Solar Lunar coincidence in 1983 El Nino event

Analysis of Earth LoD (Length of Day) data shows a coincidence between maximum effect on earth spin from the Earth orbit and lunar orbit.

The 1983 event stands out as the most major feature in the high resolution data from dataset inception in 1962, is visible to the eye just from viewing a graphed dataset.

It has been described as the event of the century, larger than the much mentioned 1998 event, which is seems differs in it's thermal signature.

The event

“The severe impact of the 1983 “Mega Niño” ...”

http://www.unu.edu/env/govern/elnino/CountryReports/inside/peru/Main_effects/Main_effects_txt.html

“The equatorial undercurrent at 159°W decayed during August 1982, partially reversed during September, and rapidly reappeared in January 1983. The virtual disappearance is consistent with the basin-wide adjustment of sea surface slope to the strong westerly winds in the western and central Pacific that caused the 1982-1983 El Niño event.”

http://www.sciencemag.org/cgi/content/abstract/222/4628/1121

Comment: suggesting the wind caused the earth spin to change are common. Public comment and even papers try to put the blame on wind blowing onto the Andies. Water is 300 times as massive as air however. The ballerina effect is why sea level change is so strong.

The Morner paper makes fascinating reading... and fits with what is presented.

http://www.pog.nu/sea/pdf/Sea.pdf

Method

A new kind of dataset analyser was used and this report is about a finding during trials and testing.

This is dataset analysis by synthesis where one to many signal generators combine to produce a synthetic version of the dataset being matched. A result might be the synthesized “signal” or more often the generator parameters.

The initial version uses Fourier Synthesis and it is clearly stated that this is not discrete, that is, it is not quantised, regardless of the input dataset being PCM data.

Within the Nyquist and Shannon limits any shape can be synthesized. Counter intuitively an input dataset is also not quantised other than the Nyquist and Shannon limits. The same is not true of DFT etc. which is quantised in time, setting often severe limits on analysis resolution.

The objective is gaining useful results, not the precision of pure math. The method uses heuristics developed privately during the 1980s, subsequently used to great effect in commercial electronics design, where formal methods could not work. Essentially this is a massive multi-dimensional optimisation problem, with many degrees of freedom where conventional techniques such as hill-climbing completely fail.

In the case of simple periodic signals the analyser will output the frequency, phase, amplitude and offset for one or many components. This applies even if the signal is “off” sample rate, where DFT fails.

Dataset

LoD data, length of day is a long term international dataset of great precision, including more than earth spin, wobble in space also appears but of no interest here.

The daily data published for 1962 onwards was used.

Data available from

http://www.iers.org/

Preamble

The LoD dataset is large. It was used as a speed stress test: this is glacially slow software, as the runtime shown below attests.

Here is the test result from a “gen” file.

Period is in years. Generator 0 can be ignored and primarily handles any offset, plus perhaps a long period item.

The R^2 is reasonable given that far more generators would be required to gain an exact result, probably impractical and of no real use: noise and chaos are present.

GENV0.1A

datacreated	Fri Jun 26 22:34:29 2009					
elapsed_seconds	13140					
R2	intercept	slope				
0.95037	9.00076e-05	0.95118				
gencnt	13					
fs	365.25					
gen#	active	type	period	phase	amplitude	offset
0	1	1	278.728	-0.649143	0.00302777	0.00178143
1	1	1	1	1.06126	0.000364986	0
2	1	1	95.8693	1.27681	0.00219383	0
3	1	1	20.7494	-2.10192	0.000546307	0
4	1	1	0.0754367	-0.644417	0.000187429	0
5	1	1	0.0374026	-3.33132	0.000356093	0
6	1	1	0.500004	-2.15944	0.000346548	0
7	1	1	13.6753	-0.797716	0.00028758	0
8	1	1	0.0373254	0.278892	0.000147463	0
9	1	1	5.94084	-2.69378	9.68377e-05	0
10	1	1	2.38475	2.04256	8.17915e-05	0
11	1	1	0.0250047	0.687063	7.11326e-05	0
12	1	1	3.71812	2.93588	5.42709e-05	0

Gen 1 is an annual cycle (earth years).
Gen 6 is a second harmonic.
At this level of analysis higher order harmonics do not show. (they can be deliberately found)

Gen 4 0.0754367 * 365.25 = 27.5532547 days
Lunar orbital.

Wikipedia shows

The Moon's periods

Name	Value (d)	Definition
sidereal	27.321 661	with respect to the distant stars (13.369 passes per year)
synodic	29.530 589	with respect to the Sun (phases of the Moon, 12.369 cycles per year)
tropical	27.321 582	with respect to the vernal point (precesses in ~26,000 a)
anomalistic	27.554 550	with respect to the perigee (recesses in 3232.6 d = 8.8504 a)
draconic (nodical)	27.212 221	with respect to the ascending node (precesses in 6793.5 d = 18.5996 a)

So this is close to anomalistic. No doubt better accuracy can be obtained, it was not an objective for this analysis. (very close to Jupiter orbital period is one item which appears in analysis of sunspot data, but the Tropical figure, reasons unknown)

Gen 5
Gen 8 this is the lunar half orbit and is modelled in a complex way.

0.0374026 * 365.25 = 13.6612997 days
0.0373254 * 365.25 = 13.6331024 days

What is gen 11?
It makes no sense but is small. One observation is it is close to 1/40th of a year, suggesting an artefact from somewhere.

A basic technique

It is trivial to subtract the synthesized data from the original data, giving a residual, possibly primarily random, one-off, chaotic or yet to be matched items.

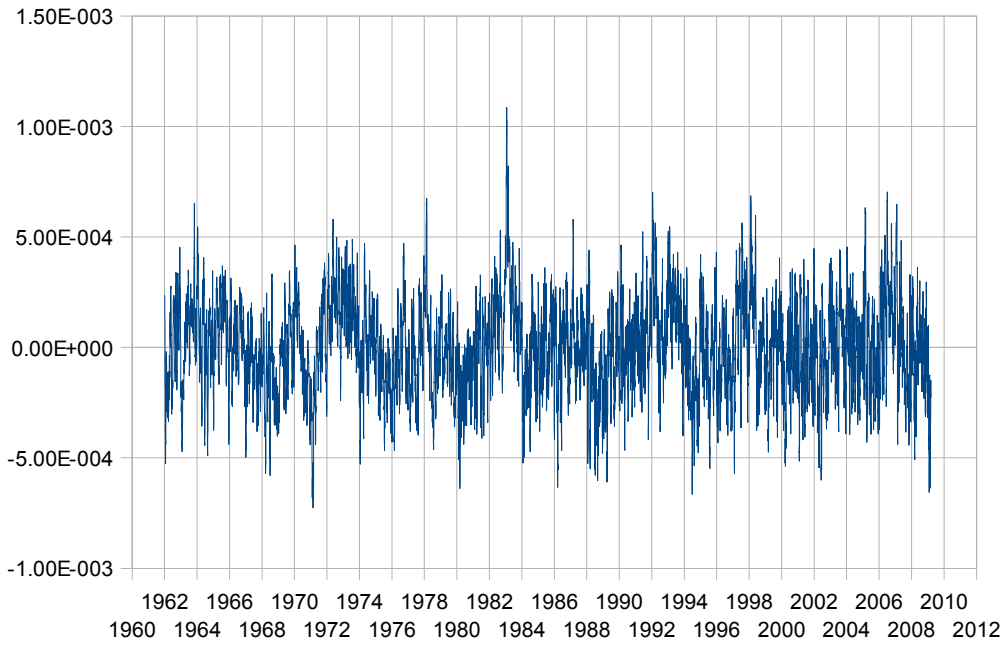

Illustration 1: Residual, 1983 event is obvious

Principle components

It is intended that for simple generators synthesis can be done using an external program or a spreadsheet. Individual components can be simply added or subtracted as desired.

Formula for spreadsheet import are produced and were used with OpenOffice Calc in the production of this document. (too large to include)

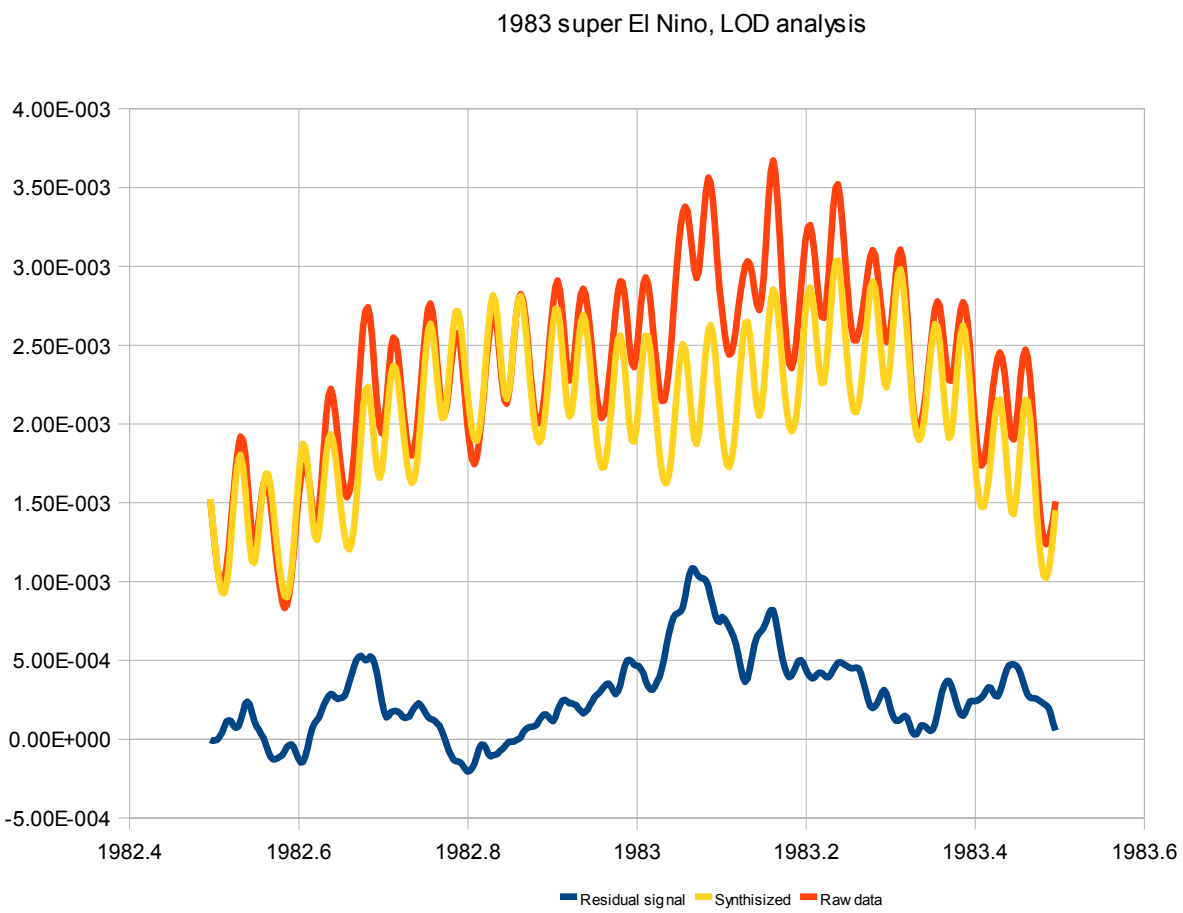

Illustration 2: Original LoD data, synthesizer output and analysis residual

Keep in mind that this analysis did not try to get very close to perfect.

Much of the wiggling in the above is half orbit lunar.

Add back in components

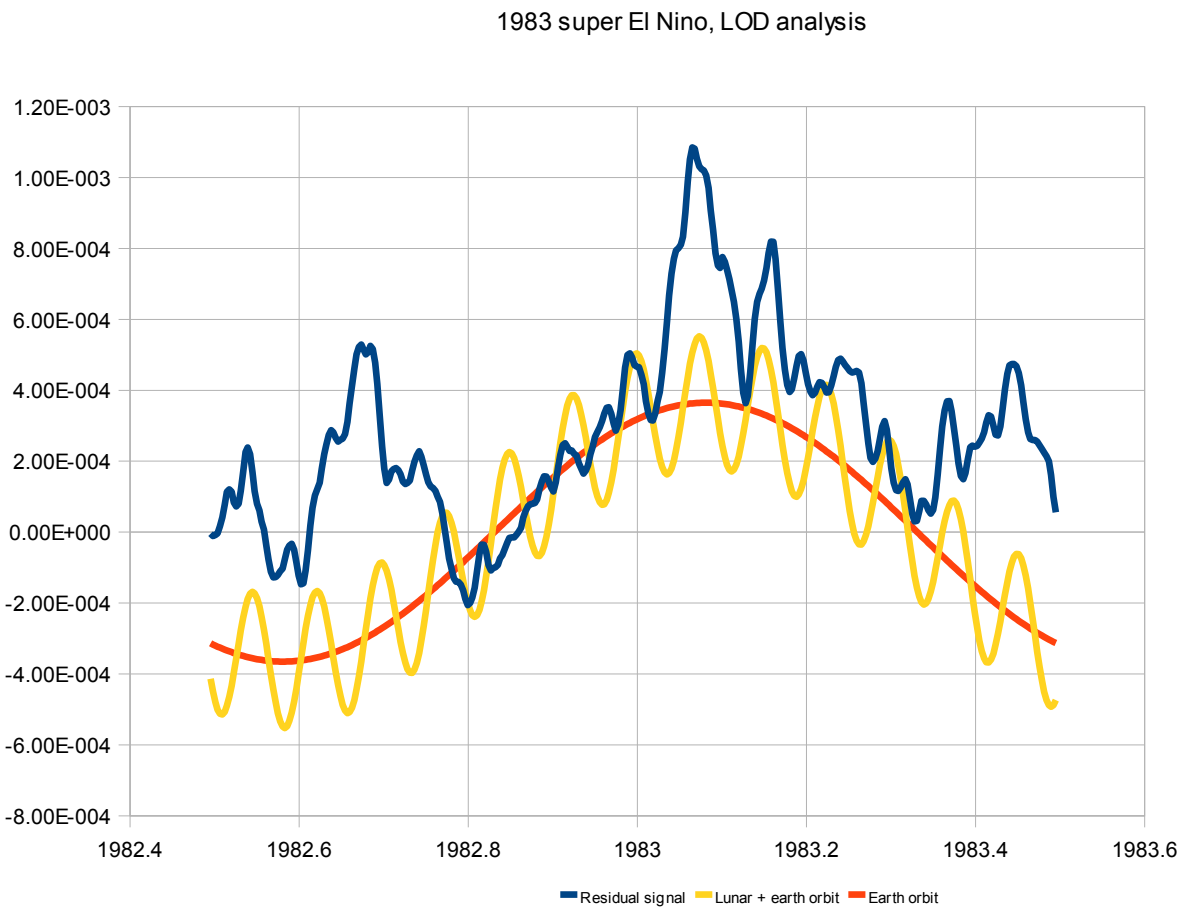

Illustration 3: The remarkable relationship between gravitational force and the 1983 event

Here I add back in two components which were subtracted, summing the annual and lunar cycle to make what is happening clearer.

A cross check using a web based lunar calculator showed the lunar earth distance was closest on the day in question. (I suggest +- 1 day is wise)

Legal

27th June 2009, Newbury, UK