

# The Clay Research Group

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## RESEARCH AREAS

Climate Change ♦ Data Analysis ♦ Electrical Resistivity Tomography  
Time Domain Reflectometry ♦ BioSciences ♦ Ground Movement  
Soil Testing Techniques ♦ Telemetry ♦ Numerical Modelling  
Ground Remediation Techniques ♦ Risk Analysis  
Mapping ♦ Software Analysis Tools



March 2014  
Edition 106

# The Clay Research Group

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Issue 106, March, 2014

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Tree distribution by ownership and frequency in height bands.

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Live Climate Data on the Web

## Rainfall, Floods & Sink Holes

According to the Met Office, the heaviest winter rainfall since records began in 1910. Over the last few years we have seen an increase in landslides as a result.

## Hillingdon

This edition contains a report on the London Borough of Hillingdon. One of the larger of the 33 boroughs, Hillingdon has a range of risks at postcode sector level, varying from high to the north of the Borough, and diminishing towards the south.

## Live Climate Data

Track 'live' ocean currents using an application developed by Cameron Beccario, and access the CRUTEM4 data via Google Earth using a KLM file. Is El Niño headed our way? View the NOAA model on the web.

## El Niño

Is there a link between El Niño years and event years? If, as predicted by some, 2014 is going to be an El Niño year, should we be worried?

## Birlinging Gap Cliff Collapse

Birlinging Cliff in East Sussex is the latest victim of coastal erosion associated with the recent wet weather. Apparently the cliffs, part of the Seven Sisters coastline between Seaford and Eastbourne, have already suffered seven years' worth of erosion since January of this year.



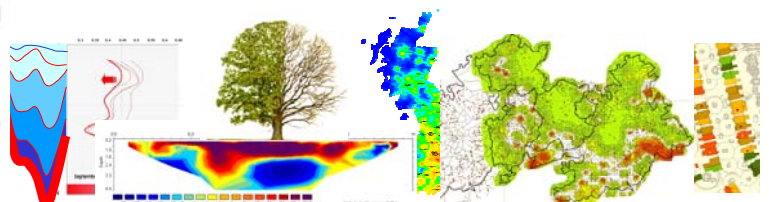
## Hortlink II Update

A summary of the findings presented by Dr. Neil Hipps in January. His initial review delivered a useful insight into the success of crown reduction, although caveats apply in terms of distinguishing whether the benefits are associated with milder weather over recent years, or directly as a result of pro-active tree management.

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## Tomorrow, Today

Last month we ran an article outlining the future. Surveys of properties would take minutes and the data would be autopopulated into readily available imagery. The building would be placed onto a 3D geological map. Surrounding trees would be plotted, and leaves photographs to identify using the Leaf Snap application.

The device that would change our world was a LiDaR camera and Apple had filed a patent to deliver this technology using their iPhone.

Things move quickly in the area of technology.

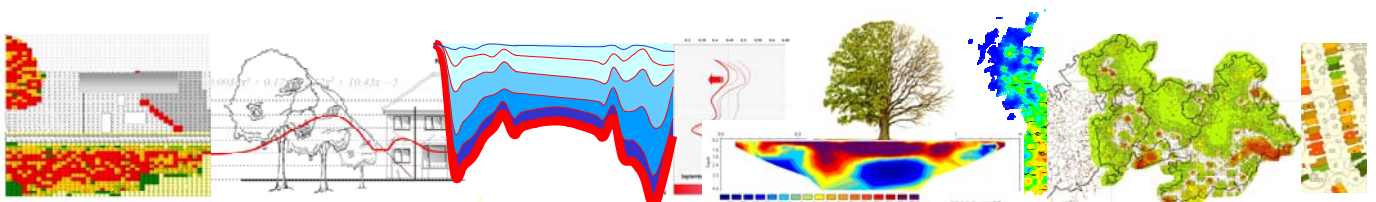
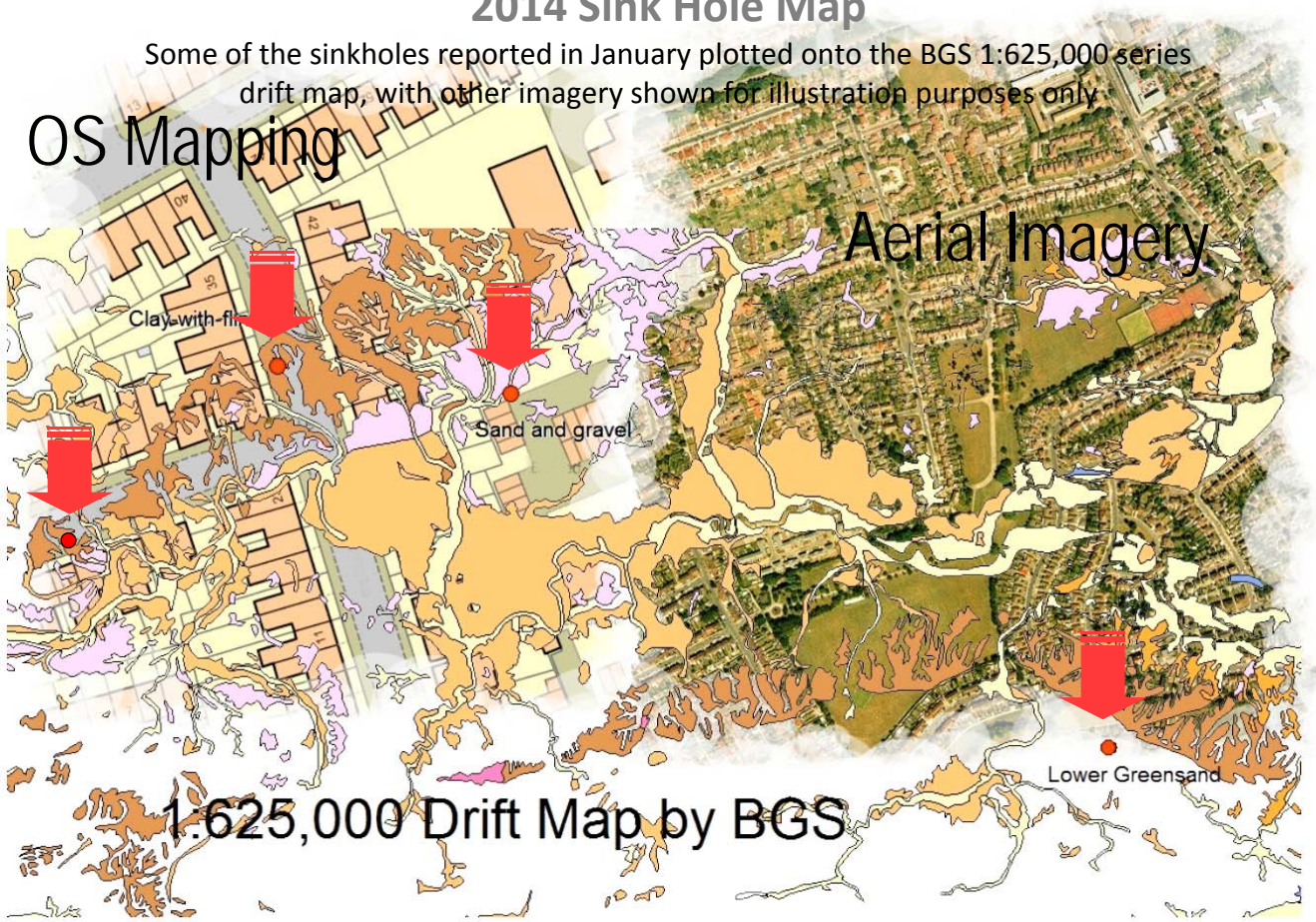
The BBC report, "Google has unveiled a prototype smartphone with "customised hardware and software" that enables it to create 3D maps of a user's surroundings.

The device's sensors allow it make over 250,000 3D measurements every second and update its position in real-time."

Google said potential applications may include indoor mapping, helping the visually-impaired navigate unfamiliar indoor places unassisted and gaming, but they don't mention subsidence claims. Yet.

## 2014 Sink Hole Map

Some of the sinkholes reported in January plotted onto the BGS 1:625,000 series drift map, with other imagery shown for illustration purposes only

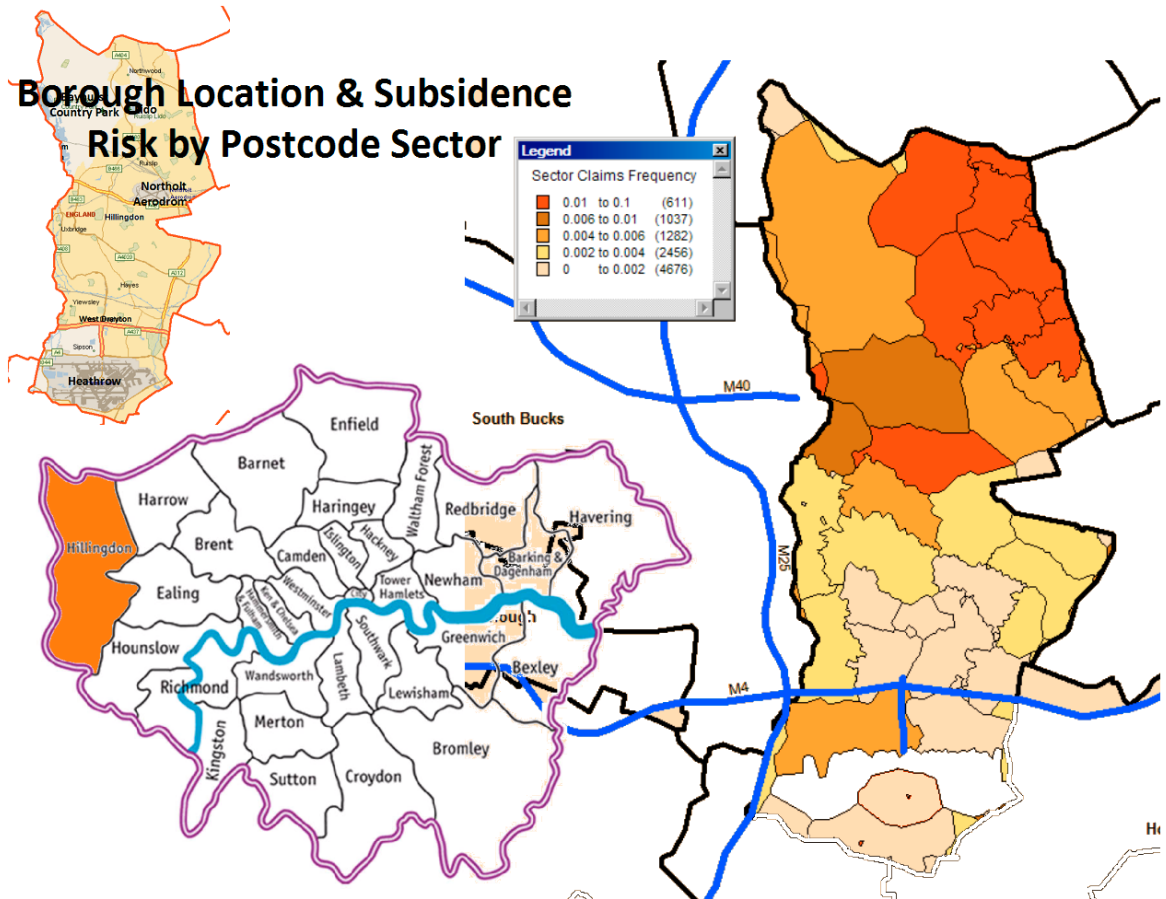




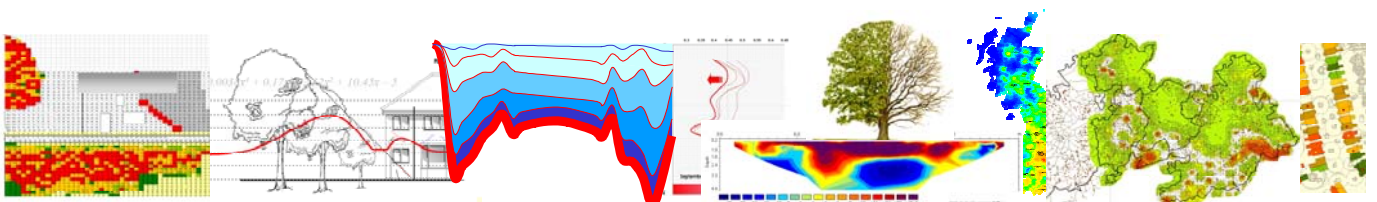
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## The London Borough of Hillingdon

Hillingdon lies to the extreme west of the London Boroughs and contains some high risk subsidence postcode sectors towards the north of the district.



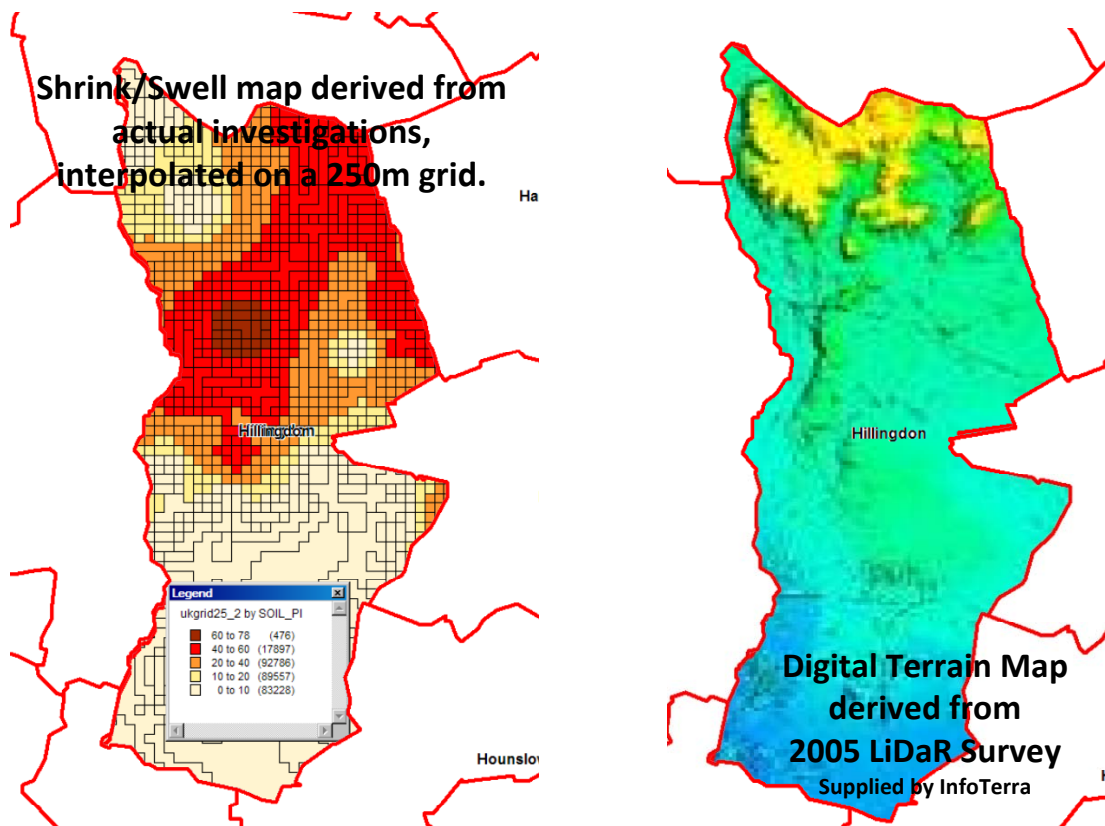
It has an area of approximately 115 sq kms and a housing population of around 114,000 residential properties – see distribution on Page 5. The Office of National Statistics estimated the population to be just over 273,000 in 2011. According to a Hillingdon Government web publication, “Due to the presence of the green belt in the north and Heathrow Airport in far south of the borough, majority of Hillingdon’s population is concentrated in the south central part of the borough between Northwood in the north to Hayes and Harlington in the South where population density (measured by number of persons per hectare) is much higher.” Above, right, the postcode sector map of subsidence, expressed as frequency (claims/housing population) reveals the risk of subsidence to be greater to the north of the borough.



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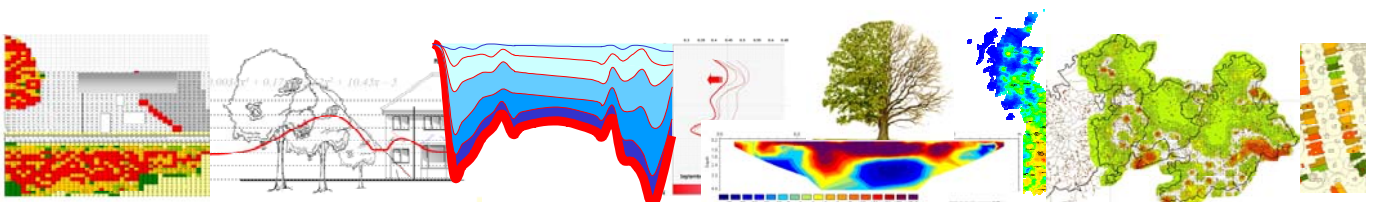
## Hillingdon – Soil and Digital Terrain Map

Below, left, the presence of clay soil colour coded on an interpolated 250m grid to reflect the shrink/swell characteristics, or Plasticity Index. Right an extract from the LiDaR digital terrain map flown by InfoTerra in 2005.



The higher frequency of subsidence claims to the north of the borough are associated with the presence of shrinkable clay soils. See claim distribution map on the following page. The adjoining borough to the north west of Hillingdon is Harrow. A borough that has a high subsidence risk.

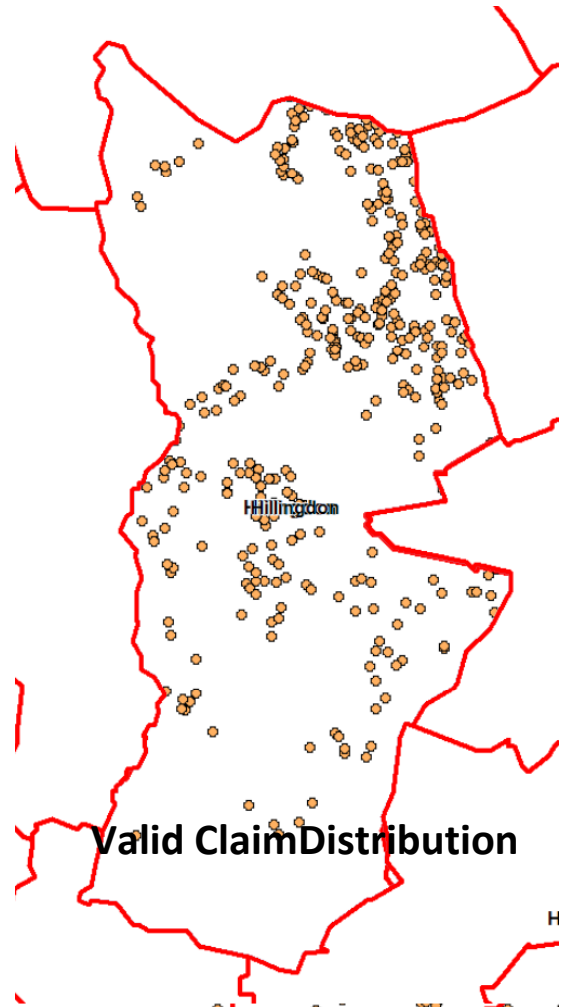
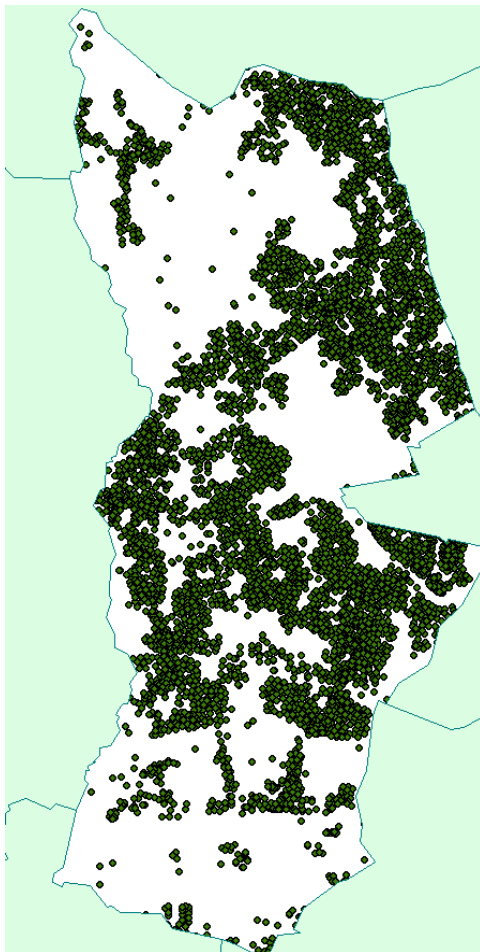
Referring back to the comments on the previous page, there is a higher density of housing towards the centre and although the sector risk maps use frequency data to overcome this, the link between the geology and risk is clear.



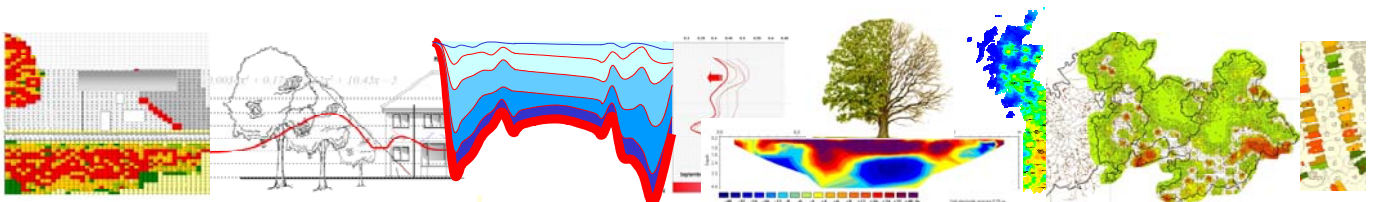
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## Hillingdon – Housing Population Distribution and Valid Subsidence Claims



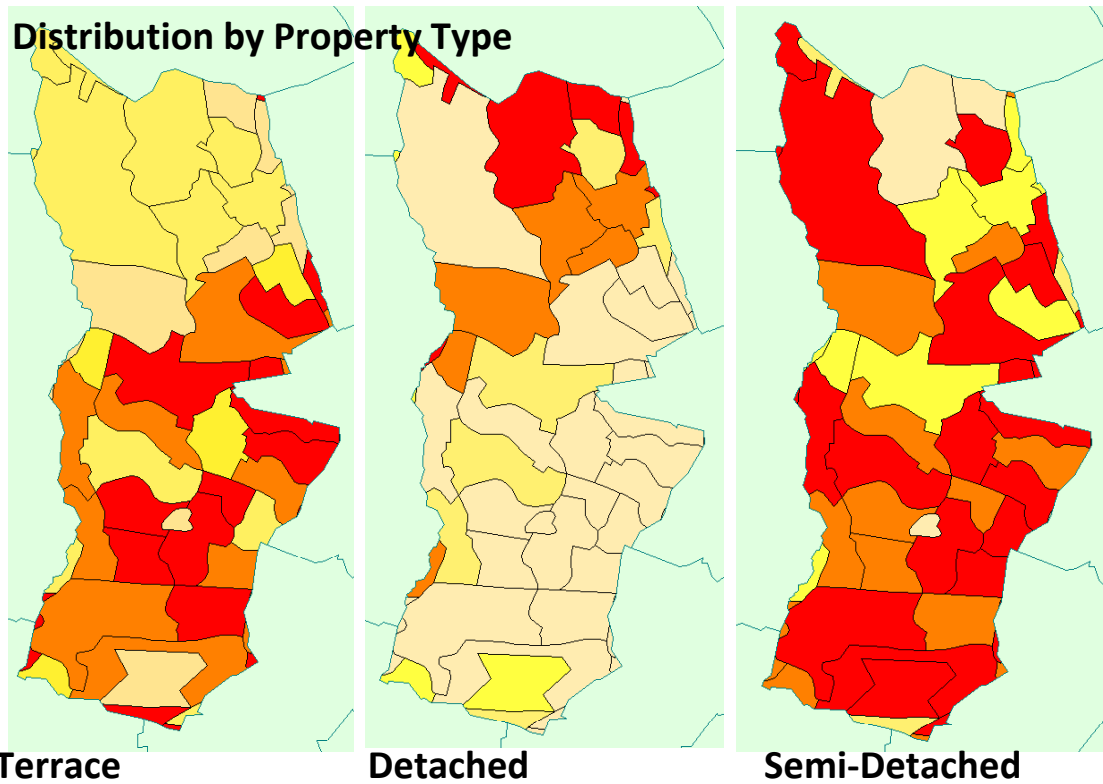
Left, the full postcode distribution showing highest densities to the north east and centre of the borough. The highest claims distribution (right) is to the north east of the borough, coincident with the clay series.



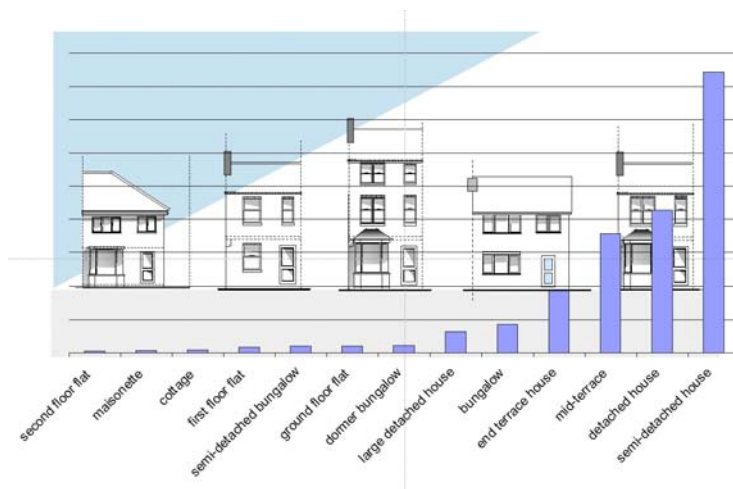




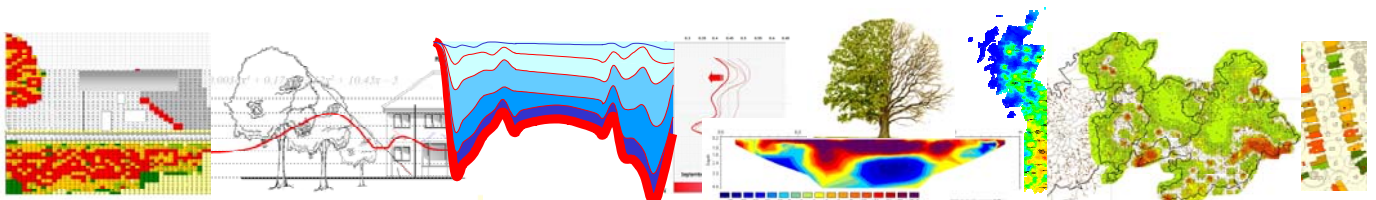
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The apparent higher risk presented by the semi-detached house (see graph below) reflects its high occurrence, rather than any particular suggestion of vulnerability. The above maps show it to have the highest count, followed by terraced, and then detached, house types.



Although the detached house comes second in the league table of risk (by count), when the mid and end-terrace properties are added together, the terrace moves into second place.

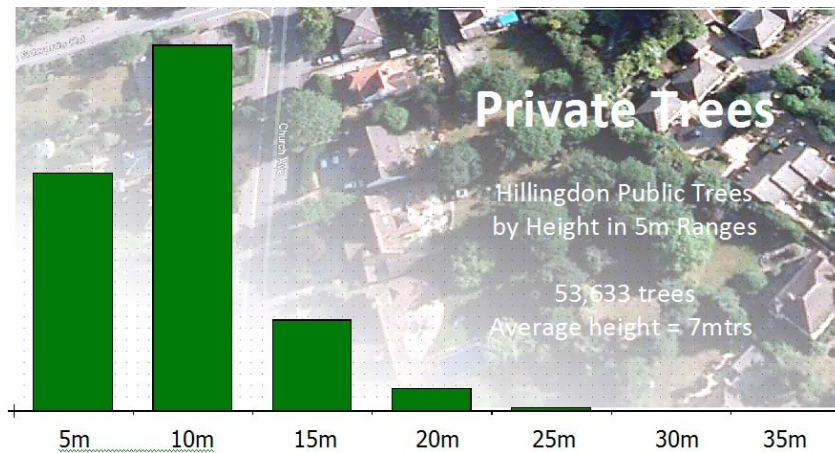




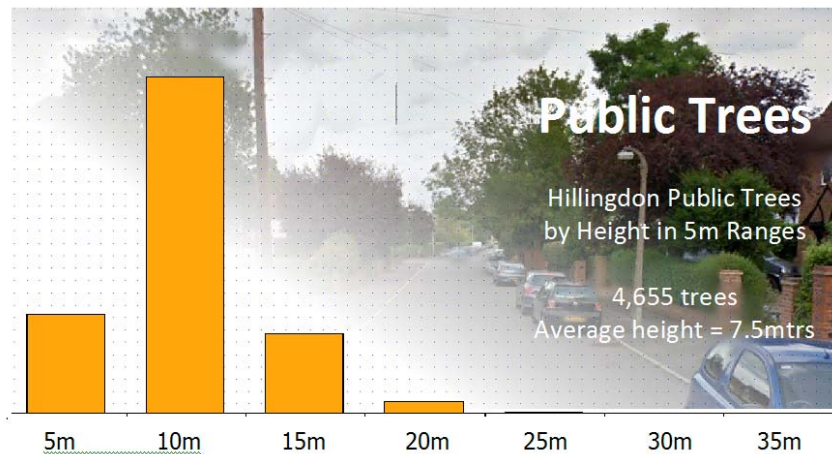
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## Hillingdon - Tree Data

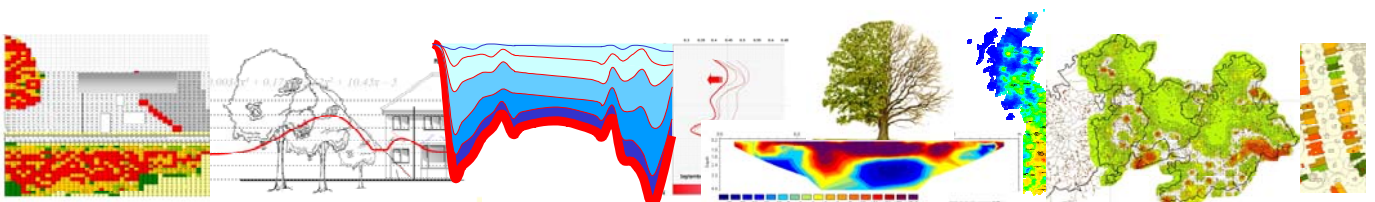
Below, heights in 5m distribution bands for both private and public trees. According to London Assembly, May 2007, Hillingdon has a total of 16,000 trees under its control. Around 2,000 were removed over a five year period, of which 40 were removed due to subsidence. For our study, we have counted trees situated on clay soil, within modelled influencing distance of a domestic property.



*Our study suggests there were around 53,633 trees in private ownership, on clay soil and within influencing distance of a domestic property. The average height = 7mtrs.*



*By comparison, we estimate there are just under 4,700 trees in Council ownership meeting this criteria with regard to soil and proximity to buildings. Average height = 7.5mtrs*



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## Very Early Warning of next El Niño

Josef Ludeschera *et al*

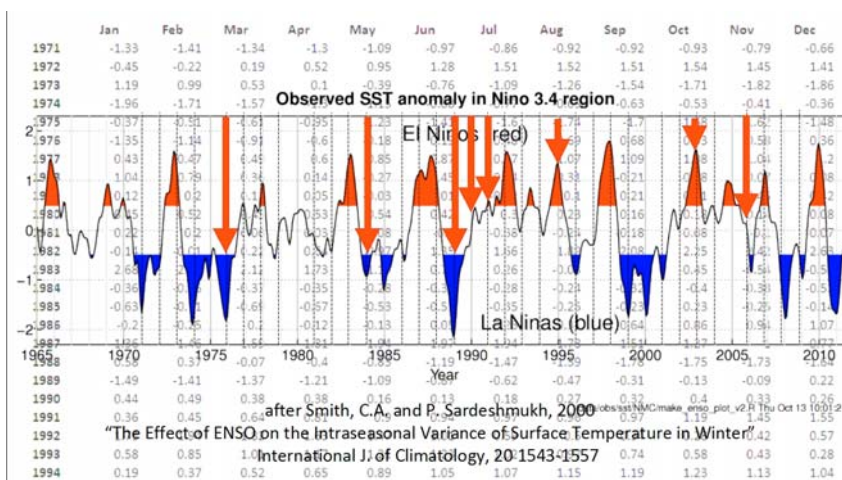
Proceedings of the National Academy of Science  
of the United States of America  
February, 2014, vol. 111 no. 6

Ludeschera and his team are suggesting 2014 might be the hottest year since records began. Predicting when an El Niño might occur is very difficult. This paper examines the link between air temperature over the equator and air temperature in the rest of the Pacific. Apparently, records showed that, in the year before each El Niño, the two regions became more closely linked, meaning their temperatures became more similar than at other times

The team also found that, once these atmospheric links reached a critical strength, around 75 per cent of the time an El Niño developed within a year. Bunde, one of the research team, is quoted as saying "there is certainly a correlation between the co-operative mode in the atmosphere that we measure and the onset of an El Niño event". As that threshold was crossed in September 2013 "the probability is 0.76 that El Niño will occur in 2014".

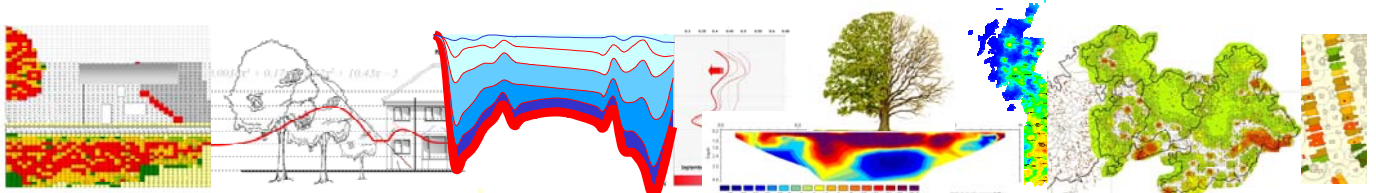
An article in the February edition of The New Scientist said the following: "As a result of climate change 2014 is likely to be one of the hottest years on record". Wenju Cai from the CSIRO, Australia's national research agency in Melbourne says "The problem is that there is so much background variability in the atmosphere and ocean that it is hard to see any signal amidst the noise. Even if there is a developing El Niño, it is hard to predict. If El Niño does develop this year, it will make 2014 even hotter – maybe the hottest ever", says Cai. But since El Niño normally straddles two calendar years, it might give 2015 that title. "It is possible, but not a sure thing. It can be tipped over either way by other variability."

Do El Niño years coincide with subsidence event years? Below we have reproduced a graph based on the work of Smith & Sardeshmukh, which plots El Niño years in red and La Nina years in blue. Bold red arrows indicate subsidence event years..



El Niño years coincided with busy claim years in 1995 and 2003. They missed 1976, 1984, 1989 and 2006, and 'narrowly avoided' 1990. 1991 falls on the borderline.

So, of the 8 years plotted, El Niño years coincide with event years only 25% of the time. 1998 was a record El Niño year, followed closely by 2010, but neither were particularly busy claim years. On the face of it, El Niño isn't linked directly or indirectly to event years.

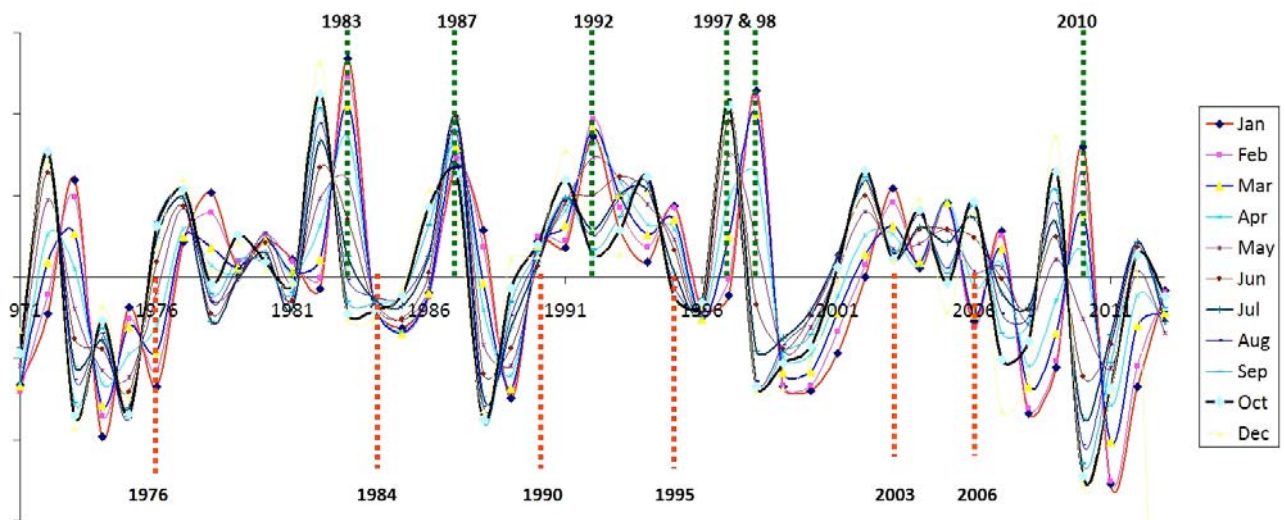


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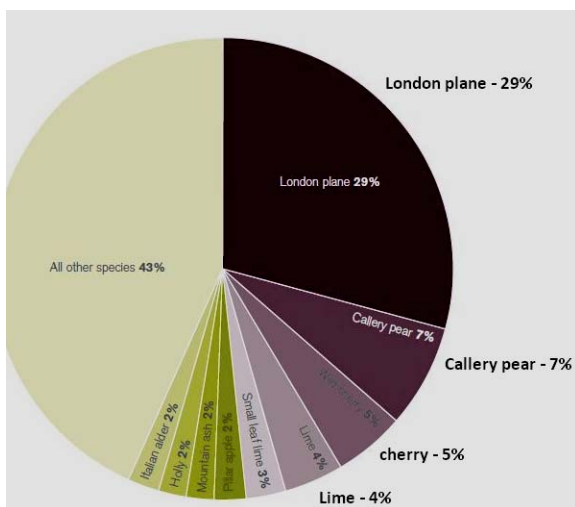
## El Niño and Event Year Comparison using Monthly Data

Are there any patterns that might be more predictive? For example, by plotting the El Niño data by month, is it possible to see anything from the months or years preceding events years that might be of assistance?

The ‘by month’ data is shown below. The years prior to 1976 and 1990 were low, whereas the years prior to 1984 were exceptionally high. 2010 stands in isolation of any event years, and 2003 and 2006 were relatively neutral, as were the temperatures to either side. In summary, we can see no direct or indirect link between El Niño and events years.



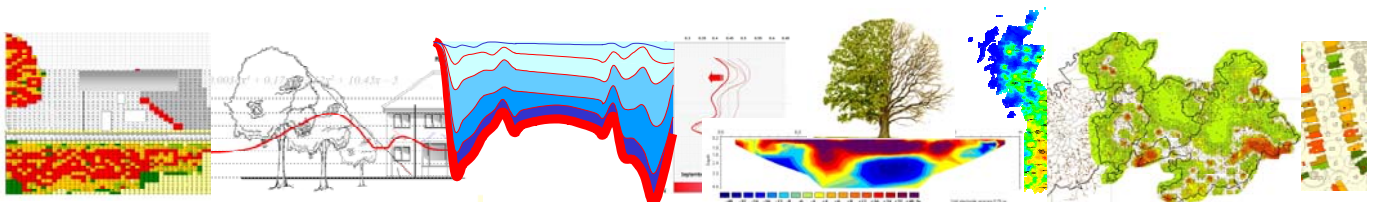
## Tree Population by Species



The pie chart, left, has been taken from “Green Benefits in Victoria Business Improvement District initiative” and shows the percentage population by tree species for the study area.

The survey included a total of 1,225 trees and contains lots of interesting information. For example, in the survey area, canopy cover is 8.8%, average stem diameter is 380mm

London plane accounts for 29% of the tree population in this location. Other graphs chart the importance of the plane tree in terms of value and leaf area.





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## Hortlink II - Summary

The January meeting was well attended and Dr. Neil Higgs gave an outline of progress to-date. He reports that a web search revealed little published work relating to the effectiveness or otherwise of pruning trees in the urban environment confirming this to be an under-researched topic.

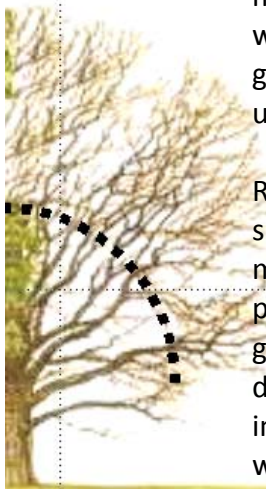
After examining records supplied by interested parties he found some evidence that, “as the number of crown-reduced trees increased the number of claims reduced.”

He concludes “there is potential for boroughs to utilise their own data to examine the effects of their pruning treatment on claims frequency at a postcode sector level.”

The caveat was the weather. Higher than average rainfall in the summer confounded a more meaningful interpretation of the results. Neil noted that there were no drought years in the period covered by this preliminary study.

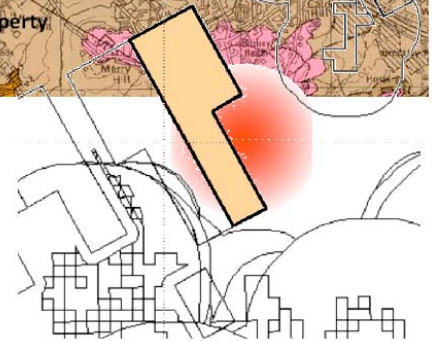
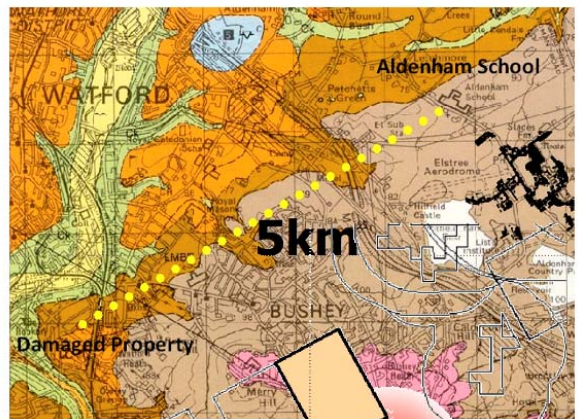
He added, that for the most meaningful outcome, it would be useful if data was gathered and stored in a uniform way.

Records should include tree species, metrics, management records, pruning regime, site geology, foundation depths, monitoring information etc., and weather data.

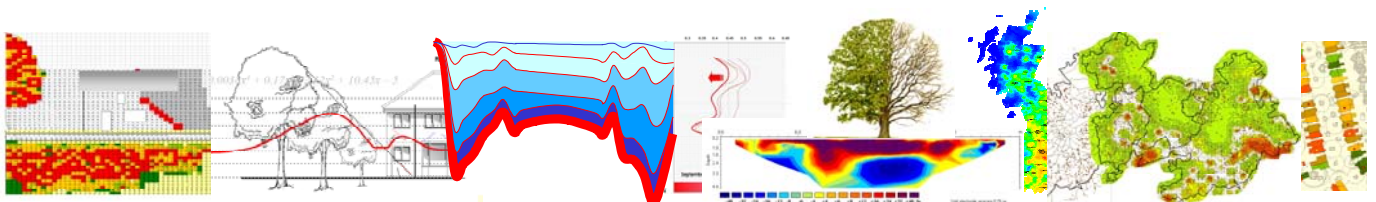


## Sinkhole Geology

The Watford sinkhole (see sketch) is around 5km away from our research site at Aldenham school and shares a similar geology. See map below.



In this instance, the semi-detached house was saved from collapse by the prompt response of InFront Innovation and their team of engineers.

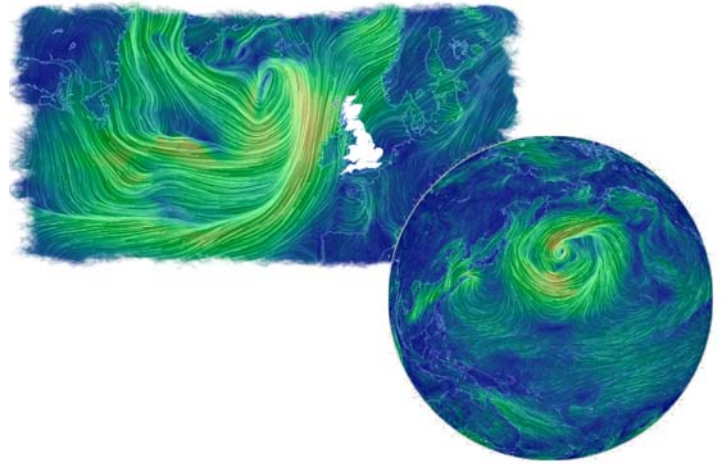


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## Today, Appearing Live at a Computer near You

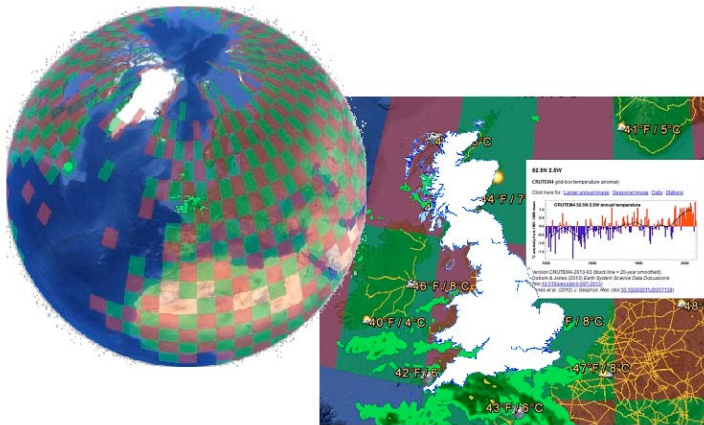
Watch the ocean currents using a new mapping system developed by Cameron Beccario

The turbulence is situated to the west of the UK. Apparently, the map “relies on data compiled by NOAA's Global Forecast System to update its global wind patterns every three hours, and OSCAR Earth and Space Research to update its ocean surface current patterns every five days.”



## Access Cru Data

This web application is viewable via Google Earth, activated by a KLM file providing access to current weather patterns and, by clicking on an area of interest, the CRUTEM4 grid box temperature anomaly data relating to a baseline set by the 1961-1990 averages.



What are we seeing at Climate Central, right? Most of the pictures tell a similar story. El Nino is dissipating as it travels eastwards towards the UK, and the Jet Stream is carrying yet another water laden stream with it. The whole thing is reflected in the ocean currents and Google shows us what is happening today. A brief calm before yet more rainfall as we view the screens today – 18<sup>th</sup> February, 2014.

