The Oil Drum
DISCUSSIONS ABOUT ENERGY AND OUR FUTURE

UPDATED: Cantarell and Questions Regarding Mexico's Oil Infrastructure

Posted by Sam Foucher on August 21, 2007 - 8:00am
Topic: Supply/Production
Tags: cantarell, google earth, hurricane dean, kmz, mexico, oil, oil prices, oil rig, peak oil, pipelines, refining, rig, shipping [list all tags]

Scroll down for the 5:00p and 11:50p EDT updates.

Hurricane Dean became a Category 5 storm last night with winds reaching 165 mph and reaching a low pressure of 909 mb (as of 2:15a EDT; Katrina was 920 mb and Camille 909 mb). Landfall occurred early yesterday morning with a second landfall occurring some time today. This is an historic hurricane by any standard.

Why this matters: If there were Cat2 winds in that area, we could have been talking about around 2.5 million barrels per day of Mexico's supply capacity being shut in for a while, and some of that shut in for an extended amount of time. Around 1.5 mbpd of that capacity is exported to the US (of the 20.5 mbpd the US uses, and the 85mbpd the world uses, each day). There are also some questions about the resilience of refineries and flow lines in the area of the second landfall.

Update (Khebab, 11:50 EDT):

> **HURRICANE DEAN ADVISORY NUMBER 35A**
> ...DEAN IS MOVING BETWEEN THE WEST AND WEST-NORTHWEST NEAR 20 MPH...32KM/HR...AND THIS GENERAL MOTION IS EXPECTED DURING THE NEXT 24 HOURS. ON THE FORECAST TRACK...DEAN IS EXPECTED TO BE VERY NEAR THE COAST OF CENTRAL MEXICO DURING THE DAY WEDNESDAY. MAXIMUM SUSTAINED WINDS REMAIN NEAR 80 MPH...130 KM/HR...WITH HIGHER GUSTS. DEAN IS A CATEGORY ONE HURRICANE ON THE SAFFIR-SIMPSON SCALE. AN AIR FORCE PLANE IS CURRENTLY APPROACHING DEAN. SOME RE-STRENGTHENING IS FORECAST DURING THE NEXT 24 HOURS.

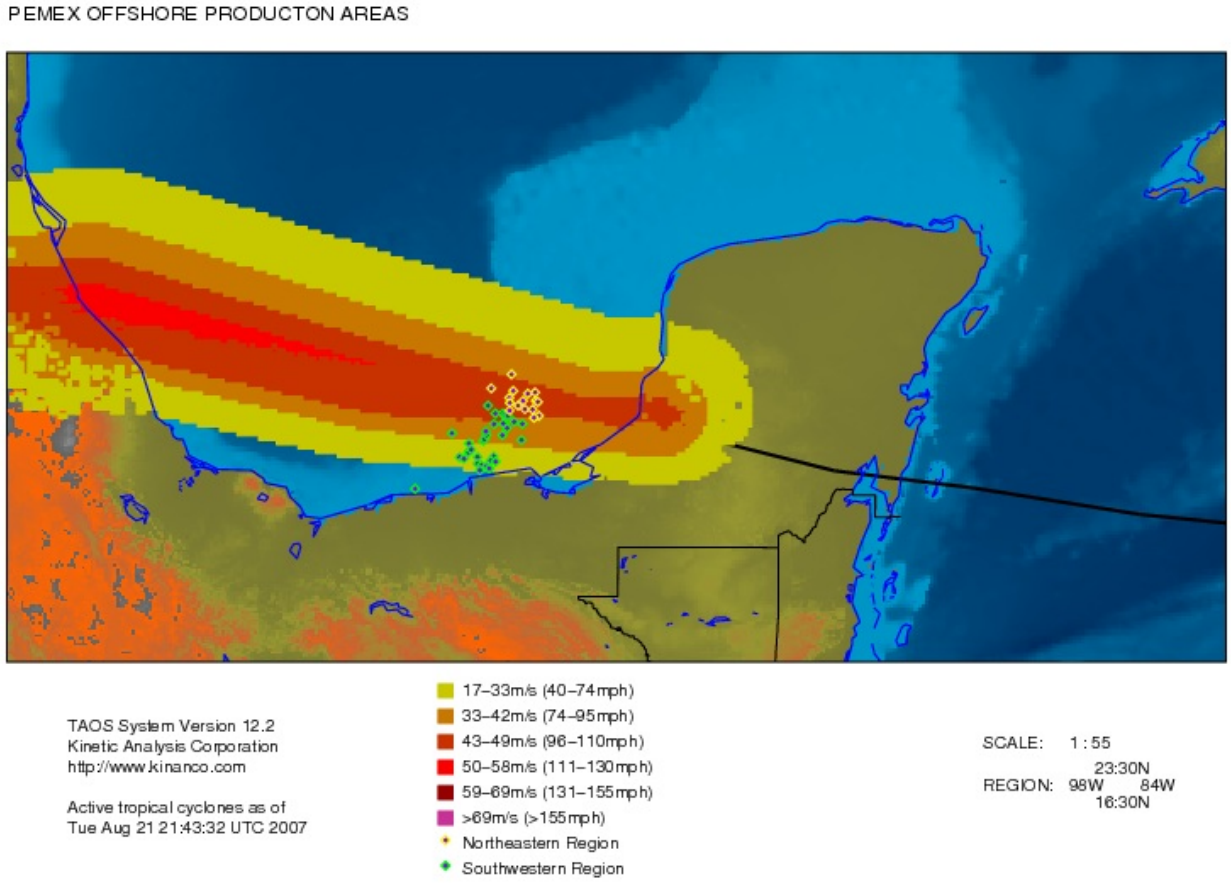
HURRICANE FORCE WINDS EXTEND OUTWARD UP TO 35 MILES...55 KM...FROM THE CENTER...AND TROPICAL STORM FORCE WINDS EXTEND OUTWARD UP TO 140 MILES...220 KM. ESTIMATED MINIMUM CENTRAL PRESSURE IS 970 MB...

Cantarell and KMZ oil complex, 50-knots wind speed probabilities (NHC, forecast #35). Click to Enlarge.

Refinery position, 50-knots wind speed probabilities (NHC, forecast #35). Click to Enlarge.

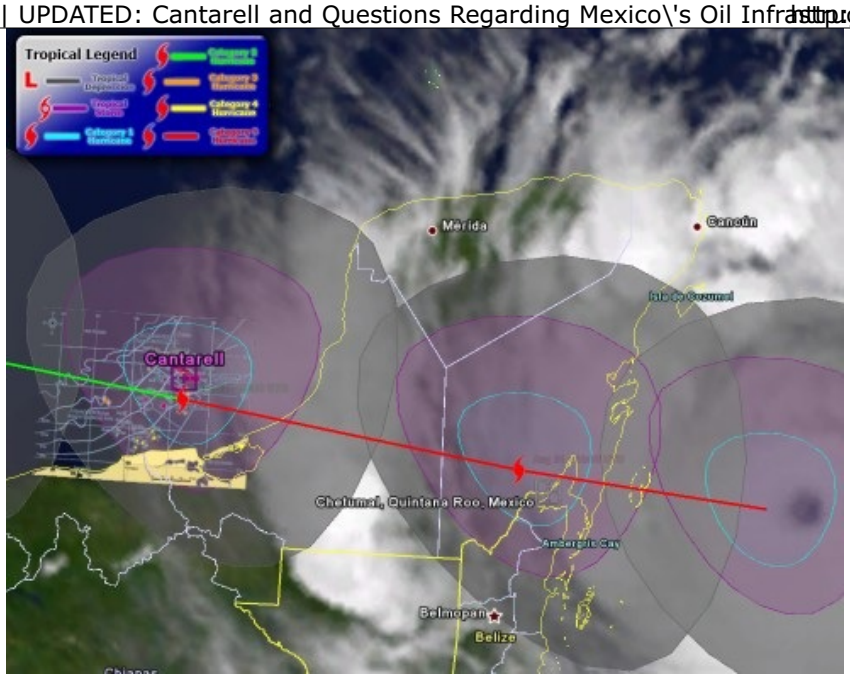
More under the fold.

UPDATE FROM CHUCK WATSON at 5p EDT, 8/21
Chuck Watson of KAC/UCF has just released his damage estimates. Here's what he has to say:

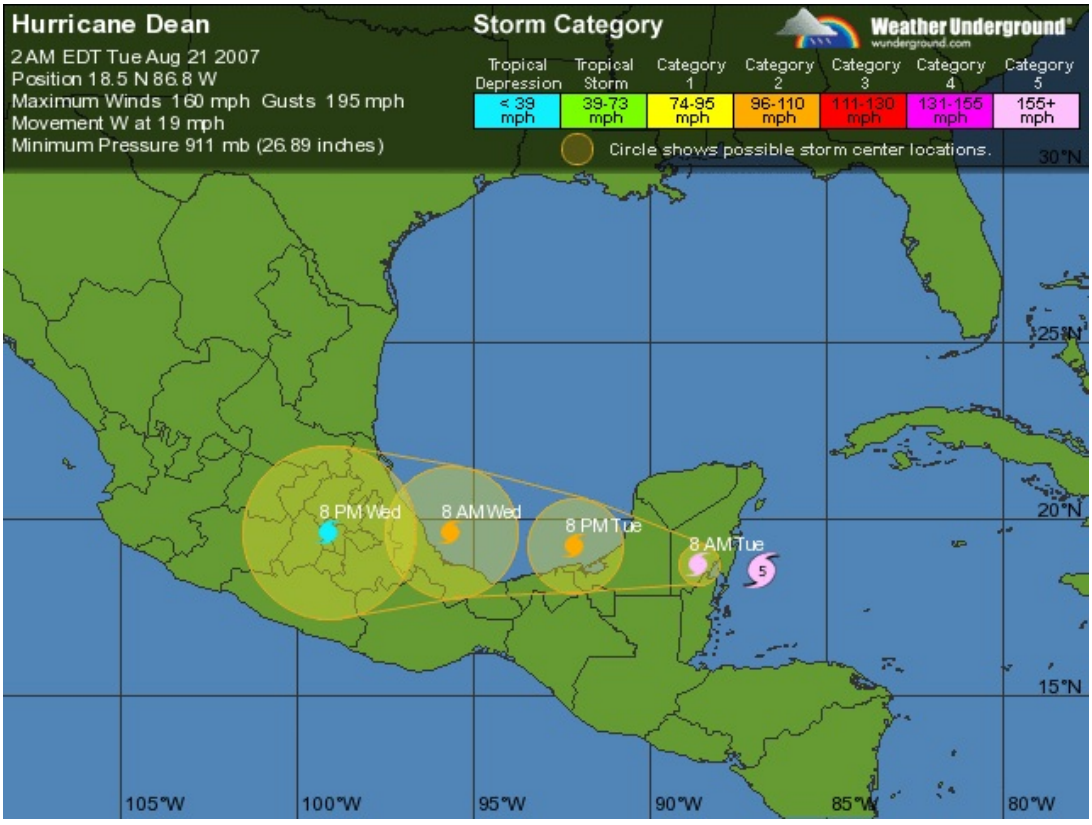


NHC has dropped their intensity more in line with our estimates. I'm sticking with the earlier damage forecast - Southwestern about 10 days, Northwestern (Cantarell etc) 15 to 18 days, unless something unlucky happens like a critical component failure. So our total shut in forecast from this event is around 30 million BBL, which was at the low end of my earlier model. The storm decayed more than the NHC estimates.

Under the fold (click "there's more" below), we are going to try to bring together some of our information we have gleaned to this point. **We ask that you post all stories, insights, links, maps, and other tools in this comment thread. If you have stories or insights you wish to share, please also feel free to use the editors' box to contact us.**

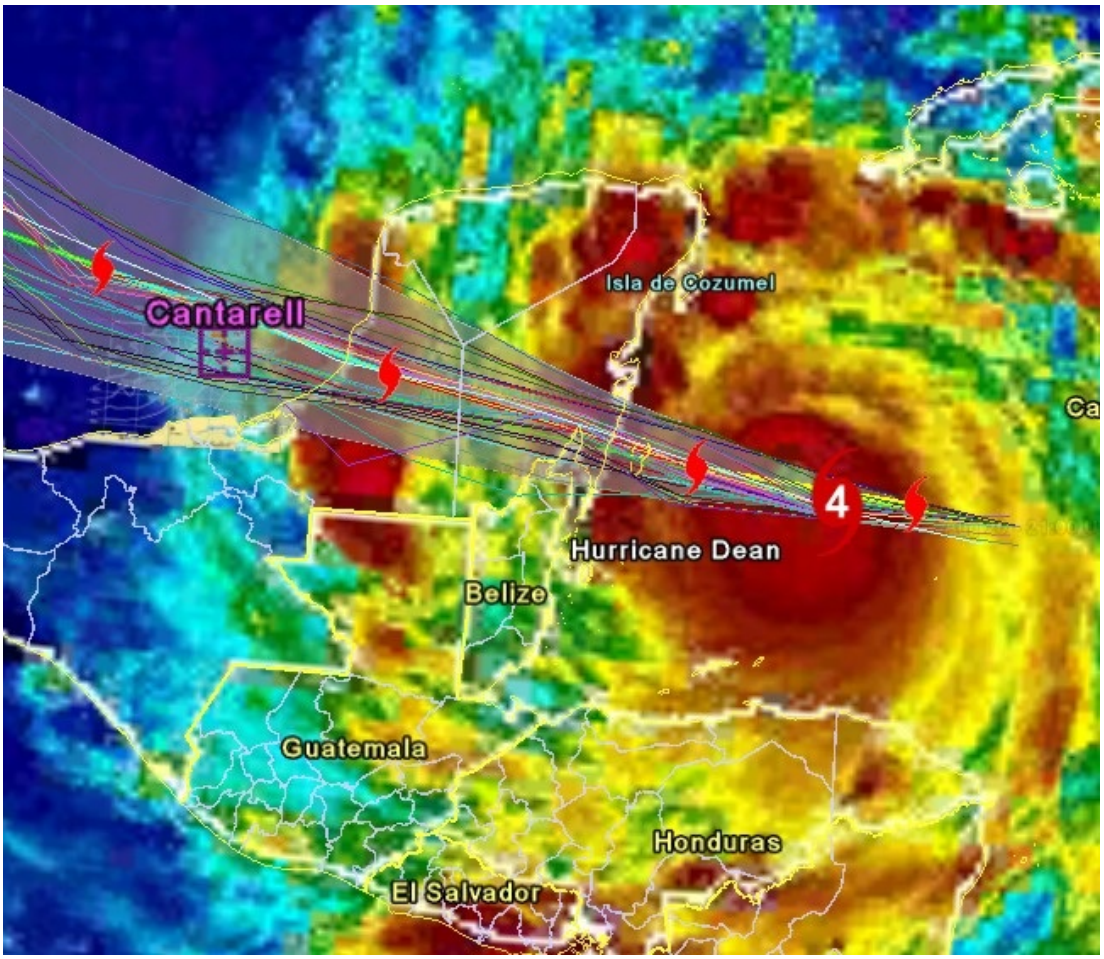


Cantarell and KMZ oil complex, forecast track and wind strength distribution (the purple area is at least tropical storm winds, blue is category 1 winds) from last night's run (21:00 UTC). Click to Enlarge.

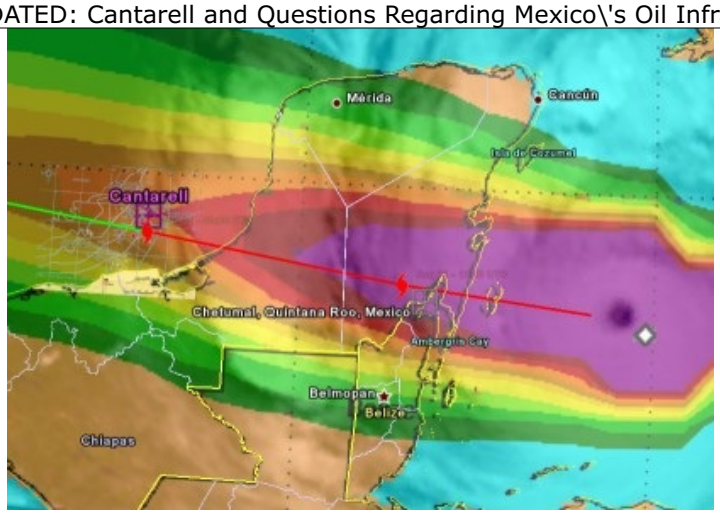


A category 5 can make this kind of damage on landfall:

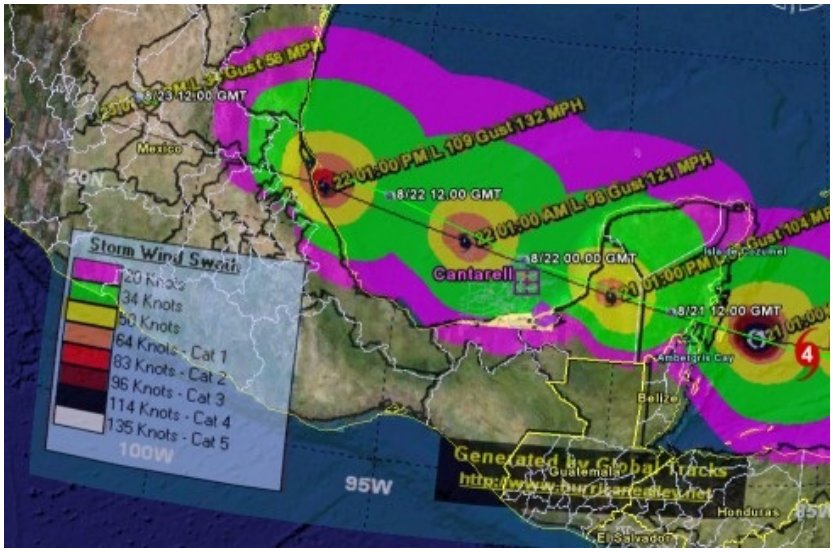
Hurricane Andrew (1992), category 5, a whole Miami neighborhood is leveled..



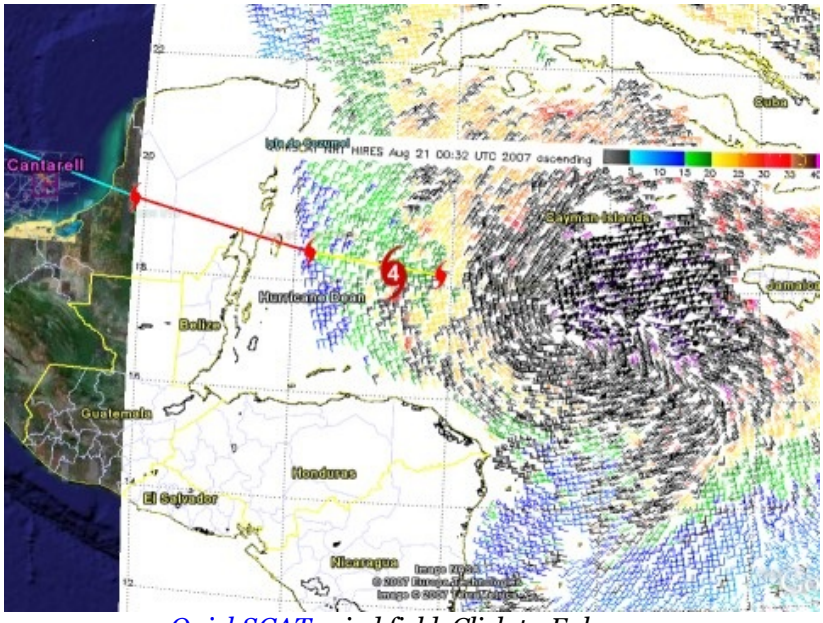
Forecast track possibility along with "spaghetti models" from yesterday night run (21:00 UTC). Click to Enlarge.



Cantarell and KMZ oil complex and 50 Knot (58 mph) Wind Speed Probabilities - 120 Hours from yesterday night run (red to purple means probability > 70%). Click to Enlarge.



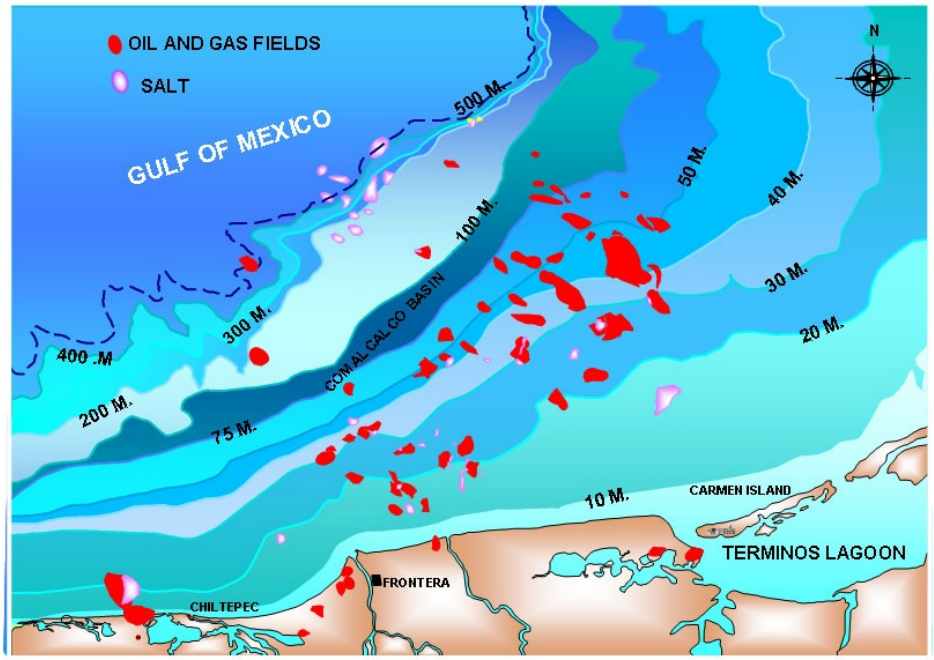
Wind distribution. Click to Enlarge.



QuickSCAT wind field. Click to Enlarge.

What is the area we're worrying about? Cantarell and KMZ, as said above, PEMEX is shutting

down ~140 rigs and moving 13,000+ workers on land. Cantarell + Ku-Maloob-Zaap account for 66% of the total oil production of PEMEX in June 2007. Cantarell alone is 47% of the total....and here's the best pic we have (right click and view image to see full size):



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The United States imported approximately 620,000,000 barrels from Mexico last year. (http://tonto.eia.doe.gov/dnav/pet/hist/mttimusmx1m.htm)

More on importers (Mexico is the 2nd ranked importer (at 1.5 MBPD) to the US behind Canada in 2007, then comes Saudi Arabia): http://www.eia.doe.gov/pub/oil_gas/petroleum/data_publications/company_l...

The IEA on Mexico: http://www.iea.org/Textbase/country/m_country.asp?COUNTRY_CODE=MX

Google maps of the Bay of Campeche: http://maps.google.com/maps?ie=UTF8&om=1&z=7&ll=19.849394,-94.163818&spn...

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Khebab posted "An Update on Mexico's Oil Production--The Rapid Collapse of Cantarell by the Numbers"

> Last year, I expressed my concerns about the eventual impact of a rapid collapse of Cantarell on Mexico's oil production (story here). The last production numbers from PEMEX seems to confirm the rapid decline of Cantarell as well as the inability of the Mexican to rapidly bring new production online. The Wall Street Journal (thanks to Jerôme) published an article on Cantarell last week:
>
> > The virtual collapse at Cantarell -- the world's second-biggest oilfield in terms of output at the start of last year -- is unfolding much faster than projections from Mexico's state-run oil giant Petroleos Mexicanos, or Pemex. Cantarell's daily output fell to 1.5 million barrels in December compared to 1.99 million barrels in January, according to figures from the Mexican Energy Ministry.

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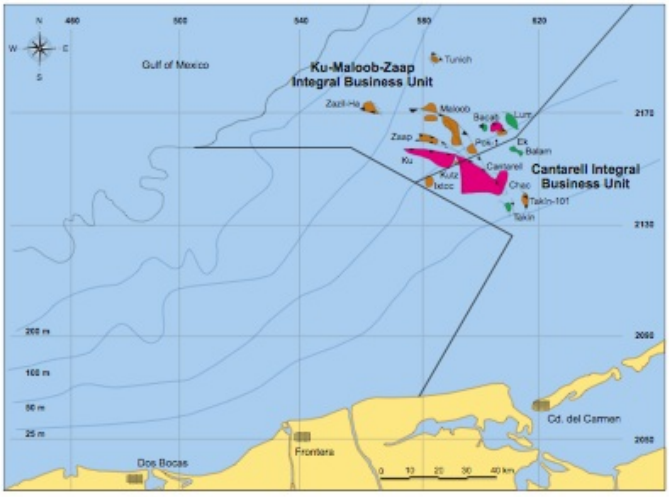
Euan Mearns put some flesh on the bones of Mexican oil production here (discusses the KMZ area very nicely and has a couple of nice maps too.)

> Following on from Khebab's posts (Jan 2007 and July 2006) I wanted to put some production geology flesh on the bones of Mexican oil production. The main points I want to make are:
>
> 1. Forecast production decline of 14% per annum in Cantarell sounds alarming but it is in fact the result of planned reservoir management.
> 2. The forecast decline of Cantarell is due in part to the diversion of nitrogen injection from Cantarell to the neighbouring Ku-Maloob-Zaap (KMZ) complex of fields. Production at KMZ is forecast to rise to around 800 MBD and this will partly offset production falls at Cantarell.
> 3. Cantarell / Mexican production is predominantly heavy crude, and it is postulated that any production declines in Mexico may be met by additoinal production of Saudi Arabian heavy crude forward to 2012.
> 4. Notwithstanding point 3, Mexican oil production decline means that 4 out of 5 major OECD producers are now in decline (Norway, UK, USA and Mexico), leaving only Canada with growing production and this presents the OECD with a growing problem of energy security.
> 5. The Hubbert Linearisation (HL) for Mexico reflects reservoir management (gas lift and nitrogen injection) and new field developments but the interpretation remains equivocal. A brief description is given of why Pemex have used gas lift and nitrogen injection to boost production at Cantarell.



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Luis de Souza put together this analysis of world oil exports for Mexico

> Mexico is here assessed to be capable of producing a total of 50 Gb to 2075, giving a midpoint of depletion in 1999, some fourteen years after what appears to be a premature actual peak in 1985. Production now stands at about 3.2 Mb/d, being subject to a fairly high depletion rate of 5% a year.
>
> Mexico seems to have peaked only in 2004, but the future decline rate is maintained.

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Ace also does some work on Mexico on his Updated World Oil Forecast.

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All TOD Work on Cantarell and Mexico

http://www.theoildrum.com/tag/cantarell
http://www.theoildrum.com/tag/mexico

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Mexican Oil reserves:
http://www.ruf.rice.edu/~leeman/MexOilReserves.gif

Mexican refineries:
http://www2.nrcan.gc.ca/es/es/NA-enrgpic2006/rpImages/5-04-e.gif

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Some PEMEX background:

http://en.wikipedia.org/wiki/Pemex
http://en.wikipedia.org/wiki/Cantarell_Field

Here's a list of refineries:

* Minatitlan Refinery (Pemex) 170,000 bpd
* Cadereyta Refinery (Pemex) 292,000 bpd
* Tula Refinery (Pemex) 320,000 bpd
* Salamanca Refinery (Pemex) 236,000 bpd
* Ciudad Madero Refinery (Pemex) 190,000 bpd
* Salina Cruz Refinery (Pemex) 320,000 bpd

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More from PEMEX on KMZ: http://www.pemex.com/files/content/ACFWVNY7kO2v.pdf

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Almost Total Cantarell Evacuation

> Mexico clears oil rigs as hurricane nears
> Might order total well closure
>
> Mexican state oil company Pemex on Sunday evacuated thousands of oil workers from the Gulf of Mexico and warned it might close up to 2.2m barrels a day of crude oil production as the powerful hurricane approached.
>
> Pemex said it was evacuating 13,360 workers – most of its workforce in the area - and that it might order the ”total closure of the oil wells” in the Cantarell oil field and other fields.

http://www.ft.com/cms/s/0/96593284-4e46-11dc-85e7-0000779fd2ac.html

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This is from the EIA Hurricane analysis for 2007, showing historical production of oil and gas from the Outer Continental Shelf of the Gulf of Mexico.

Oil production seems to be about 1.4 million BPD; natural gas appears to be about 7.5 billion cu. ft. per day.

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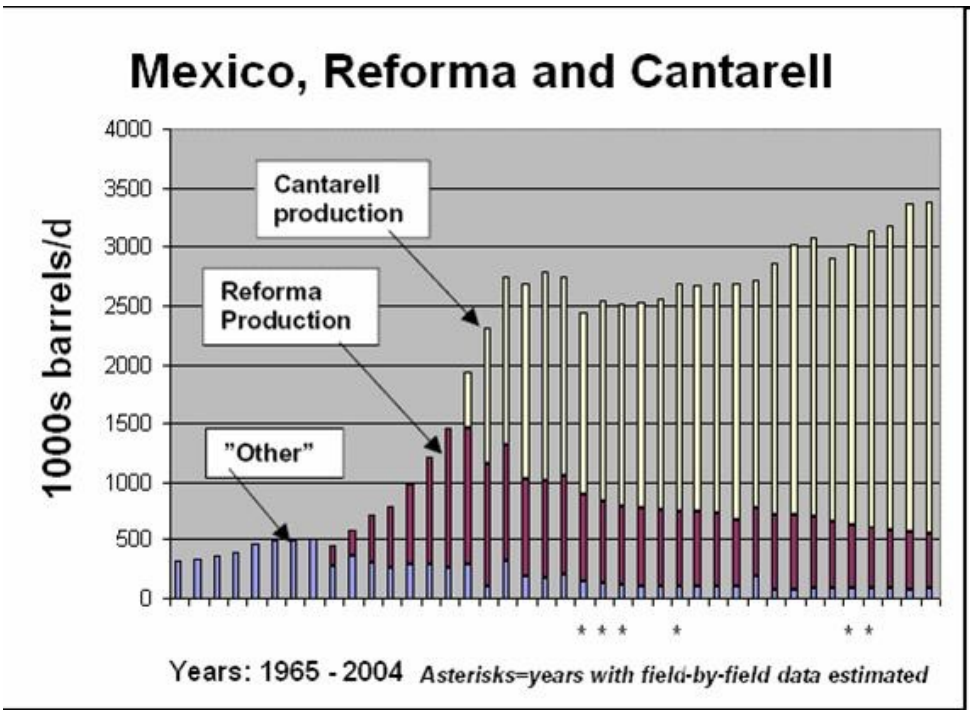
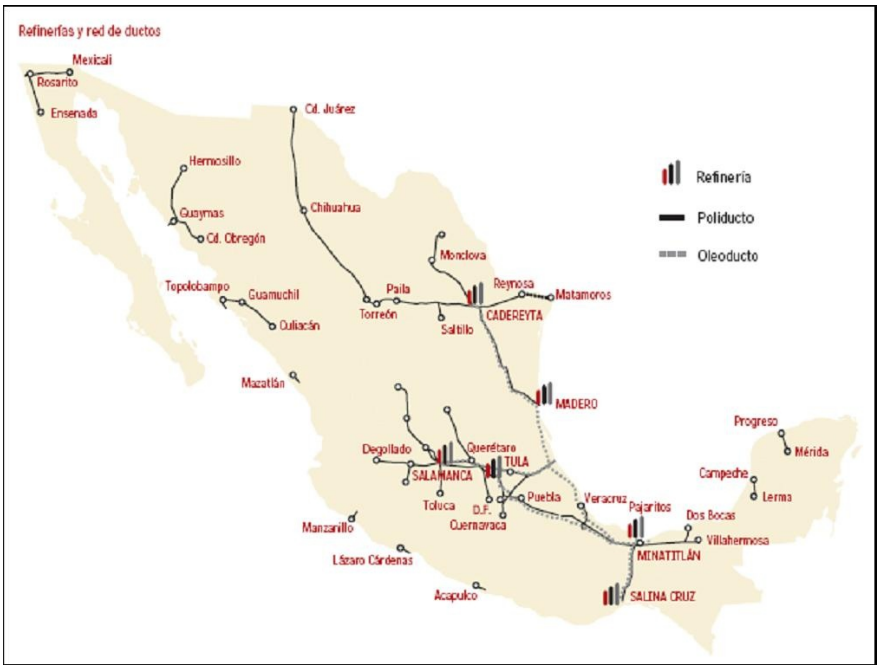
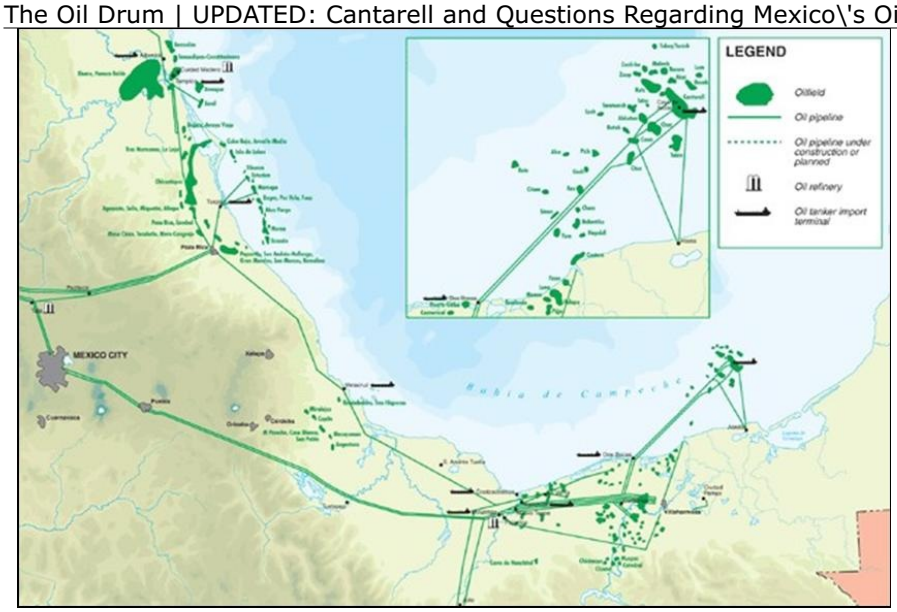
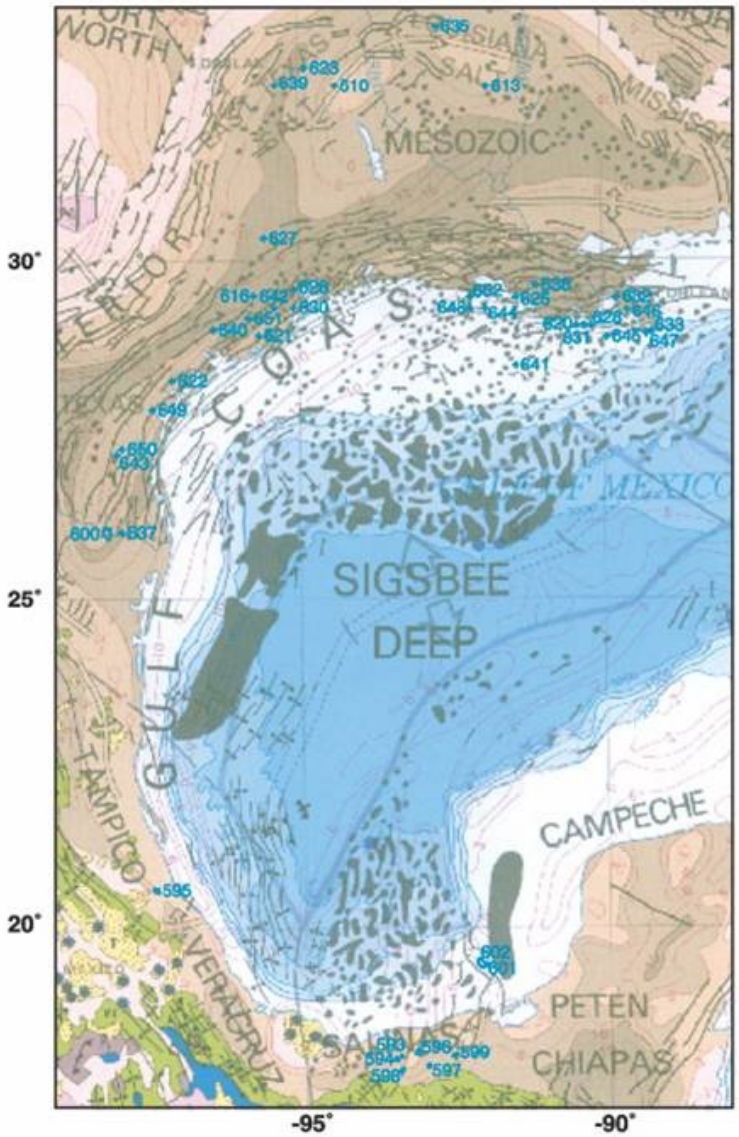
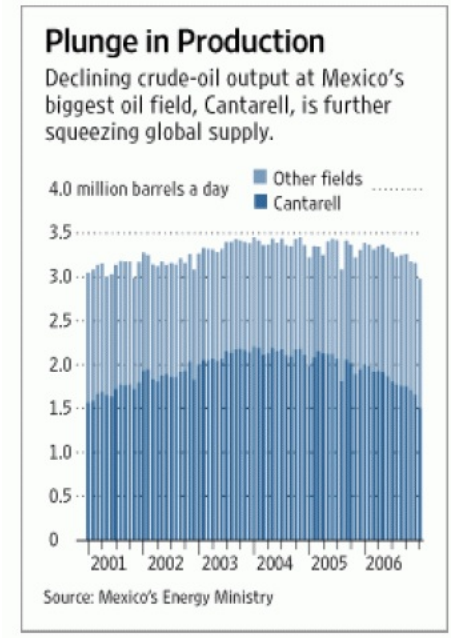
And then some charts and maps and such:





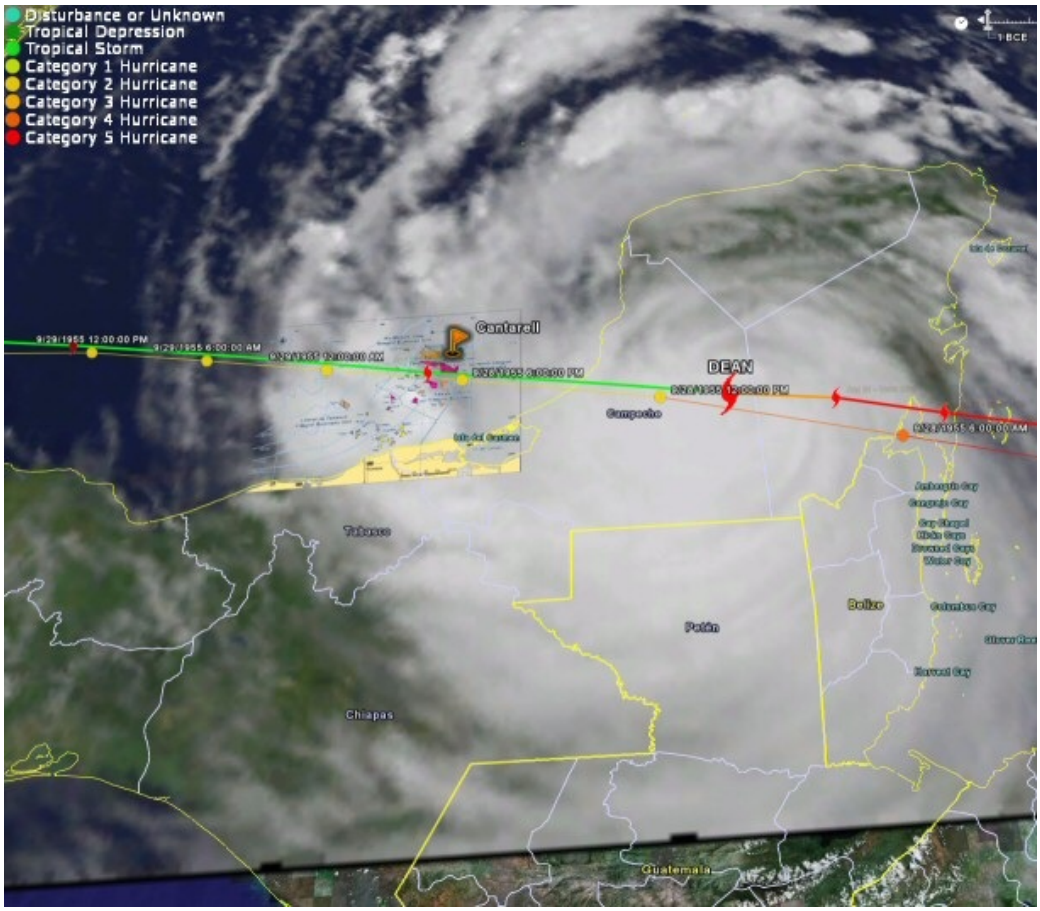

LEGEND
Oilfield
Oil pipeline
Oil pipeline under construction or planned
Oil refinery
Oil tanker import terminal
MEXICO CITY


MESOZOIC
SIGSBEE
DEEP
GULF OF MEXICO
CAMPECHE
TAMPICO
VERACRUZ
PETEN
CHIAPAS
30°
25°
20°
-95°
-90°



Update (Khebab, 11:55 EDT)

Hurricane Dean is a clone of Hurricane Janet (1955) who emerged in the gulf as a category 2:



Cantarell and KMZ oil complex, trajectories of Hurricane Dean and Janet (colored circles). Click to Enlarge.