

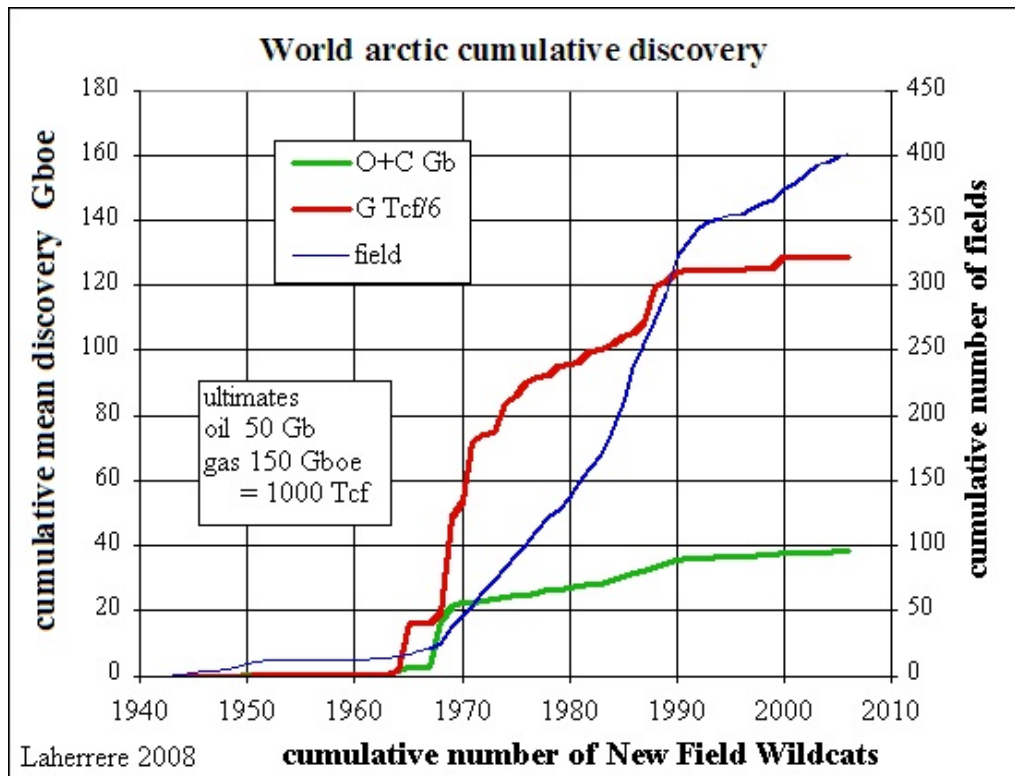


Arctic Oil and Gas Ultimates

Posted by [Luis de Sousa](#) on March 11, 2008 - 11:00am in [The Oil Drum: Europe](#)
Topic: [Geology/Exploration](#)

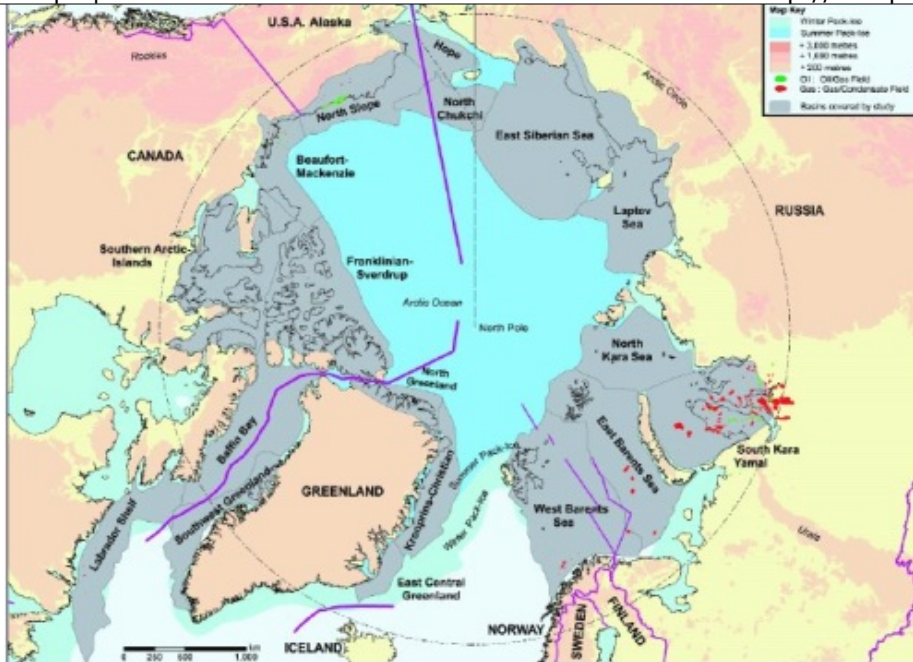
Tags: [anwr](#), [arctic gas](#), [arctic oil](#), [mackenzie delta](#), [north america](#), [north slope](#), [norway](#), [npra](#), [russia](#), [usgs](#) [list all tags]

This is a guest post by [Jean Laherrere](#).



World Arctic cumulative discovery.

In the context of this article the Arctic is defined as the area of the globe with latitudes north of $66^{\circ} 33' 39''$, the present polar circle with an obliquity of $23^{\circ} 26'$ (that can vary from 22° to $24^{\circ} 30'$ during a 40 000 years cycle). The Arctic can be also defined as the isotherm of $<50^{\circ}\text{F}$ any month of the year. Both definitions mean that Arctic area is changing slowly with time.

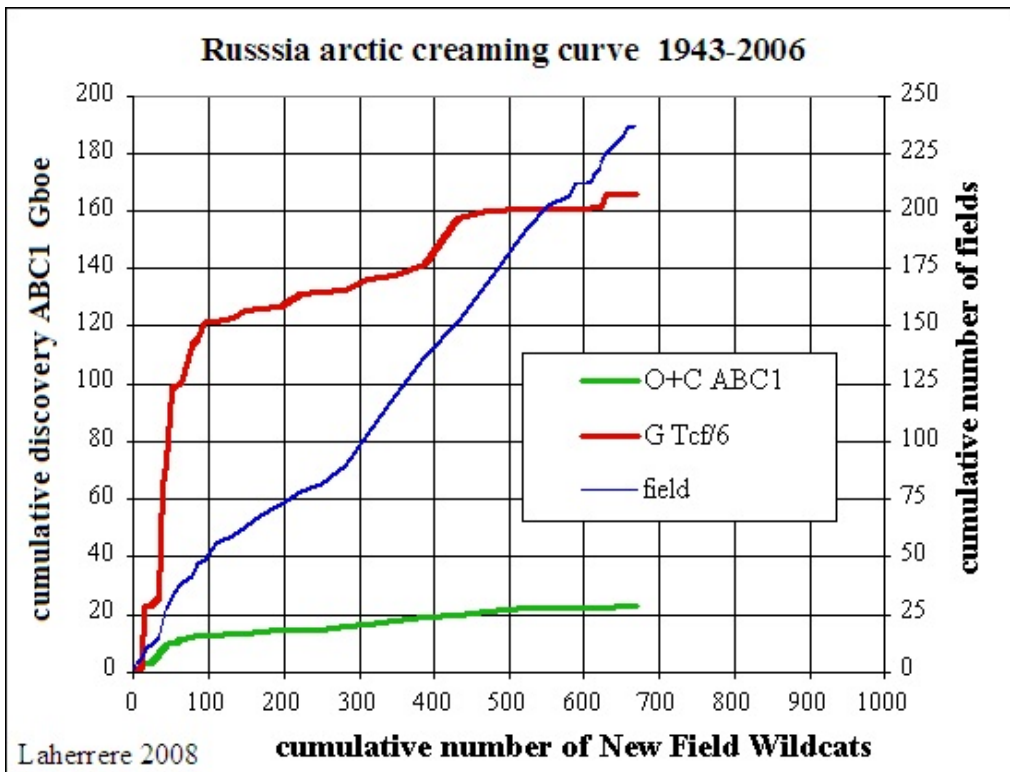


The Arctic and its hydrocarbon resources. Source believed to be Wood Mac. [Click for large version.](#)

Using the IHS database (February 2007) Arctic fields and New Field Wildcats (NFW) were extracted for Russia, Europe (Norway and Svalbard) and North America (US and Canada).

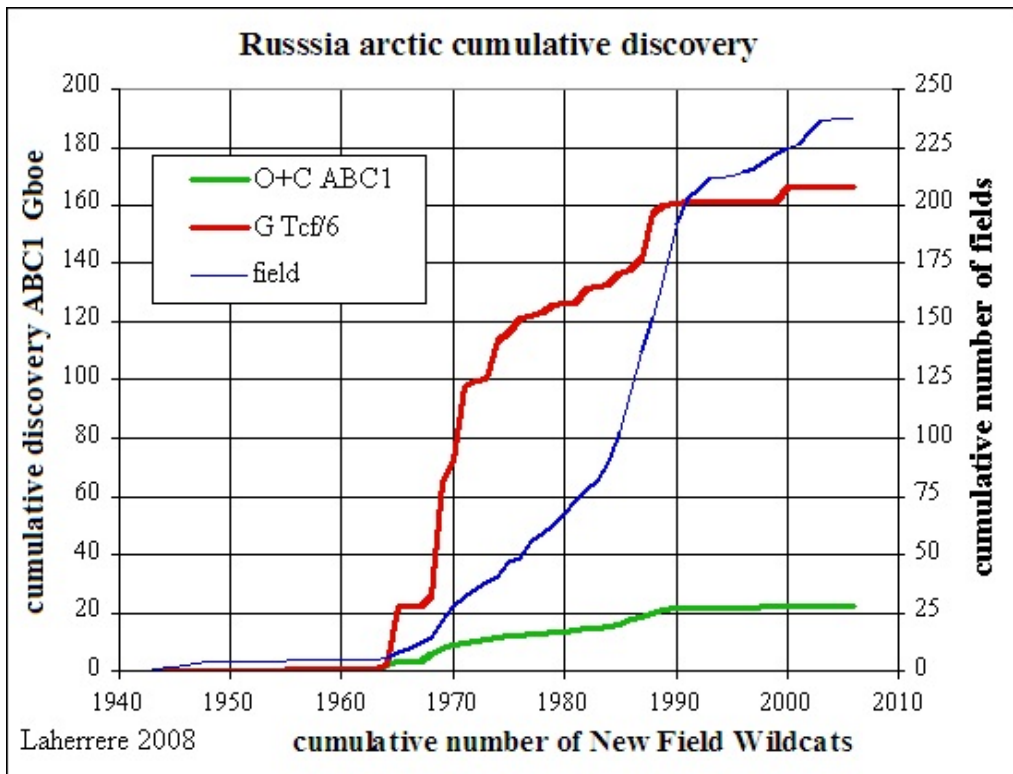
Russia

Reserves are estimated in CIS using the Russian classification as ABC1 (corresponding to the maximum theoretical recovery or 3P)



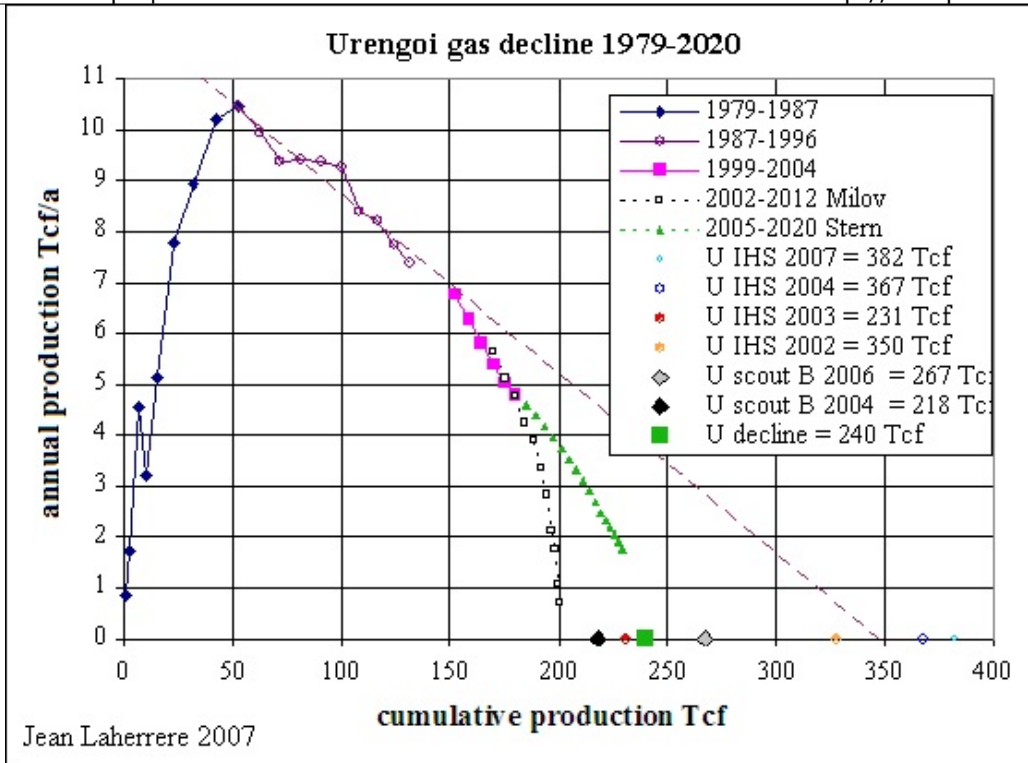
Russian Arctic creaming curve.

There are clearly two distinct cycles. A third cycle offshore the Eastern Siberia coast is unlikely or with small potential, looking at the onshore results. The USGS ultimate estimates for the Laptev sea shelf (FS2007-3096) are at 3 Gb for Oil, 0.8 Gb for Condensate & 36 Tcf for Natural Gas.



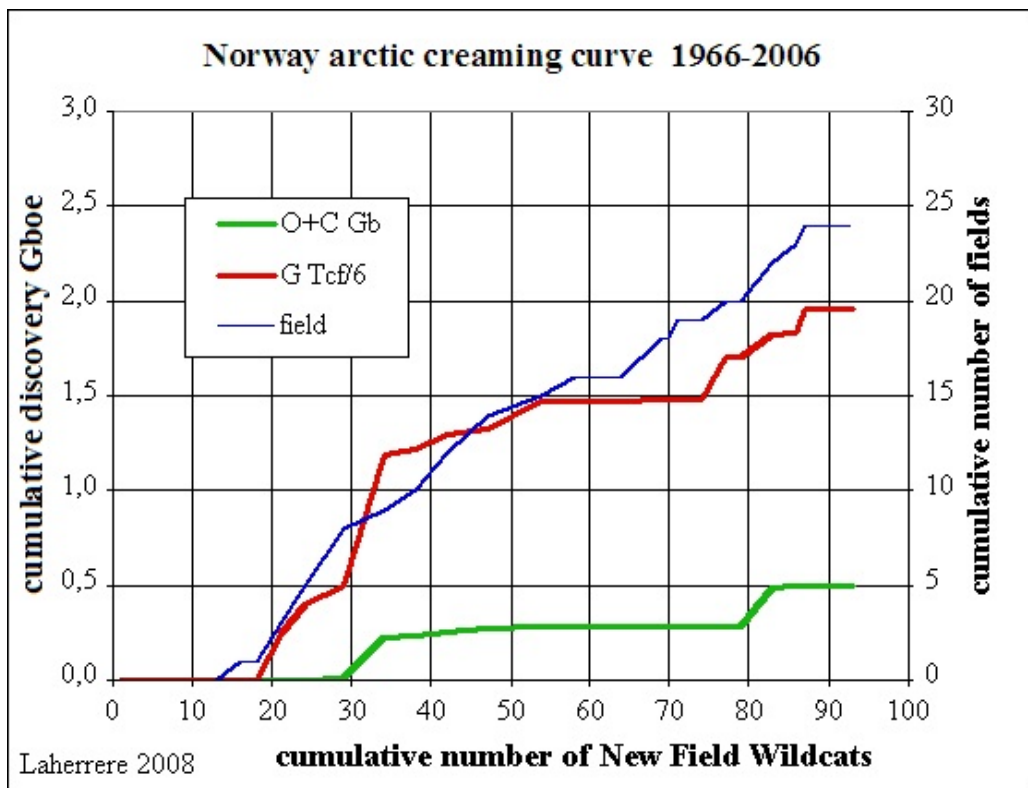
Russian Arctic cumulative discovery.

ABC1 reserves need to be corrected to 2P (proven+probable). The best way to do so is looking at the estimate for Urengoy, called in the past the world's largest gas field (although North Dome in Qatar/Iran is much larger). Urengoy (at a latitude of 66°03', is close to the polar circle) is reported as having more than 350 Tcf, but when plotting the decline it points to less than 250 Tcf.



Urengoy Natural Gas decline.

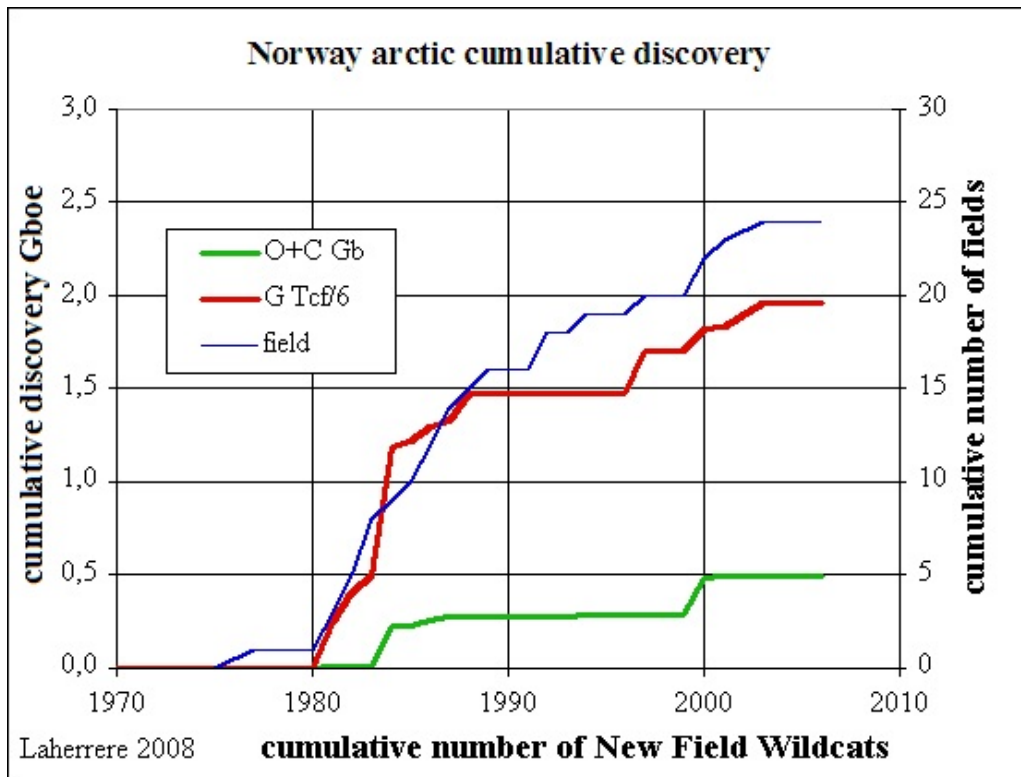
Europe



Norwegian Arctic creaming curve.

Several cycles mark the discovery in Norway. New cycles are possible but of small size because

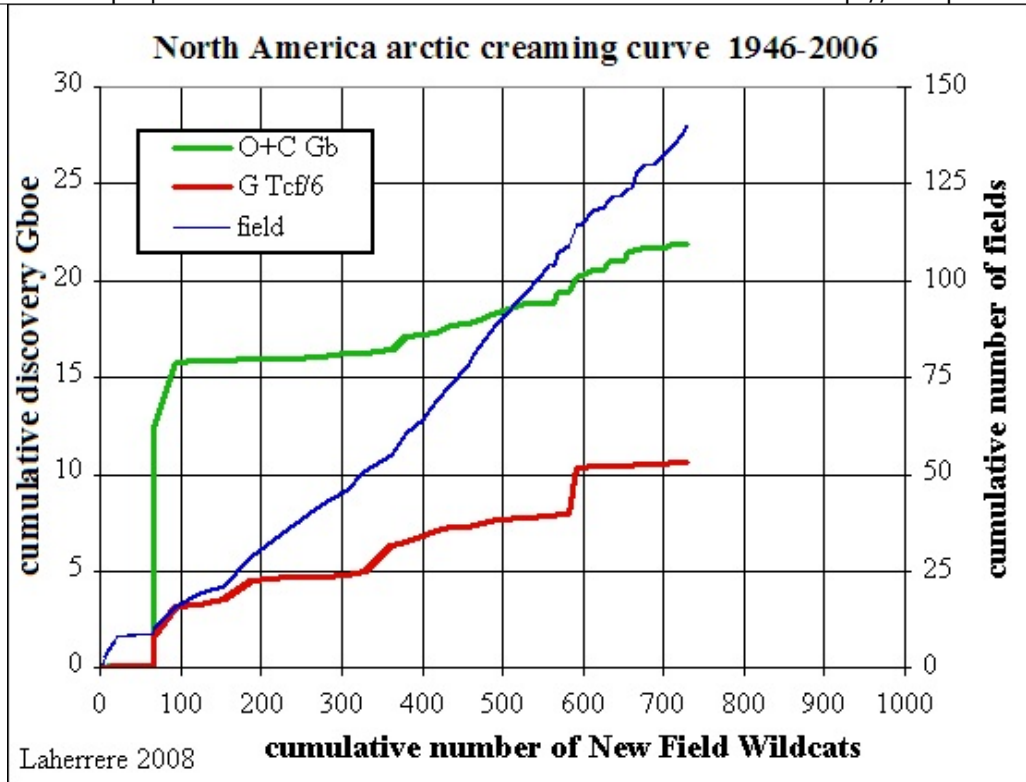
the results in the Barents sea have been poor so far.



Norwegian Arctic cumulative discovery.

In addition to Norway and Svalbard, there is potential in Greenland. In its 2000 world assessment, the USGS estimated the East Greenland undiscovered volume at 47 Gb for Oil, just by guessing the number of discoveries to be expected (range 1, 250, 500) and size (range 20, 85, 12 000 Mb) without any seismic or well data, just plain analogy with the North Sea. The estimates for undiscovered Condensate were 4 Gb and 81 Tcf for Natural Gas. This exaggerated estimate was reduced in 2007 (FS 2007-3077) by updating East Greenland to 9 Gb for Oil, 8 Gb for Condensate and 86 Tcf for Natural Gas.

North America

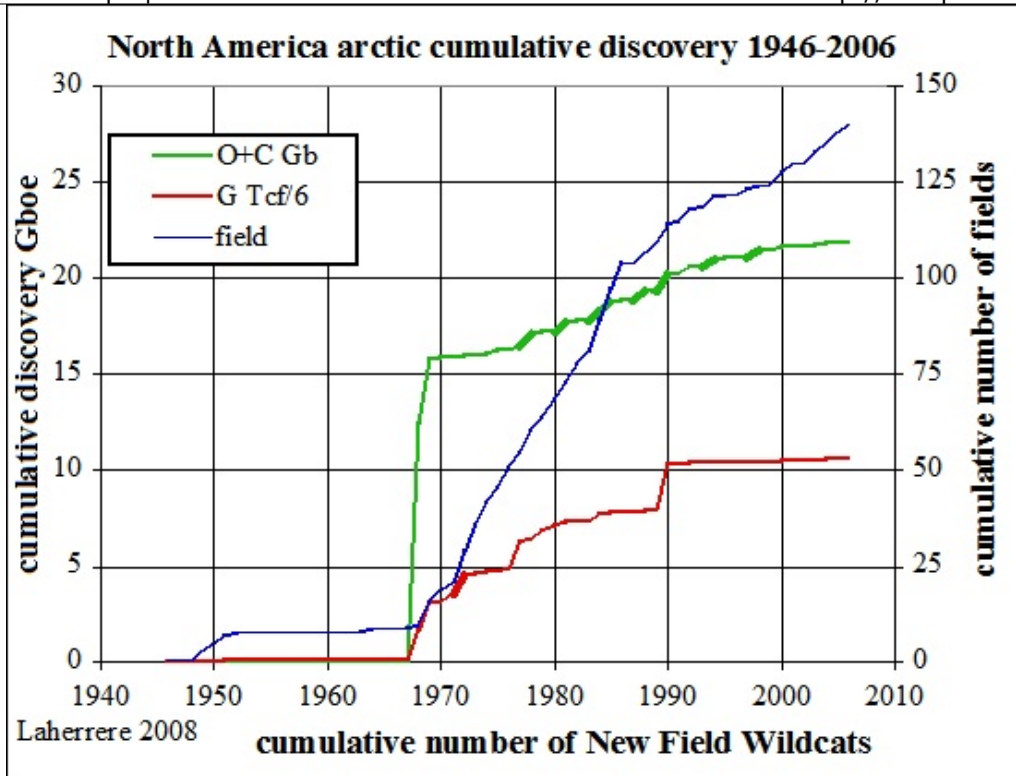


North American Arctic creaming curve.

There are several cycles in the creaming curve, with a possible future one but of small size. On February 6th of 2008, the US sold 488 leases in the Chukchi sea, totalling 2.2 G\$; most leases were bought by Shell and Conoco. In 1989 and 1990 4 dry holes were drilled in this area plus a gas discovery at Burger (14 Tcf) which was relinquished by Shell in 1996. Shell bought back the Burger lease for 105 M\$ (about the cost of one well in this area). The cost of the famous Mukluk dry hole in 1983 in the shallow waters of the North Slope was over 1 G\$.

The USGS published in 2005 a report (FS2005-3043) on the central part of Alaska - Central North Slope – putting undiscovered Oil and Natural Gas resources at 4 Gb and 37 Tcf. In addition to that there's the potential of 7.7 Gb and 4 Tcf for the Arctic National Wildlife Refuge (ANWR) (FS2005-1217) and also at the National Petroleum Reserve in Alaska (NPR). The KIC well drilled in 1985 in the ANWR is still confidential, despite the rule of becoming public after only a few years! All these estimates seem in disagreement with the creaming curve. But the USGS past approach since 2000 has been too optimistic, where only one geologist is simply guessing solely the number of discoveries and the size to be forecast (seventh approximation sheet) and then a Monte Carlo run (50 000 transforms) These wild guesses result into a beautiful distribution that looks real. A better approach should be hoped for, based on the complete past data reviewed by several geologists.

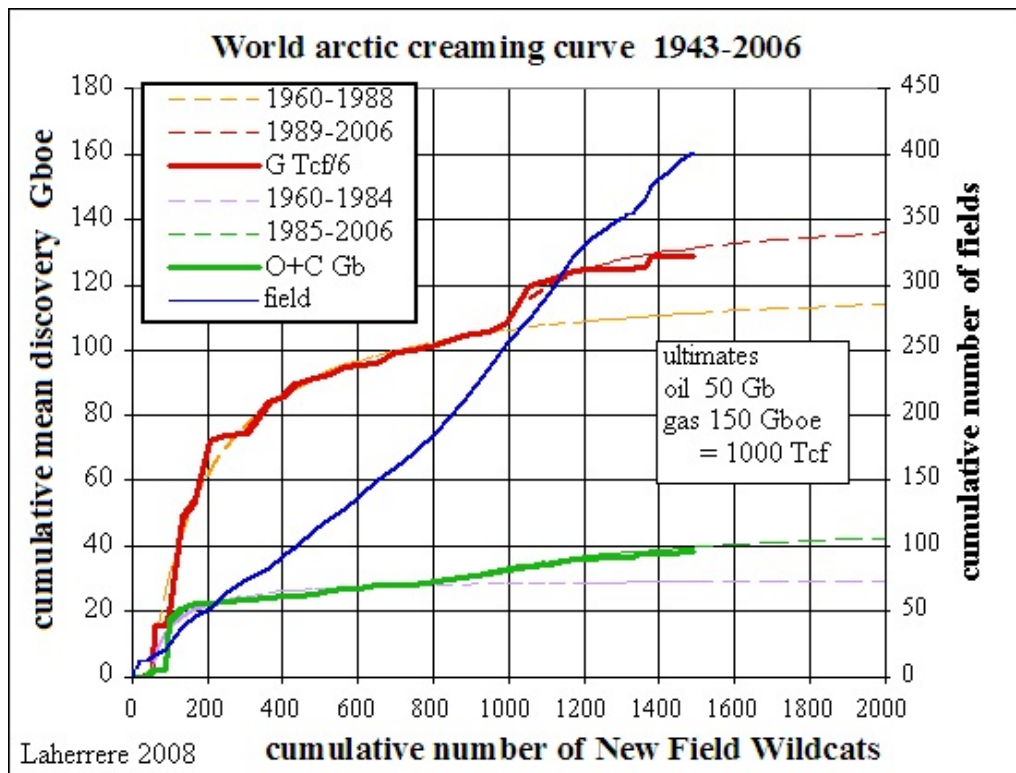
The closest developed field to ANWR is Badami, operated by BP, with an initial estimate of 120 Mb for 300 M\$. It was abandoned in 2003 after 4 years of production, totalling 4 Mb with a peak of 3150 b/d in 1999, ten times less than expected! For the Mackenzie delta (FS2006-302) the USGS estimates undiscovered Oil at 10 Gb, Condensate at 4 Gb and Natural Gas at 87 Tcf.



North American Arctic cumulative discovery.

World

Adding the three regions above - after correcting the Russian ABC1 to a mean value by reducing 30% - give the world Arctic potential.

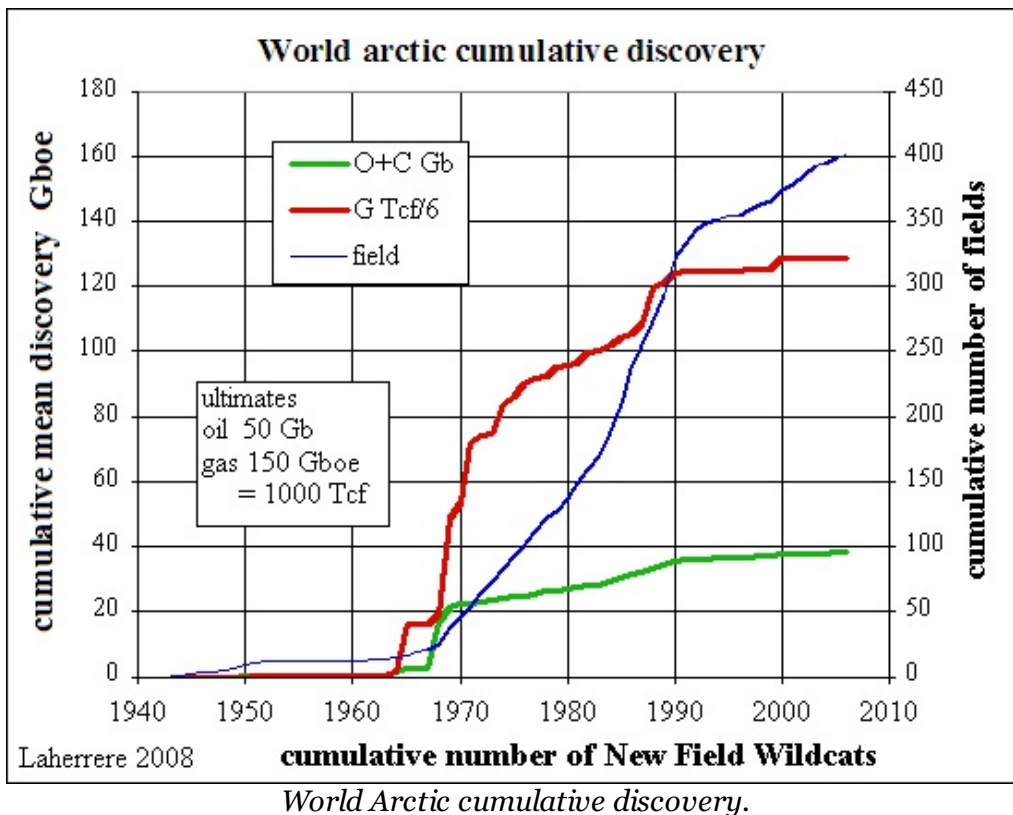


World Arctic creaming curve.

Two cycles can be modelled (1960-1988 and 1989-2006 for Natural Gas, 1960-1984 and 1985-2006 for Oil) A third cycle is likely to be of a size lower than the accuracy (bad in Russia) of the present discoveries. The creaming curve is flattening for both oil and gas cumulative volumes, but not for the number of fields, which present a linear display since 1943. Only small fields are likely to be found in the future.

The ultimate is estimated to be 50 Gb for Oil and 1000 Tcf for Natural Gas. For Oil this estimate is very close to Colin Campbell's 52 Gb value, but it is less than half CERA's 2007 estimate (118 Gb). It is equal to about the potential given only for East Greenland (47 Gb) in the USGS 2000 report.

The USGS did not assess the global Arctic, only several Petroleum Systems, but a new study called "The Circum-Arctic Oil and Gas Resource Appraisal" is planned for the summer of 2008. The Wood Mackenzie and Fugro Robertson 2006 report estimates the Arctic containing only 3% of the world's oil (with 80% of the Arctic potential being gas).



Conclusion

The Arctic oil and gas potential has been fairly well explored since 1943 and displayed several cycles with little discovered volumes since 1990 (despite 75 discoveries in number of fields). Known discoveries have three times more gas than oil. Most of the Arctic gas reserves are stranded (Prudhoe Bay) gas pipes from such remote places are very expensive and will be built only in a decade.

The recent attempt by the Russians to claim the North Pole is attributed to oil and gas potential. The only seismic line on the Arctic Sea I know of is from a [study by the IODP](#):

The scientific inspiration that subsequently led to ACEX surfaced aboard F/S Polarstern in 1991 when two reflection seismic profiles (AWI-91090 and AWI-91091) were acquired by Wilfried Jokat and Yngve Kristoffersen across the Lomonosov Ridge between 87° and 88°N. These profiles show a neatly draped sediment sequence being over 400 m thick, at a modest water depth of ca 1200 m, which were considered to represent an undisturbed and continuous record of lower Eocene to Recent sediments.

A thickness of 400 m is not enough for a real oil and gas potential. The Russian's move seems to be more connected to controlling sea navigation.

Arctic oil and gas will not change much the coming world peak oil and gas!

Previously at The Oil Drum : Europe: [Interview with Jean Laherrère](#)

The Oil Drum : Europe is once more grateful to Jean Laherrere for sharing his experince with us.



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