

# The Clay Research Group

---

## 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



May 2014  
Edition 108

# The Clay Research Group

---

## CONTENTS

Issue 108, May, 2014

**Page 1**

Aston, Root zones and Skype

**Page 2**

Geology & Risk within the M25

**Page 3 & 4**

Modelled Root Overlap Zones

**Page 5 & 6**

System Driven Cause Locator  
Proposals & Problems

**Page 7 & 8**

Weather Updates, El Nino and SMD

**Page 9 & 11**

Francis Maude, Systems, BIMs and IBs.

## “The doctor will see you now ... on your smartphone screen”

The Times, April 29<sup>th</sup>, 2014

Continuing the exploration of where technology might lead we see that doctors are now willing to diagnose routine medical problems over the web – see Page 7. And why not? Anyone who watches Embarrassing Bodies on television will see where the idea came from.

Surely surveying a damaged building using a smartphone can't be that difficult? Directing site investigations from the armchair, arranging monitoring etc. BIMs and IBs might make it all even easier.

## Aston Update

Paul Stanley from 360Globalnet is presenting new technology at Aston – an amended program will follow shortly. The talk, entitled "The Black Box for Subsidence", includes a demonstration of how live streaming video technology is the next "new frontier"

The day covers all of the varied elements of subsidence claims handling and we look forward to seeing you there.

## Modelled Root Overlap Zones

This month we look at modelled root zones with the usual caveats in mind (i.e. species, age and health unknown) to see if there is any link between risk and the estimated percentage that the root zone overlaps the building footprint.

Taking samples of claims and relating them to the population, we see that the smaller the overlap, the higher the risk when expressed as both frequency and count.

Why would this be? Next month we visit the site courtesy of Google Street View to see if there is a possible explanation.

## BIMs and IBs

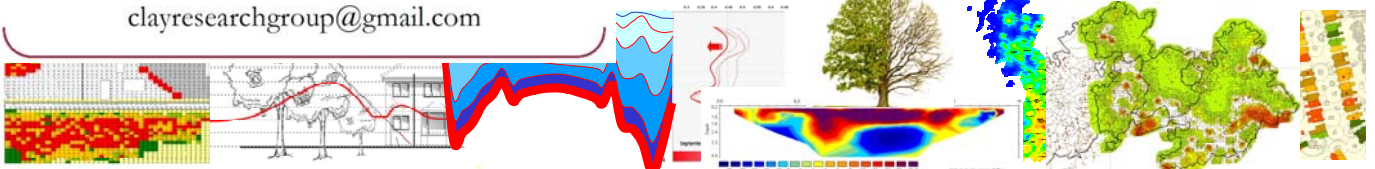
We take a tongue in cheek look at BIMs and IBs to see if they have any relevance to our world of domestic subsidence.

Merged with intelligent systems that are the current focus of our work, we think there may be some synergy.

THE CLAY RESEARCH GROUP

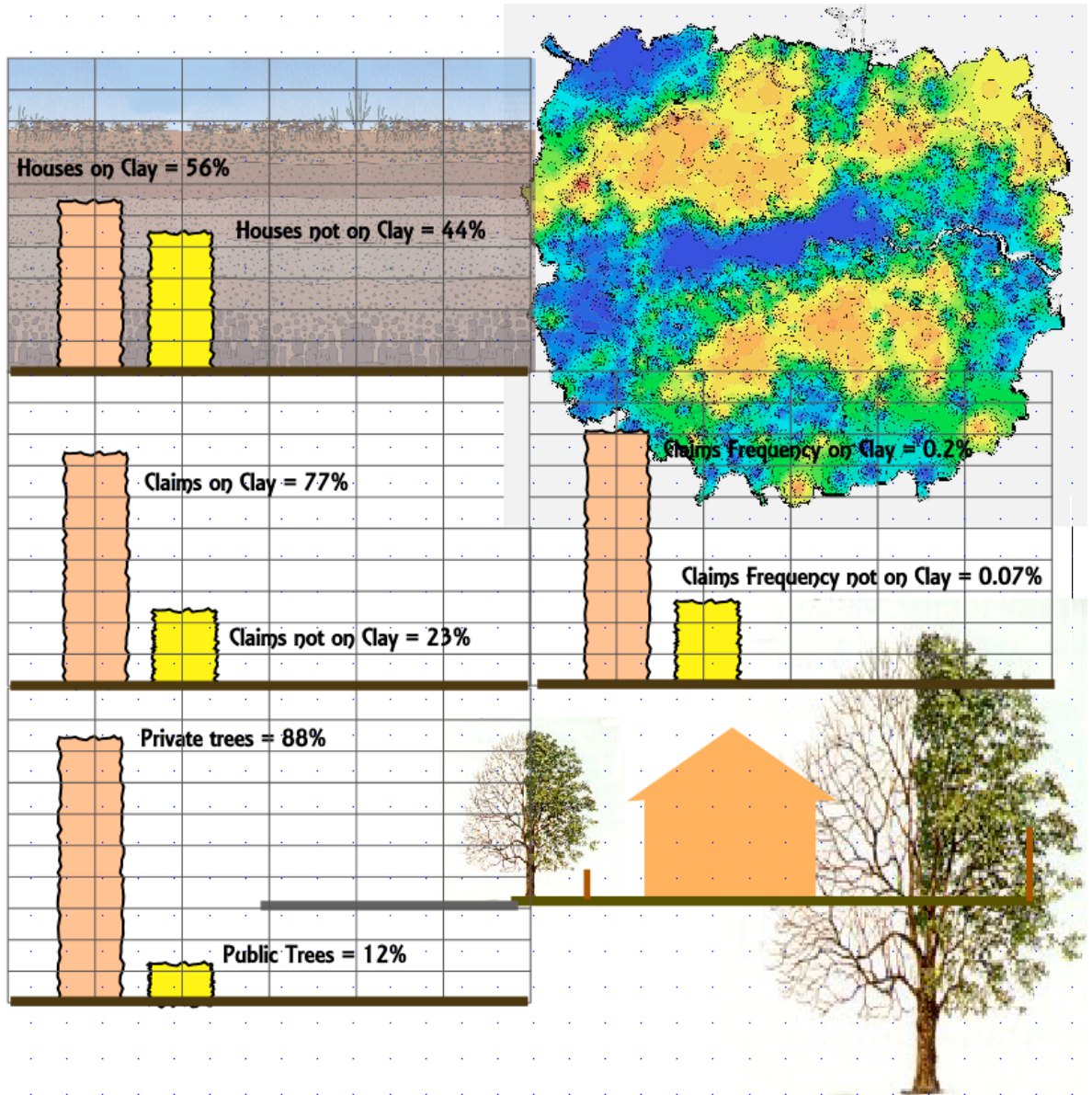
[www.theclayresearchgroup.org](http://www.theclayresearchgroup.org)

[clayresearchgroup@gmail.com](mailto:clayresearchgroup@gmail.com)



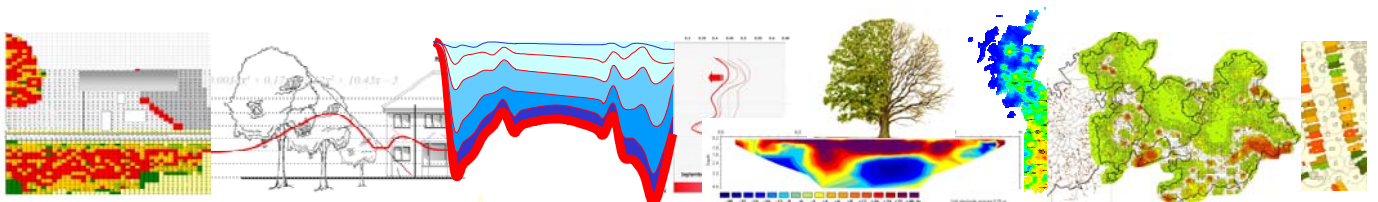
# The Clay Research Group

## Relative Risk of Clay Soils in terms of Subsidence within the M25



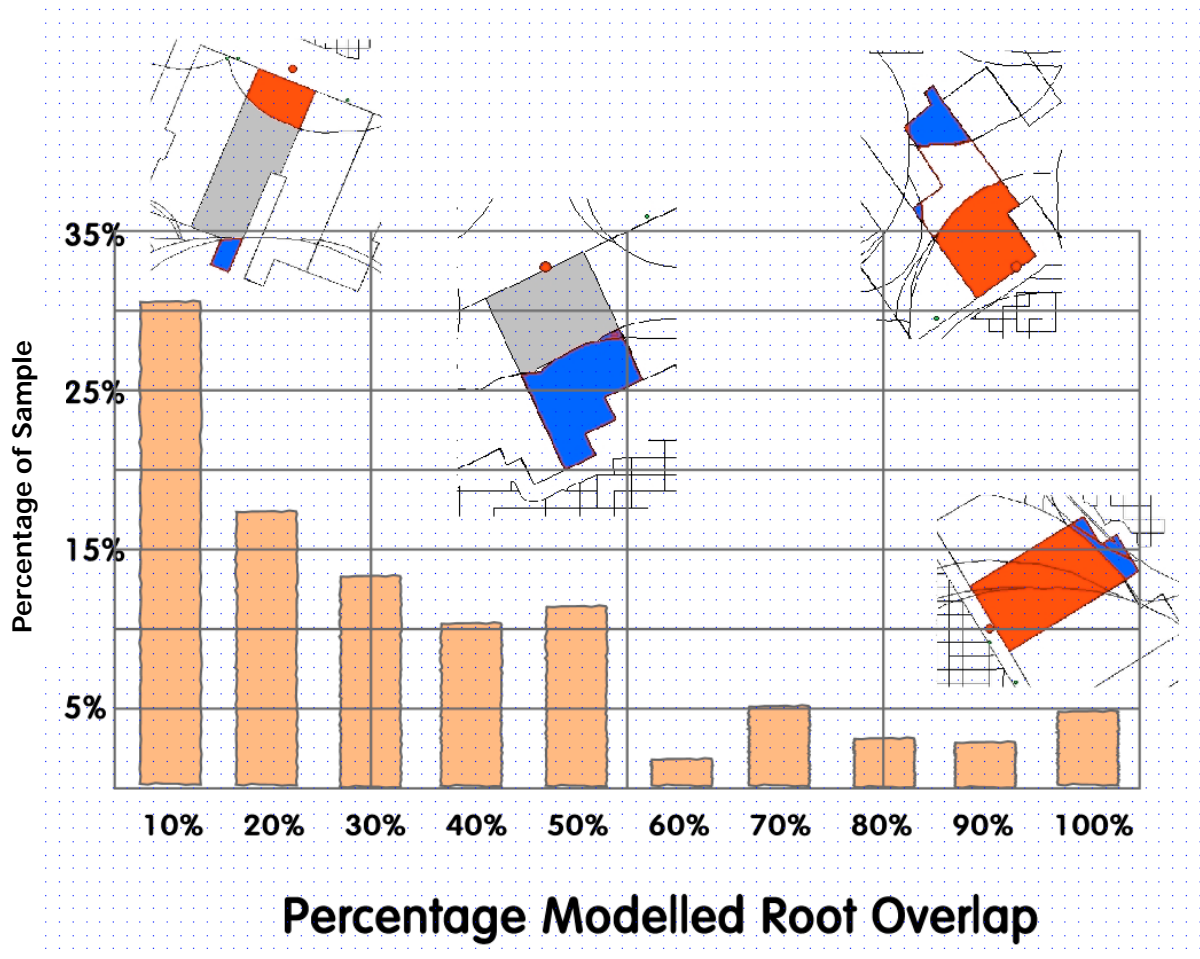
Top (Fig 1) records that around 56% of the housing population within the M25 is on a clay soil. The disproportionate risk posed by the geology is confirmed by the fact that 77% of claims from our data sample are related to clay shrinkage.

This delivers claims frequencies as follows. For properties on clay soil the claim frequency is 0.2% whereas the claim frequency for properties on 'other' soils is 0.07%. In this area, clay soil is 3 times riskier, which accords with our earlier studies.



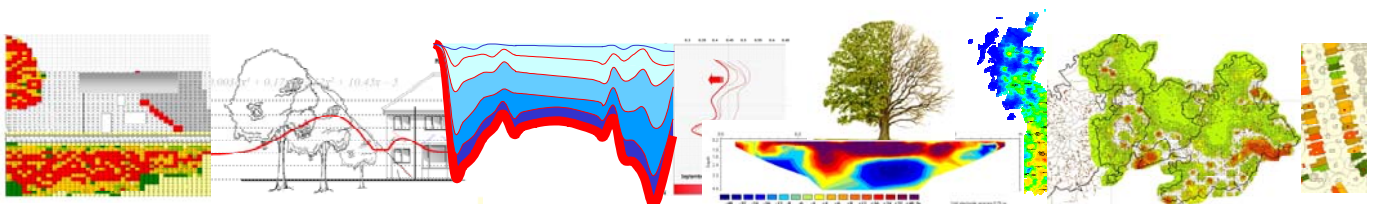
# The Clay Research Group

## Modelled Root Overlap Zones and Risk - 1



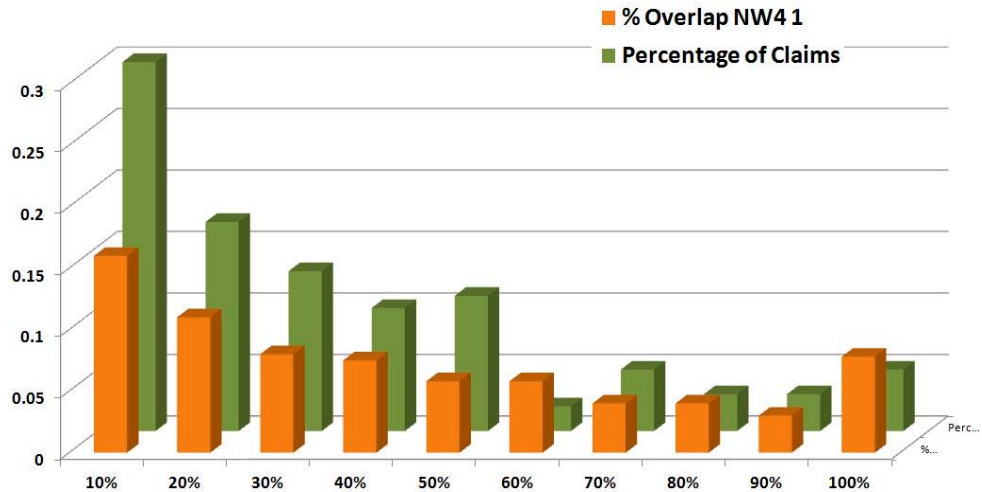
The above data has been taken from a sample of around 214 claims where the cause of damage has been confirmed as root induced clay shrinkage. Each of the properties has been assessed using the model. The zone of root encroachment has been estimated in terms of which tree was involved. For example, where there are root zones to the front and rear, but the damage is described as being to the front bay window, only the front zone has been considered.

The graph shows the number of instances each class of root overlap has been implicated. For example, it can be seen that a modelled overlap of 10% is the most commonly encountered (in terms of count, and not frequency) accounting for 28% of the entire sample - see following page for comparison with the population.



# The Clay Research Group

## Modelled Root Overlap Zones and Risk - 2

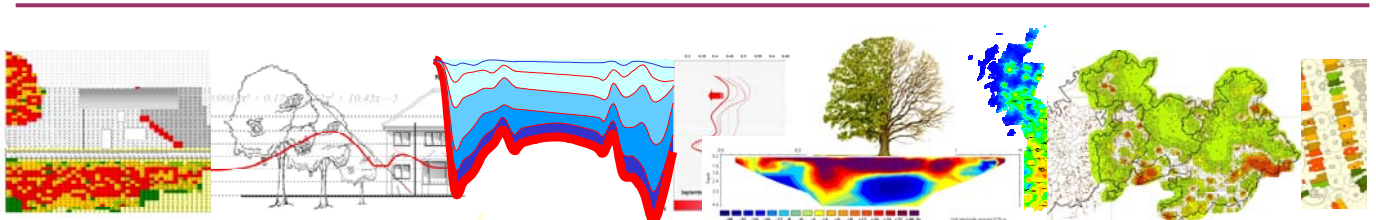


Graph comparing the modelled root overlap zones for (a) the tree population in a high risk postcode – NW4 - with (b) a selection of 214 claims where tree roots have been proven to be the cause of damage. The claims are a sample from across the London area, within the M25. They are not from within the postcode.

The purpose of the exercise is to see if, from the sample, there are any distinguishing patterns. The 'x' axis plots ranges of overlap zones beneath buildings for both samples. The 'y' axis plots the percentage within each group. For example, 15% of the tree population in NW4 has a root zone covering 10% of the building footprint, whereas 30% of the claim population falls in this range, suggesting this to be a high-risk category.

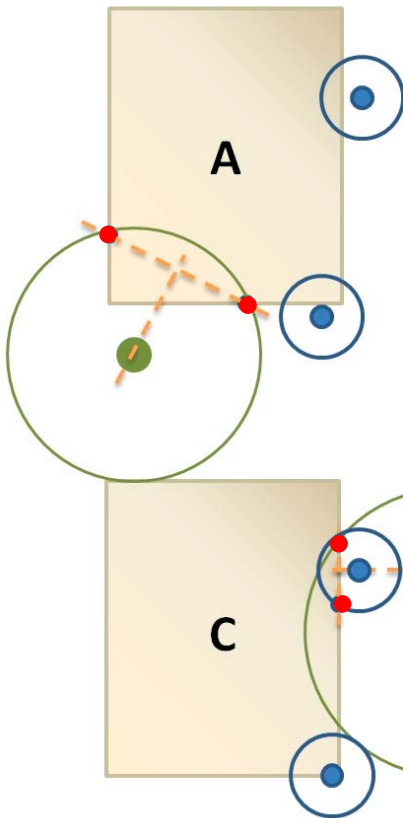
Perhaps the '10% overlap' is linked to the conifer? A tree often planted close to houses acting as a screen or delineating a boundary, and a high-risk species in terms of count. There could also be a contribution from the peripheral zone of the Oak tree and other high risk species.

In contrast, in the category with a modelled 100% root overlap the risk reduces significantly. In general, the two profiles follow one another as might be expected, and there is no doubt that species and metrics (height and distance) would refine the model considerably. 25% of the houses in this postcode fall outside the root zone of trees above 4mtrs high.



# The Clay Research Group

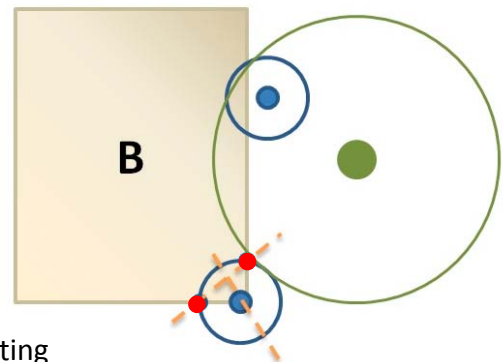
## System Driven Cause Locator



Ordnance Survey scale mapping is the foundation layer to the development of a system driven cause locator.

Using the maps as a background, the user drags and drops tree and drain symbols as shown in the pictures. Each has a radius determined by claims experience, but that radius is dynamic and can be expanded or contracted by the user.

The base of any crack is plotted by extending it down to ground level (indicated by the red dots) and the circles dynamically re-sized to coincide, as closely as possible, with them.

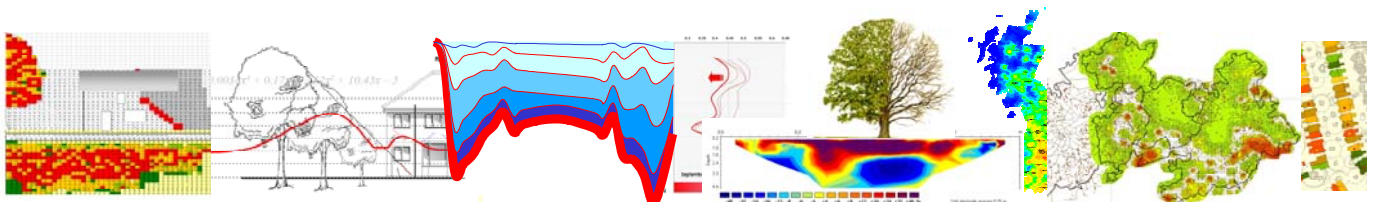
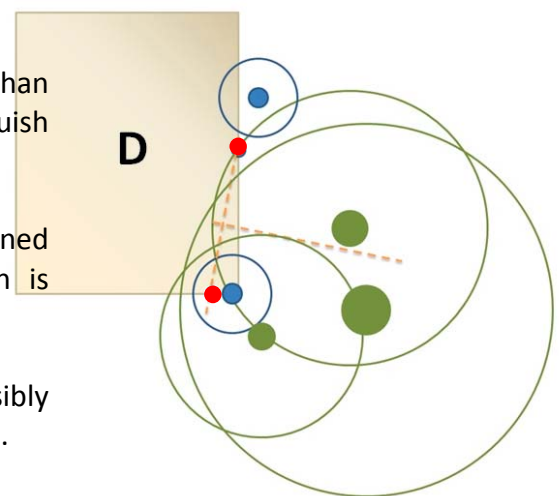


By drawing a perpendicular to the line connecting these red circles, the system identifies the most likely cause, ascribing a probability to each where there are several.

Alternatively, and where that probability is lower than say 0.6, and the variance isn't sufficient to distinguish clearly, the system triggers a suitable alert.

Of course, the chances of seeing such clearly defined and equally balanced patterns is unlikely, which is where the learning module comes in.

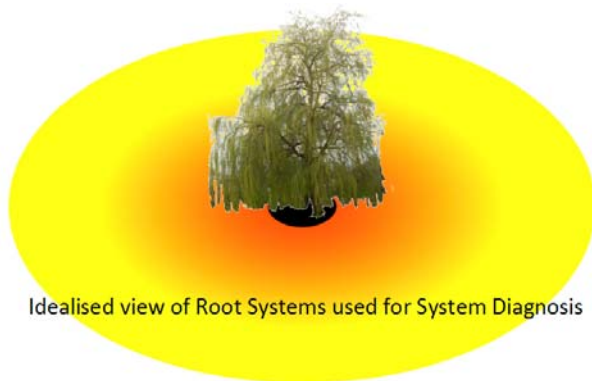
More about this in future editions. What could possibly go wrong? See the following page for a more details.



# The Clay Research Group

## Drawbacks to System Modelling.

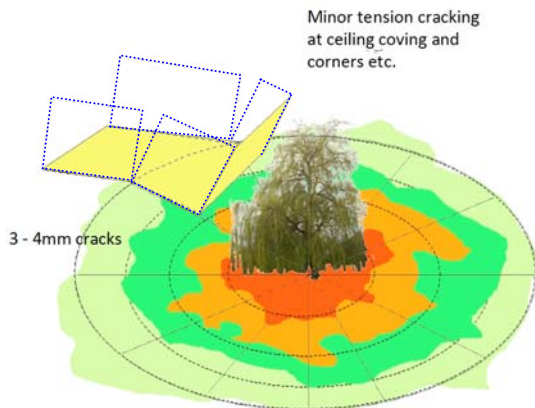
System diagnosis would be fine if roots, soils and buildings were uniform, but they aren't of course.



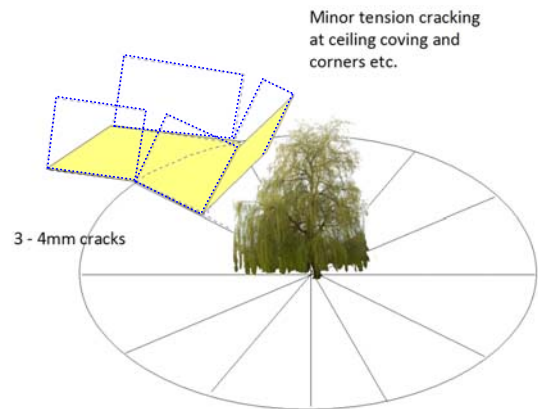
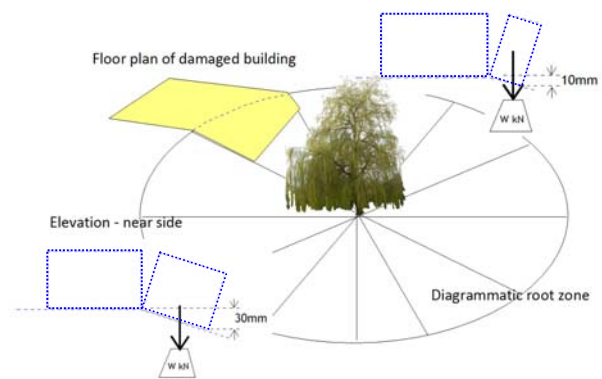
Idealised view of Root Systems used for System Diagnosis

If we place a building onto the periphery of a root zone and model in three dimensions the variability makes coding more difficult.

Root zones vary considerably, as does soil mineralogy and moisture distribution. The 'real life' picture is far more likely to look something like the image below.

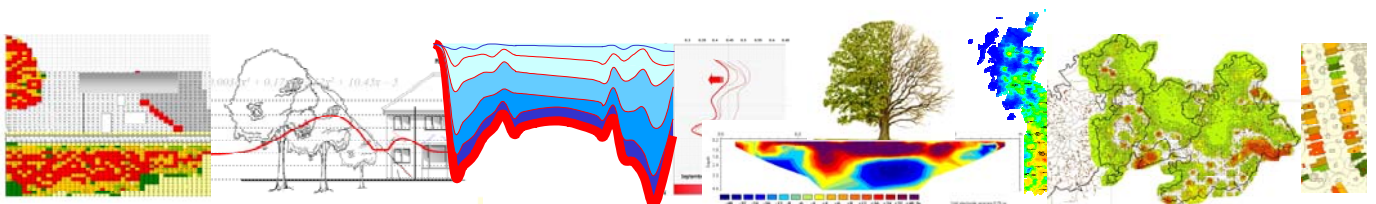


Another element to consider is the building's response to non-uniform stresses. A computer model handles in-plane stresses easily enough, but we often see (but rarely take account of) torsion introduced by the three dimensional nature of the building and the nature of the ground movement.



By assembling the in-plane forces (top) and then constructing a three dimensional model (bottom) we see the complexity and how torsion can influence the building's response to movement.

In summary, we have a better understanding of the problem but the solution could be a little way off.

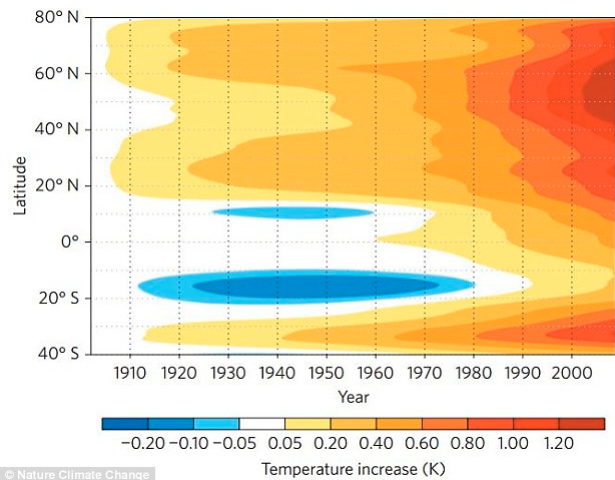


# The Clay Research Group

## Uneven Global Warming

Zhaohua Wu, an assistant professor of meteorology at Florida State University, has been studying the distribution of temperature change around the globe, and finds that whilst most of the world is indeed getting warmer, the change is uneven. In some areas, cooling had actually occurred.

This graphic shows how temperatures have changed from 1910-2000 over different latitudes. “Global warming was not as understood as we thought”, said Wu.



*Warming first started around the Arctic and subtropical regions in both hemispheres. The largest accumulated warming to date is at the northern midlatitudes.*

## This year's El Niño could be one of the strongest yet

A spike in Pacific Ocean sea temperatures and the rapid movement of warm water eastwards have increased fears that 2014 may deliver a particularly strong El Niño

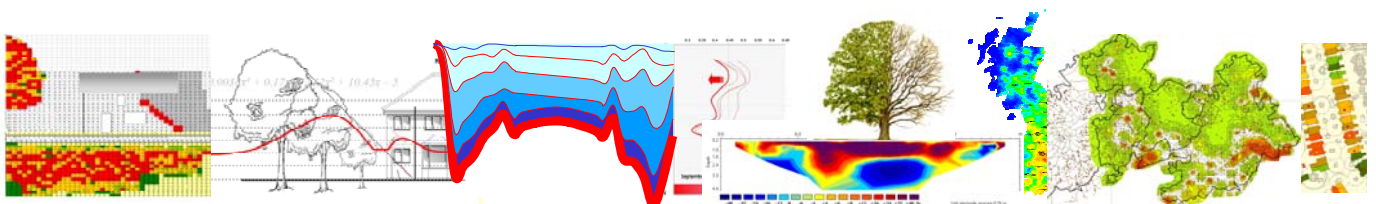
El Niño - a warming of sea-surface temperatures in the Pacific - affects wind patterns and can trigger both floods and drought in different parts of the globe.

Although previous research has suggested extreme El Niño events could occur later this year, experts claim this recent rise hints they are likely to be more significant than first thought. Dr Wenju Cai, a climate expert at Australia's Commonwealth Scientific and Industrial Research Organisation, said the rises in Pacific Ocean temperature were above those seen in previous El Niño years.

‘I think this event has lots of characteristics with a strong El Niño,’ said Cai.

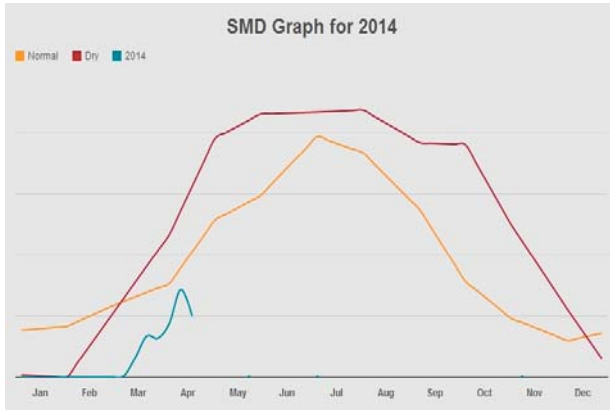
He based his conclusions on studying data released by the U.S. National Oceanic and Atmospheric Administration.

See Edition 106 of the CRG newsletter for more information on the link between El Niño and subsidence surge years.





# The Clay Research Group



## UK Meteorological Office Soil Moisture Deficit Data

No suggestion of a moisture deficit so far this year, and given the rainfall data below, this is no surprise.

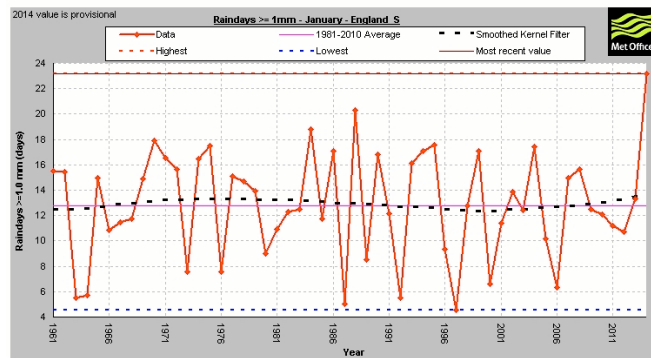
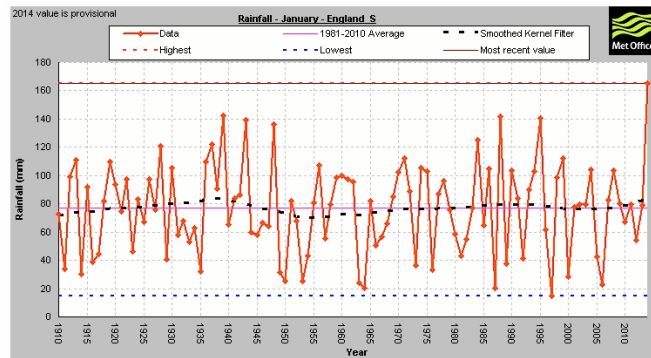
The probability of a surge is low at the moment.

## UK Meteorological Office Rainfall Data

The Met Office carries a wide variety of data on its web site, and here are the rainfall charts for January.

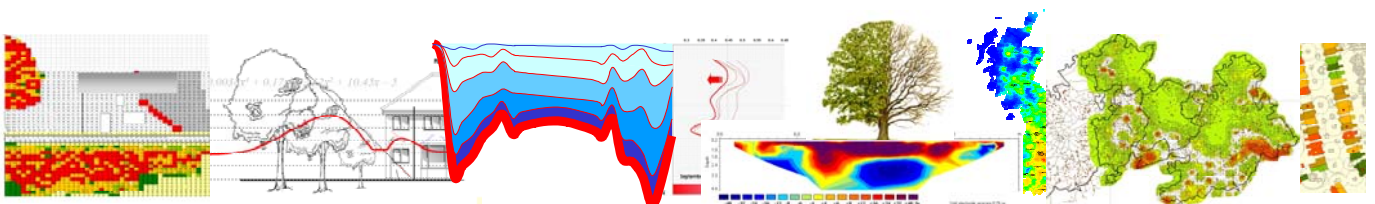
Top, the rainfall for January illustrates what we all thought. Record amount of rain, well above that recorded over the last 100 years.

Bottom, the 'days of rainfall' graph tells a similar story.



## Improved Predictions

Professor Scaife and his team at the Met Office have developed a model, tested on 20 years retrospective data, that hopes to improve the accuracy of weather predictions to around 62%, instead of 50% using current methodology. According to an article in The Times, Professor Scaife feels communicating to the public the intrinsic uncertainties associated with long-range forecasts, even when using the best available data and software, remains a challenge. "It's stupid saying a seasonal prediction of risk is wrong. It's like blaming Ladbrokes when the favourite doesn't win a horse race."



# The Clay Research Group

## Handling Claims with Less Fuss and More Care.

**SITE TECHNICIAN:** *“The homeowner is worried about cracks at the base of the wall. We have dug some holes as you directed, and retrieved some samples. The drains are leaking by the way. What should we do next?”*



iPhone Ian

Efficient data gathering, automated processes, making better use of telemetry and data analysis will remove much of the fuss associated with subsidence claims handling in the next ten years, and this will be driven by procurement – in our view. The outcome will be better service, less stress and improvements in standards.

Continuing our theme of wondering what the future might look like, we have to challenge the status quo and ask whether the overhead of handling the claim can be reduced hand in glove with improving service delivery. What does the homeowner really want?

Is it the case that they want constant phone calls every month, explaining that nothing much has happened but they will call again next month, or do they want action? Do they really look forward to that ‘personal touch’. Or do we follow the Sainsbury/Tesco/BP/NCP model of introducing card machines and auto-checkouts?

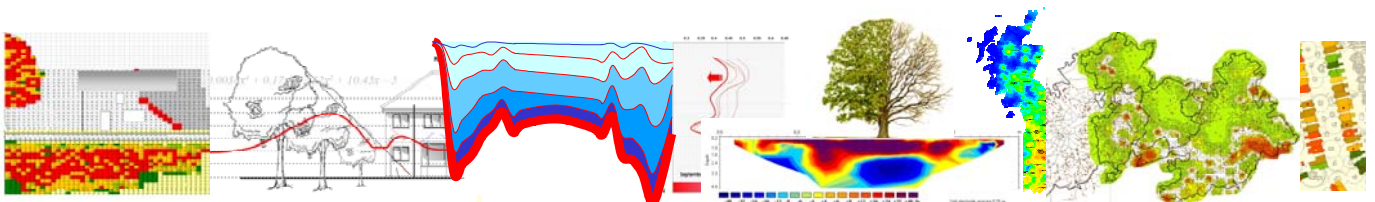
Perhaps people aren’t as enthralled as we think with taking time off work to greet strangers visiting their home at regular intervals. They might actually view it as intrusive and inconvenient.

**ENGINEER:** *Thank you. I’ve checked the policy. It’s a valid claim so can you arrange to repair the drains as quickly as possible please, and produce the quotation for superstructure repairs. I’ll discuss this with Mrs. Smith now.*

We are all for shortening the process and removing parts that add little. Very few repudiations are related to fraud. When we turn claims down, more often than not it is due to the damage being old. Not some cunning clause in the fine print of the policy. If we can find a way to identify the major causes of repudiations - historic movement, shrinkage and settlement – we could save millions in fees.



Ernie Engineer



# The Clay Research Group

---

## Francis Maude, Cabinet Minister

The headline from Francis Maude read as follows. “If a service can be delivered online, then it should only be delivered online”.

He believes that the cost of online delivery will save around 50% of the cost when compared with face-to-face meetings. He feels that service will be “faster, simpler and more convenient”.

In the same newspaper we see this philosophy being extended to the most complex of areas – medicine.

Patients fed up with calling the surgery, trooping along, waiting in a queue and then disclosing all to another human being, face to face, now have an option. For £7.99 a month, they can access an app called Babylon that will connect them to a doctor between the hours of 8am – 8pm.

Simply select the “I want an appointment” button, and you will receive a text message along the lines of “please connect to Dr. Smith in 10 minutes time using your Skype authentication code”. Upload some pictures, type in your symptoms, and job done.

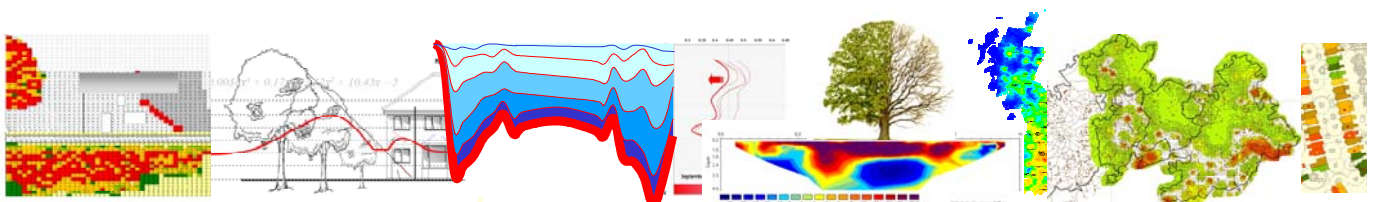
Is subsidence really too complex to follow this pattern? Are homeowners really keen to take half a day off work to point out the damage, and then perhaps take yet more time off as they wait for strangers to drop by and monitor their home, dig holes, sink bores and test soils?

Or would they prefer a remote assessment? Take some digital images, upload them and then have a 15 minute conversation using Skype to agree the best way forward perhaps?

No doubt there will be cries of “some people don’t like technology”. Of course. This is where having a choice adds to the offering. For those homeowners who do like it, they should have an option. Katherine Murphy, Chief Executive of the Patients Association apparently feels the app is a great advance in technology and warned that the NHS could not afford to be left behind.

Can we?

*“This Governments four year strategy for BIM implementation will change the dynamics and behaviours of the construction industry supply chain”.*



# The Clay Research Group

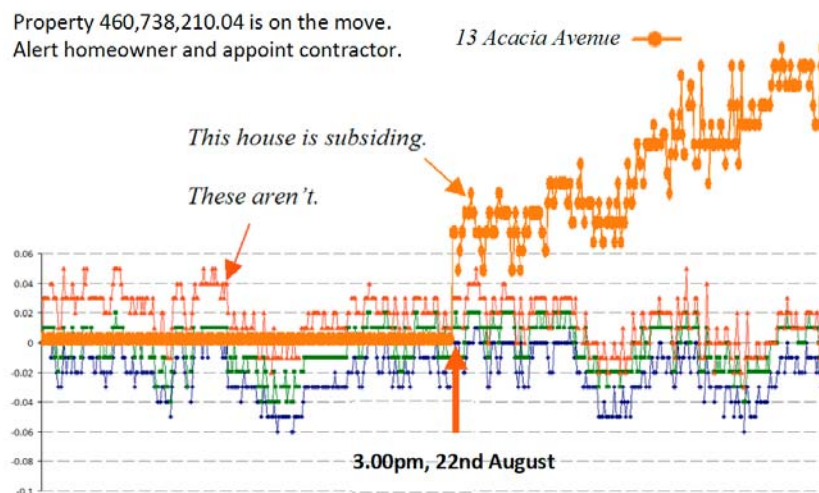
---

## BIMs (Building Information Modelling) and IBs (Intelligent Buildings)

Future buildings will have to cater for a much more demanding occupier. Energy efficiency, security, fire alarms and temperature regulation plus a host of environmental measures in addition to the existing broadband array of telephones, smart phones and televisions etc.

Will telemetry play an increasingly important role, as predicted by some experts in the insurance press?

For our (the subsidence industry) part we can see how this might be achieved. Small tilt sensors installed at each corner of the main house, and perhaps bay windows, porches and so forth, could relay data to a server for automated analysis easily enough.



Plotting movement ‘by exception’ could trigger preventative action before damage appeared. Imagine the discussion with the homeowner living at the home where Sensor 460,738,210.04 was located. “Cracks will be appearing above the side door of your home at 3.00pm on Thursday the 22<sup>nd</sup> August, but not to worry, our team will be with you on the 24<sup>th</sup> to install the Intervention Technique”.

When asked what the Intervention Technique was, insurers would send them a DVD of the July, 2025 edition of the Sarah Beeny program from Channel 4, “Your house hasn’t got cracks because ...”. Insurers adopting this strategy would win awards at the annual innovation show, funded by the “InterTeQ installer of the Year” contractor.

It could happen. Watch it live on Skype when it does.

