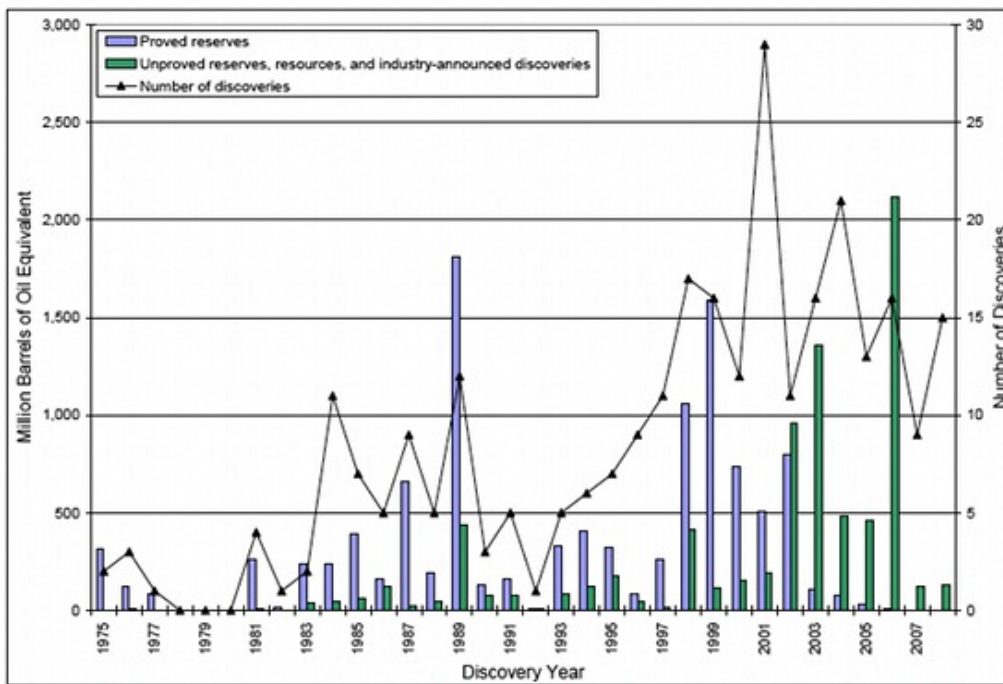
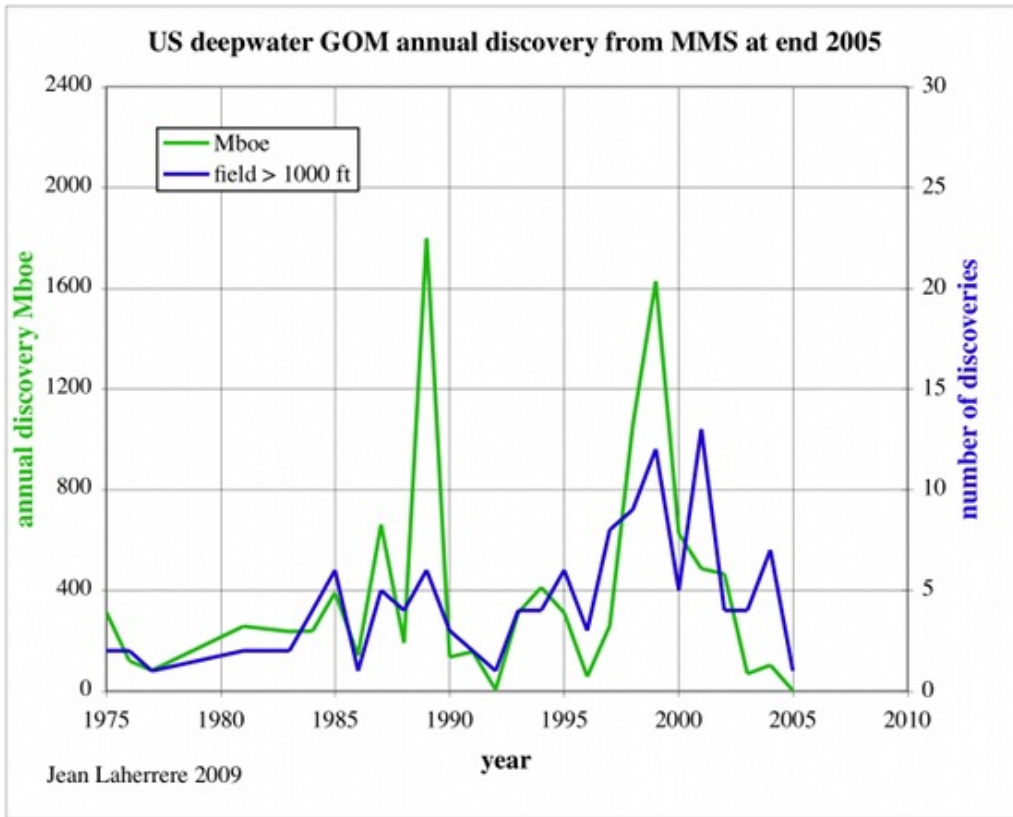
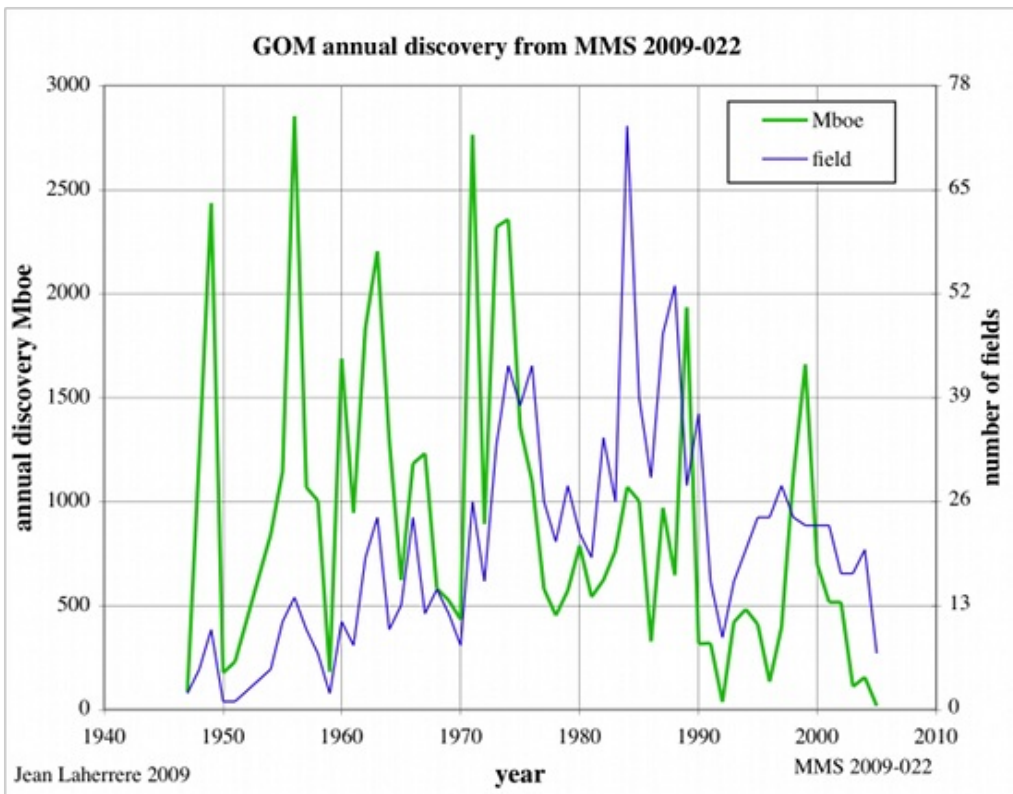


Figure 22. Number and volume of deepwater discoveries. Volumes include MMS reserves, MMS resources, and industry-announced discoveries.

The complete file of field reserves at the end of 2005 in MMS 2009-022 shows a complete historical plot. The deepwater (>1000ft) plot shows also a peak in 1989 and 1999, but the number for 2001 is 13 against 29 fields from the previous graph, and for 1989 6 fields against 12 ! MMS2009-022 seems restricted to fields and not discoveries.



For the whole GOM and from MMS2009-022, the peak in number of discoveries is in 1984 (73) and the volume in 1956 (2,8 Gboe).



Deepwater discoveries

Geographically, deepwater (>1000 ft) discoveries are reported in MMS2009-12 mainly around

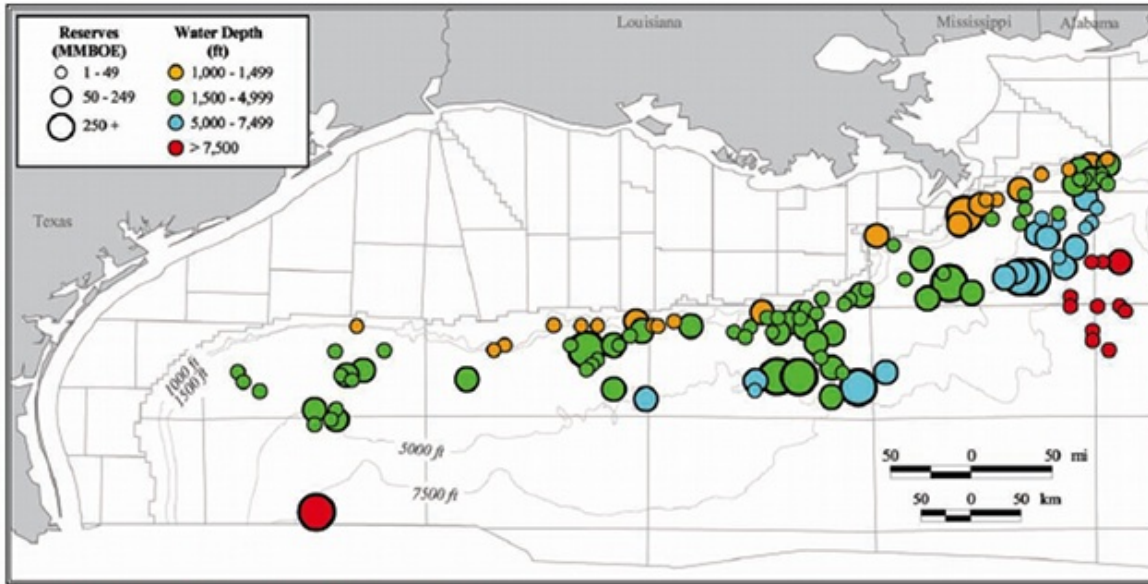
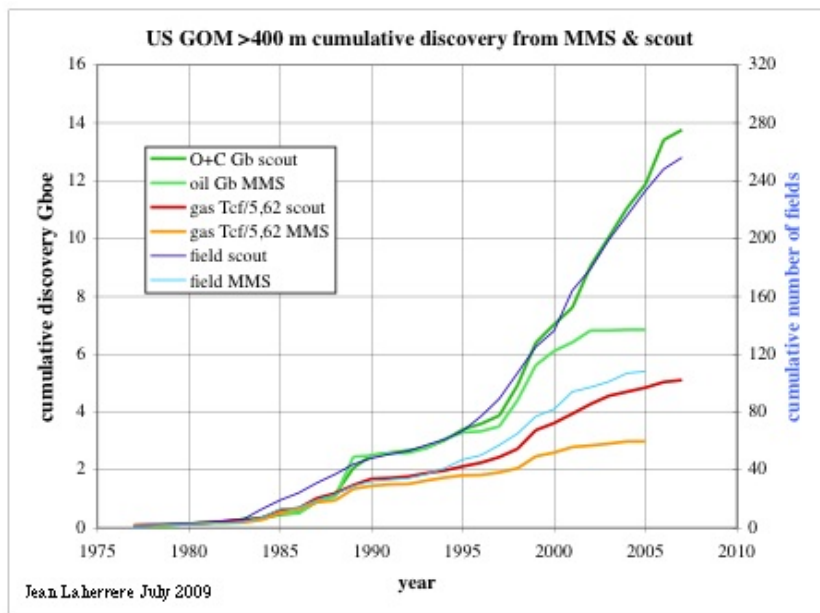


Figure 4. Estimated volume of proved deepwater fields.

Frontier scout data reports only discoveries for water depths beyond 400 m; they are compared to MMS at end of 2005:

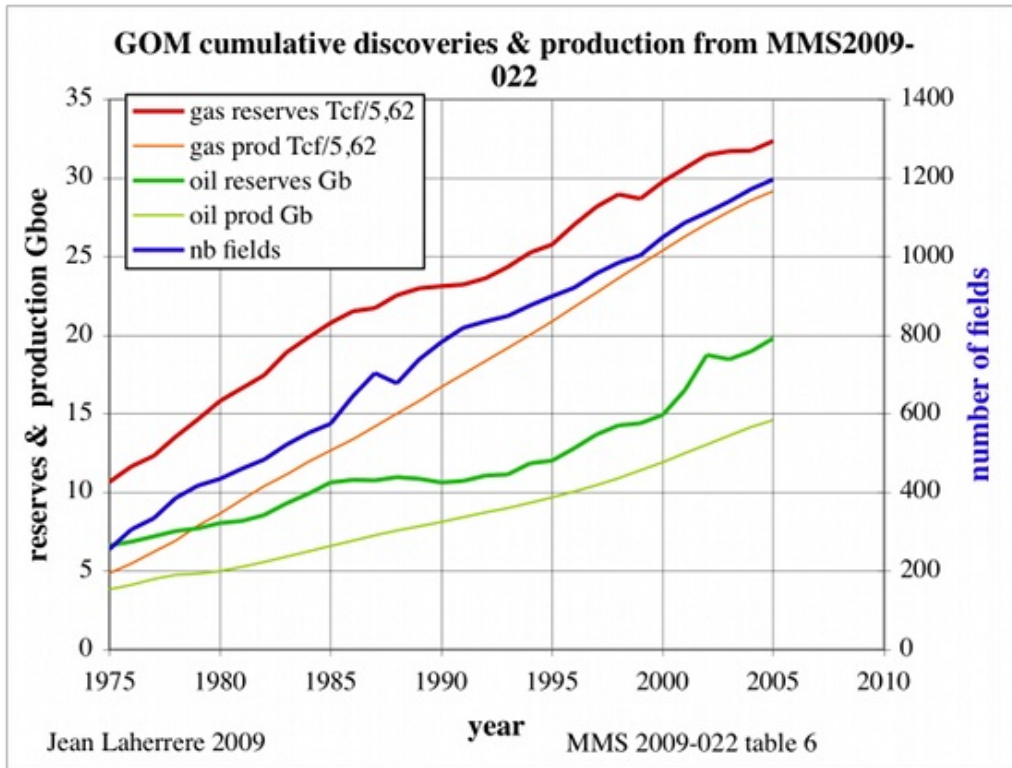


It is obvious that MMS2009-022 reports only fields and not discoveries and is incomplete for recent years. It is a pity because MMS GOM field data is the most complete database in the world, together with the UK's and Norway's files, and should be the base of studies to apply to the rest of the world.

However, the synthesis from this data leads to the following forecasts.

US GOM oil and gas reserves at end 2005 (MMS 2009-022)

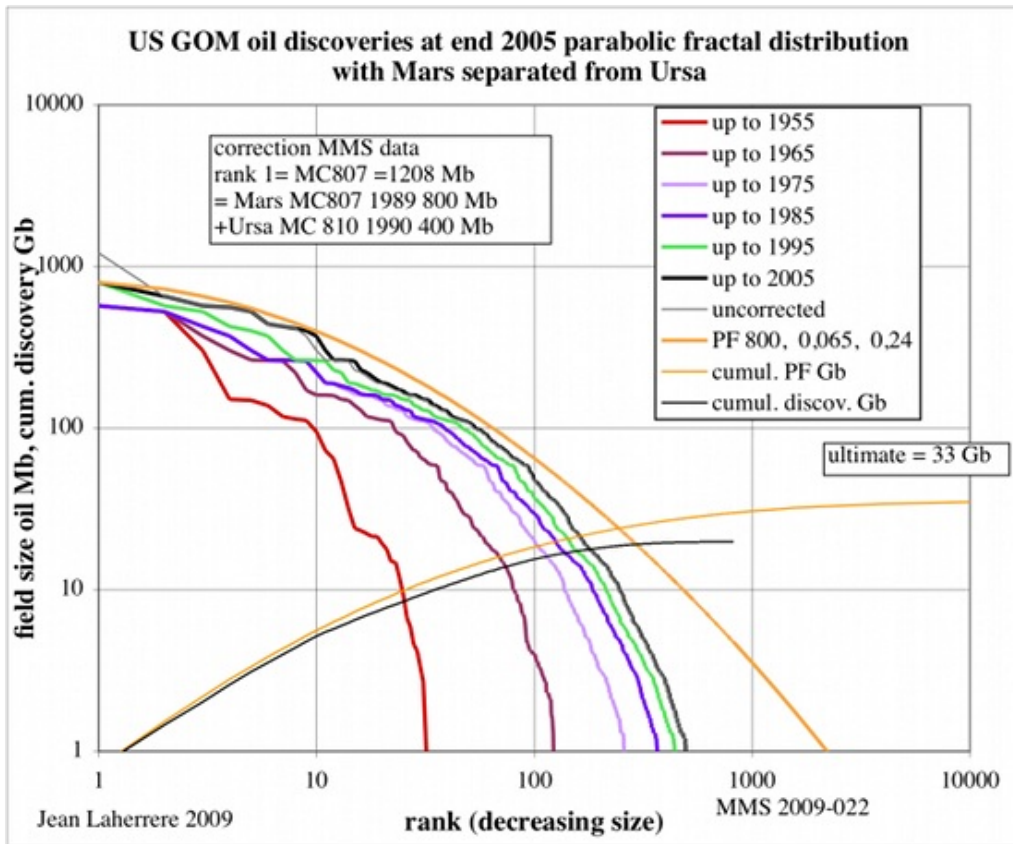
Cumulative production increases in line with cumulative discovery both for oil and gas.



Ultimates can be estimated looking at the fractal distribution or at the creaming curve.

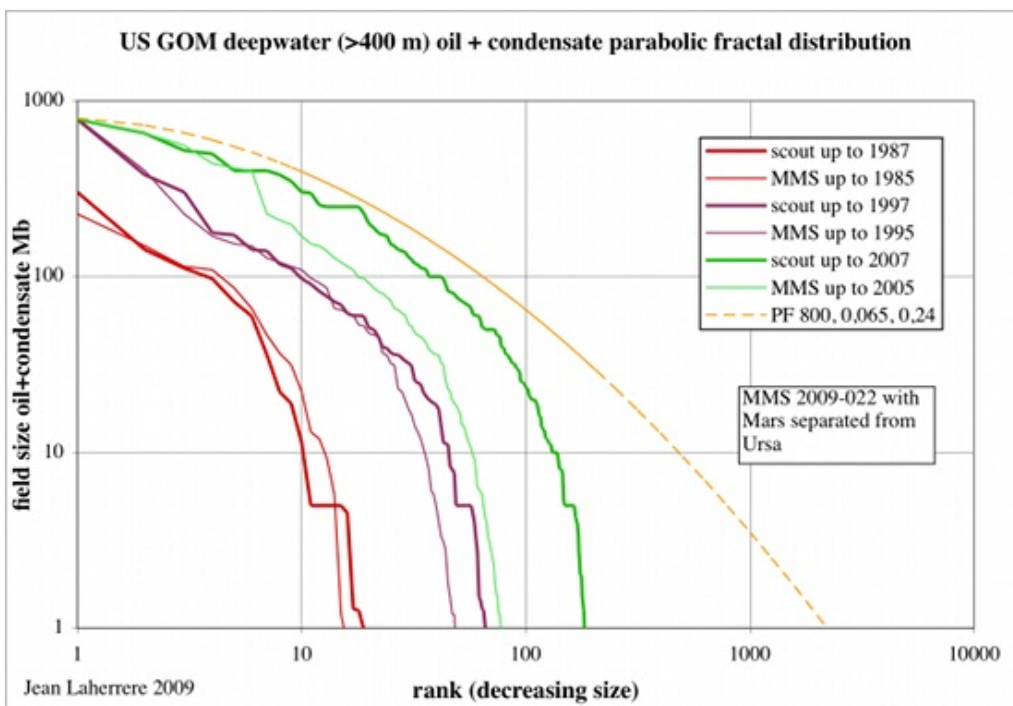
Fractal display

The fractal display (cumulative discovery versus size rank in a log-log scale) is obviously parabolic when corrected and a parabola can be taken as a model of what is in the ground. MMS field data ranks as largest field MC 807, but in fact it gathers two fields: Mars (1989) and Ursa (1990), operated by the same operator; despite that, in other reports they report them separately. The corrected display with a plot every 10 years shows that contrary to most fractal displays, if the largest fields (the largest Mars was found in 1989, the second Thunder Horse was found in 1999) are found first, there are still large fields to be found.

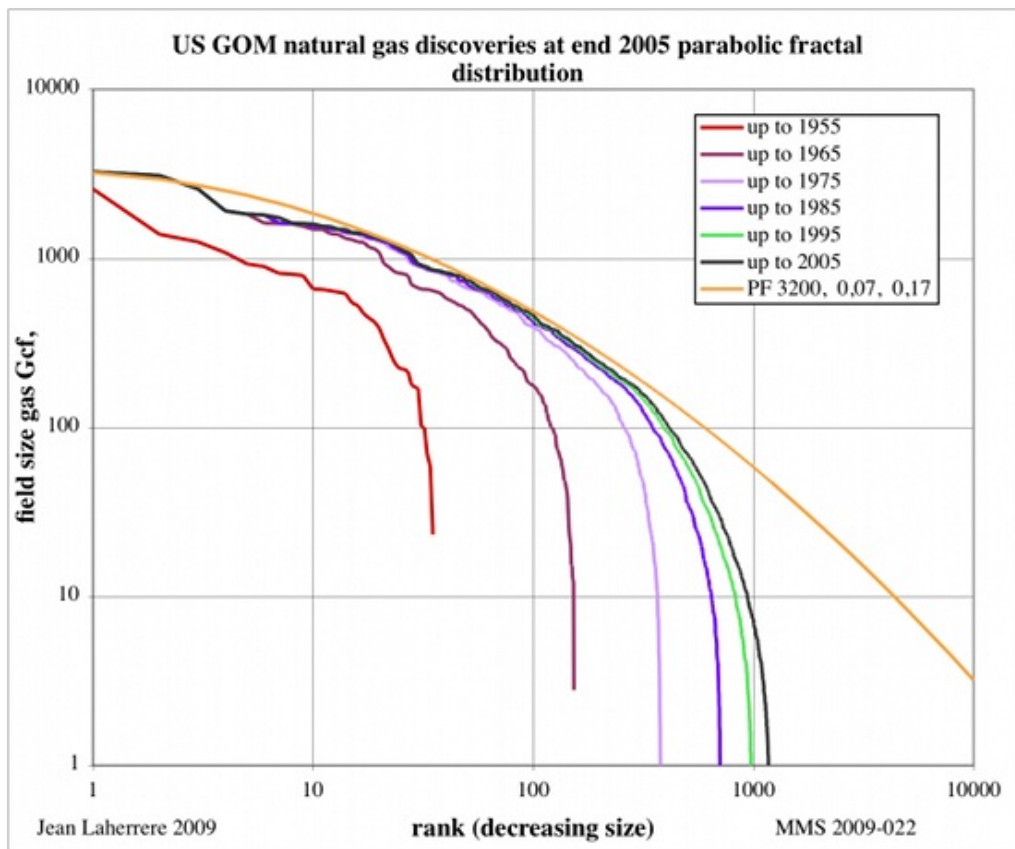


Using the parabolic model an ultimate of 33 Gb can be estimated.

The comparison of the fractal display for water depths over 400 m between MMS at end of 2005 and the scout data at end 2007 shows a similar plot. The parabola used for MMS full GOM is a fair model for the scout data for a depth > 400m, because the largest fields are in deepwater.



MMS gas field reserves at the end of 2005 are plotted as a fractal display and the display is more like the usual ones with large fields found first (before 1985) with recently found fields mainly

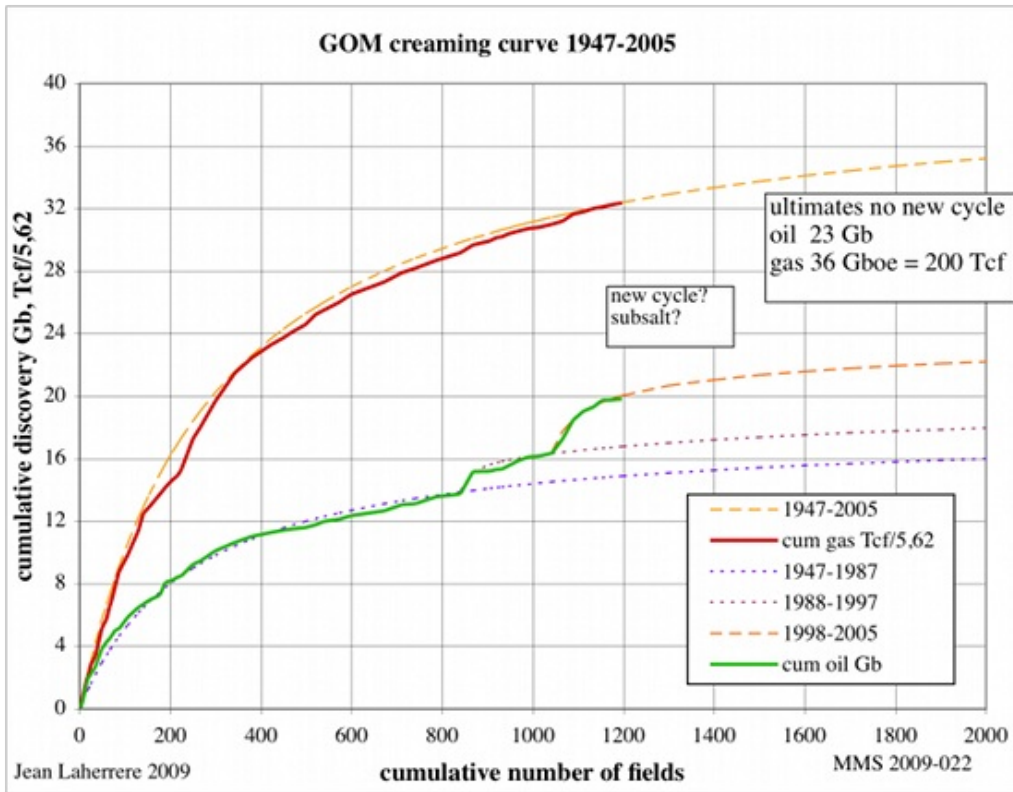


Creaming curve

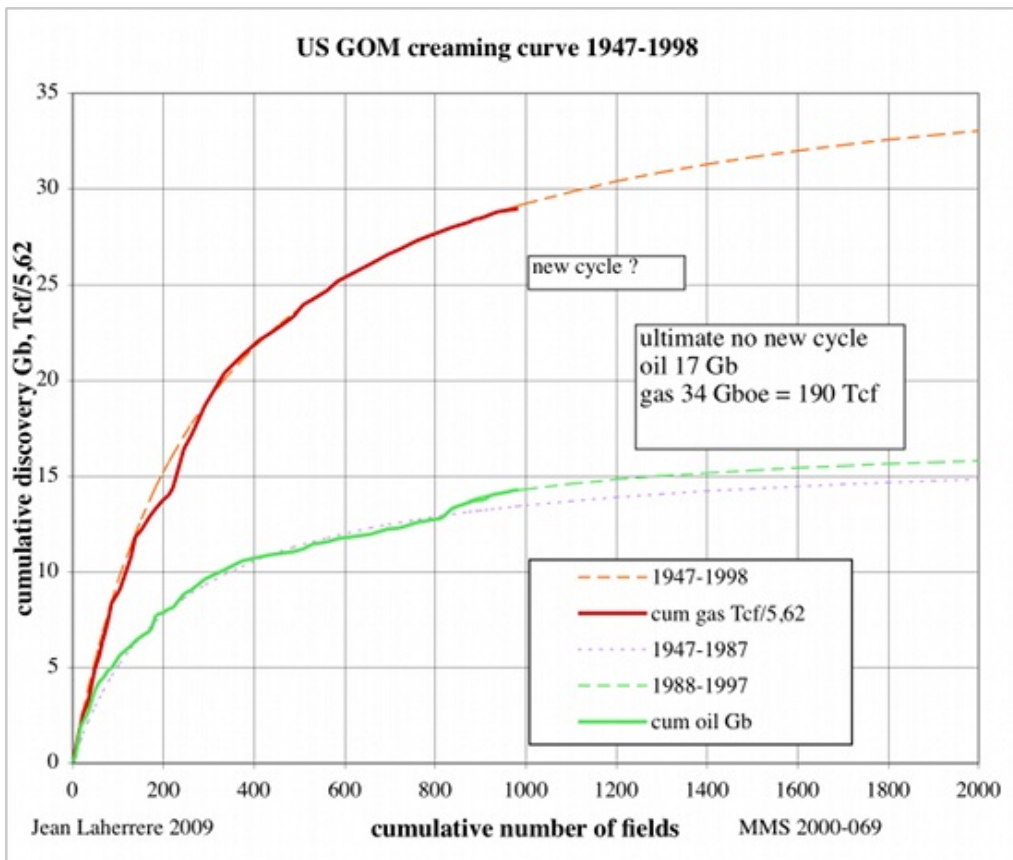
The creaming curve is a graph that plots the cumulative discovery versus the cumulative number of New Field Wildcats (or of fields when NFW are not available). It is the best tool to estimate ultimates, but the field reserves must be the mean values (or 2P) and not the proven values (1P) used by MMS to follow the obsolete SEC rules (in 2010 SEC will allow reporting of 2P, meaning that the past reporting was wrong, leading to artificial reserve growth).

The creaming curve for 1947-2005 is easily modelled for natural gas with one cycle for an ultimate of 36 Gboe or 200 Tcf. I do not know enough about deep gas geology to foresee a new cycle for deep gas!

For oil, three cycles are needed, leading to a possible fourth cycle (subsalt?). Minimum oil ultimate is estimated at 23 Gb.

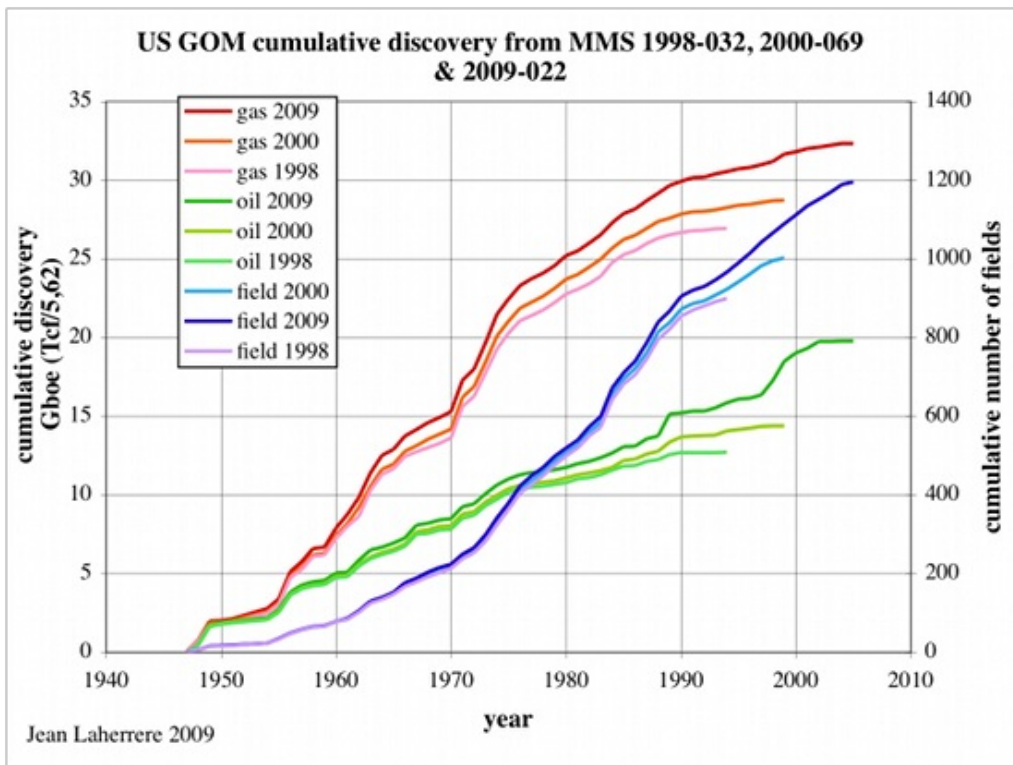


The creaming curve plotted at end of 1998 was extrapolated for an ultimate of 190 Tcf for gas and only 17 Gb for oil (the large deepest water fields were not yet drilled).



But a comparison of the MMS1998-032, MMS2000-069 and MM 2009-022 shows that obviously the past data were incomplete, when plotting the cumulative number of fields (in blue).

The growth in Gboe was mainly due to incomplete data (as found when comparing with scout data), but also due to reserve growth because of the practice to report proven estimates instead of 2P figures.



Conclusions

The GOM field database is one of the best ones to study the evolution of discoveries and to estimate ultimates, but unfortunately the data is incomplete (missing fields and discoveries) and reserves estimates are only proven (because of the obsolete SEC rules) and not the reliable proved + probable values used in the rest of the world outside the US. But in the future with the new SEC rules allowing the reporting of 2P, it will be interesting to see the evolution of reported GOM reserves in 2011 or 2012!



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