

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



June 2014

Edition 109

The Clay Research Group

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Research News

Aston Subsidence Conference

We are looking forward to the conference this year. Attendees will have the opportunity of catching up with the latest news and developments in case law, but also the growing use and value of analytics in our industry. We will see and how they are being used by companies to improve their performance and in some cases, change the way service is delivered.

Understanding ‘how many of what sort’, ‘when’ and ‘where’ is central to what we do. Without some record, every claim is a surprise. The use of so-called Big Data helps us to understand what we do, and drives improvement.

Tony Boobier sets the scene when he tells us about his unique experience spanning subsidence handling at all levels and managing analytics for the insurance division at IBM.

Later in the day, Paul Stanley reveals how he uses new technology to speed up the claims process. Removing touches and providing the insured with options on service delivery by using live streaming and a ‘self-serve’ option. What tools are available and how might they be used to drive down cost and speed claim settlements?

Tom Clinton and Steve Plante will be providing updates on current research and explaining their objective - to reduce the trauma of subsidence.

Measuring the success or otherwise of these developments is essential, which leads us back to the use of analytics. Richard keeps the whole thing together ensuring the day runs smoothly, concluding by talking about the state of adjusting.

Find out how things are changing by attending the subsidence conference at Aston.

Aston - 10th Anniversary

It is the 10th anniversary of the Aston Subsidence Conference and previous topics are reviewed in this edition.

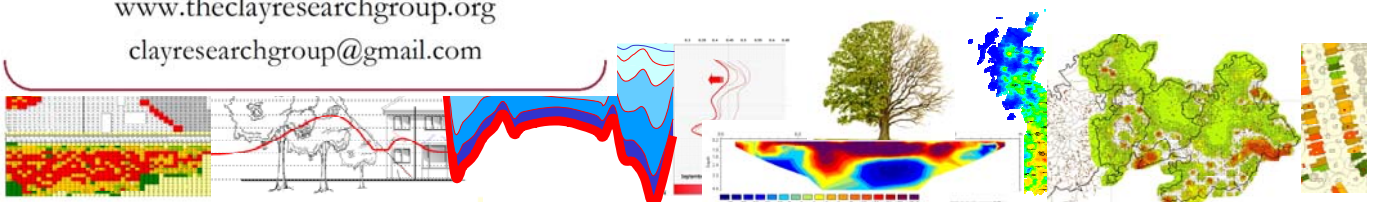
A recurring theme has been the marriage between technology and service. Does one really exclude the other? How can they best be combined to improve our expertise, speed up the claims process and ensure high levels of satisfaction for everyone concerned?

This year continues the theme and we hear how technology and research is reinforcing service delivery.

THE CLAY RESEARCH GROUP

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This is the 10th Anniversary of the Aston Subsidence Conference and a review of past programs helps to describe its objective.

In 2004, Richard Driscoll chaired the day and spoke about the need for data and pondered the benefit of 30 years of research, reflecting on the work of the Building Research Department in his time as Head of Foundation Research.

Giles Biddle spoke about “Mitigation, Education and Investigation”. He wondered about the benefit of soils investigations and said “In the vast majority of cases all other investigations (trial pits, boreholes, soil analysis) are unnecessary. They are usually a complete waste of money, and, worst still, a distraction and cause of delay.”

Both talks are as relevant today as they were ten years ago.

In 2005 we heard from the insurance claims and adjusting community, including John Parvin, Robert Sharpe, Gary Strong and Nigel Barham.

Nigel’s talk was entitled “Startreck - the next frontier”. Robert spoke about “Global Warming – Modelling the Effects and Discussing the Implications”

Again, topics as relevant today as then and a recurring theme over 10 years.

Hilary Skinner from the BRE gave a talk on the CRG proposal to explore electrokinesis osmosis (EKO), something that has been threatening for years and an area that is only recently reaching fruition thanks to the efforts of Tom Clinton, John Peterson (Foundation Piling) and Dr Ian Jefferson (Birmingham University).

In 2006, Gary was joined by Jill Hunt from Lloyds TSB when they asked if there was room for both service and technology.

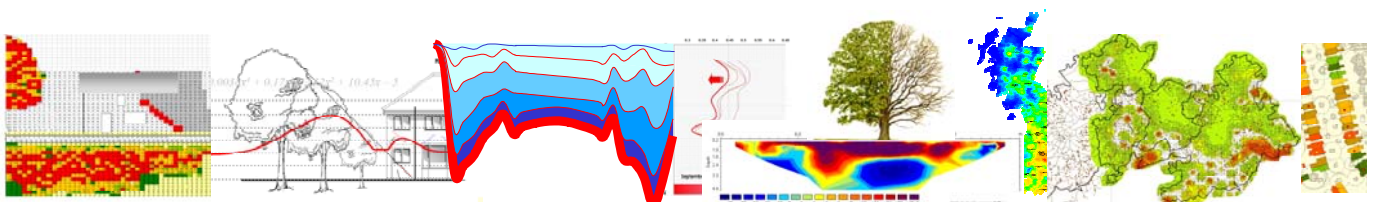
Tim Freeman reinforced the views expressed earlier by Giles when he promoted the use of precise levels. Tim’s background working at the BRE led him to the view that they are the most useful of tools to diagnose subsidence. Tim is the author of “House your House got Cracks?”.

Nigel Cassidy from Keele University reviewed alternative techniques of sub-soil investigation including ground imaging and electrical resistivity – something the Glenda Jones, the PhD student from Keele, spoke about at a later conference.

Malcolm Cooper provided an underwriters view of subsidence. Not the most costly of perils, but capable of delivering a nasty surprise.

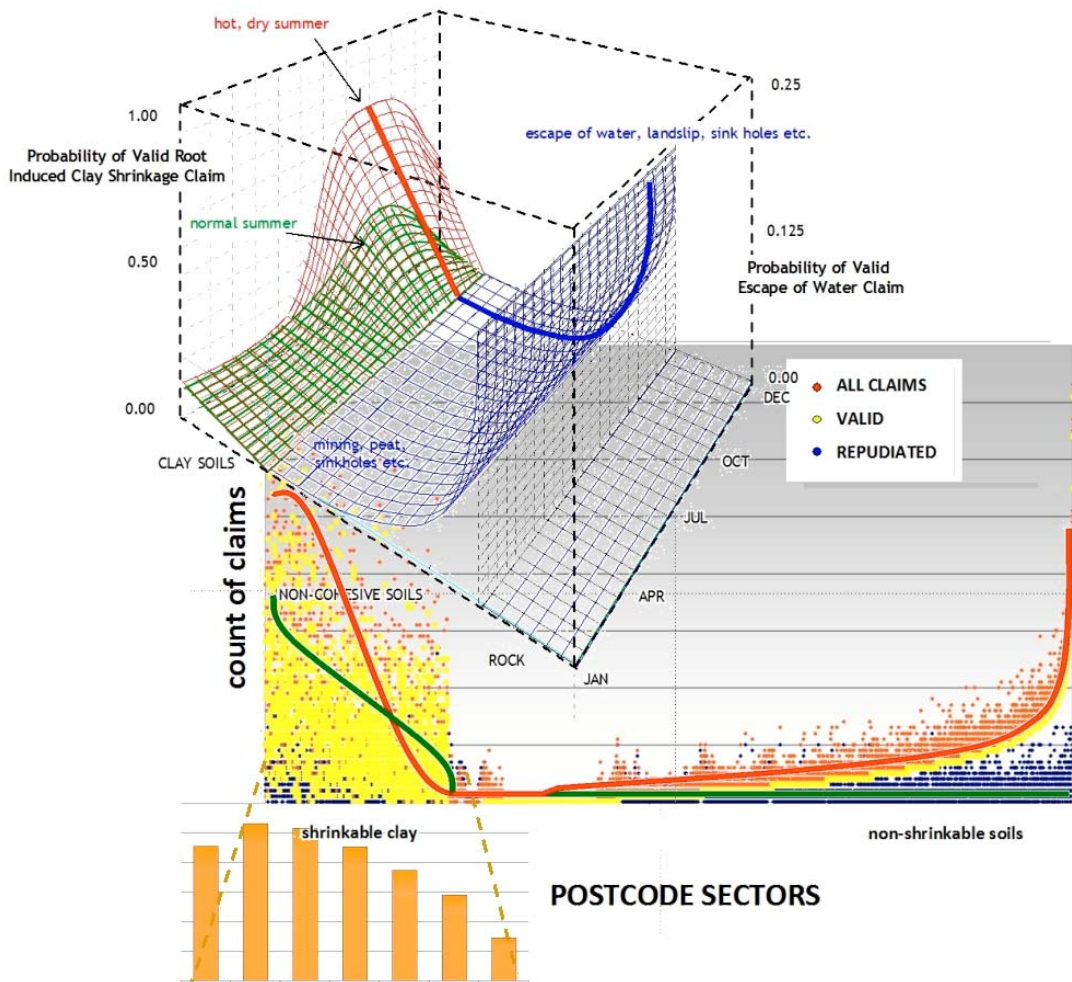
In 2011 we heard from four of the major practitioners in the arboricultural world. Giles spoke again, but this time proposing “A Realistic General Protocol for Investigation of Tree-Related Subsidence”. Mike Lawson talked about “Planning for City Trees – Putting Subsidence in Context”. Peter Osborne mischievously posed, “Councils – the root of the problem?” and finally Paul Thompson delivered a thought provoking video entitled “Mitigating the Environmental Impacts of Building Subsidence”.

Mike Lawson spoke again in 2012. “An Analysis of Clay Soil, Climate and Plant Interaction as this Relates to Claim Numbers 1975-2011”. Other speakers included Paul Harris and Maciek Kawecki. Many more speakers on a wide range of topics, but we see the theme



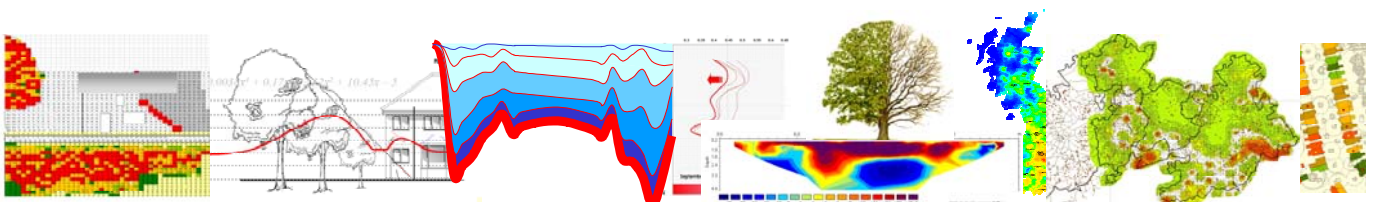
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Intelligent Systems - Analytics



The industry has dealt with over one-and-a-half million subsidence claims over the last 50 years. We have a reasonable understanding of the risk posed by the geology, the interaction between clay soils and vegetation, drains and non-cohesive soils, age of house and so forth. In this and subsequent editions we look at those relationships with a view to developing systems to assist practitioners and improve the business process.

The above illustration contains some of the modules we will be examining in future editions. Spatial distribution of claims, their periodic signature (where it exists) and how we might build a series of intelligent modules that learn from their experience.



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Surveys using Google Tablets and Apple iPhones

In Issues 105 and 107 we looked at developments in surveying. LiDAR cameras fixed to wobbly springs that took millions of readings and allowed the surveyor to carry out a detailed survey of the Leaning Tower of Pisa in about 20 minutes.

How far off are we from being able to plug into this technology? A browse of the web revealed that Apple had already lodged a patent application to incorporate this into its iPhone using what they call iBeacon technology.

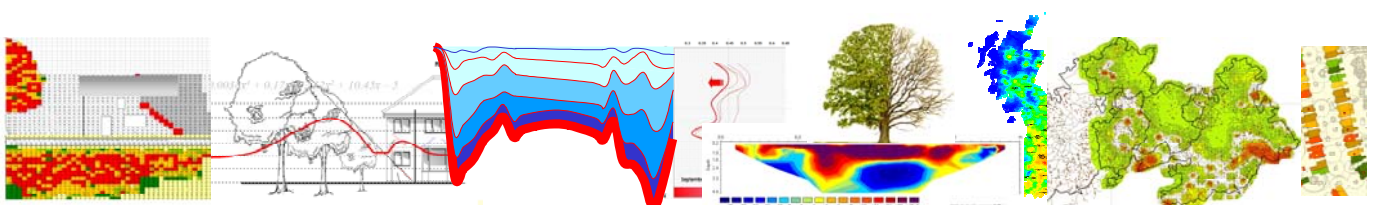
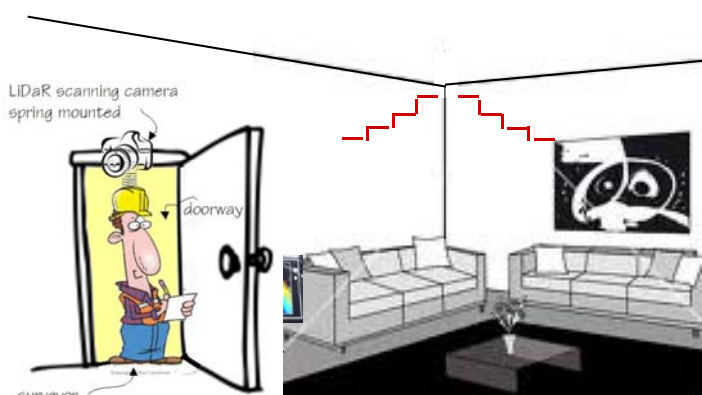
This was only a few months ago.

Such is the excitement amongst the larger technology companies that they may have found a route into the domestic subsidence market (yes, we do have our tongue in our cheek), Google have reported that they will be offering a tablet that can measure rooms and build 3D maps under their “Project Tango”. The cost is likely to be around £600 and 4,000 beta test kits will be available in the next month or so.

£600 isn’t expensive when we consider the value in time saving alone for the busy surveyor plus the accuracy it delivers. Having a base map that can be digitally shared by all – homeowner, insurer, repair contractor etc. – is a huge step forward.

The press release explains “the device maps the world in 3D through the use of two cameras, one on the front that can see 120 degrees, and a 4MP camera on the rear. A motion tracking camera on the back also helps the mapping process, in addition to an integrated depth sensor. These sensors allow the phone to make over a quarter million 3D measurements every second, updating it’s position and orientation in real-time.”

This opens the door to the next generation of claims handling software. Instead of having a sketch pad with a hand-drawn map scanned into your system as a pdf file, we can start to think how we might automate more of the processes. As for service, fast, accurate surveys that lead to accurate diagnosis and improved pricing has to benefit everyone.



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Higher Temperatures = Fewer Claims

The temperature may have levelled out over the last 15 years or so, but where are the claims?

Bottom right, the trendline analysis reveals that since 2006 claim numbers have been reducing which may seem perverse. The industry was anticipating an increase.

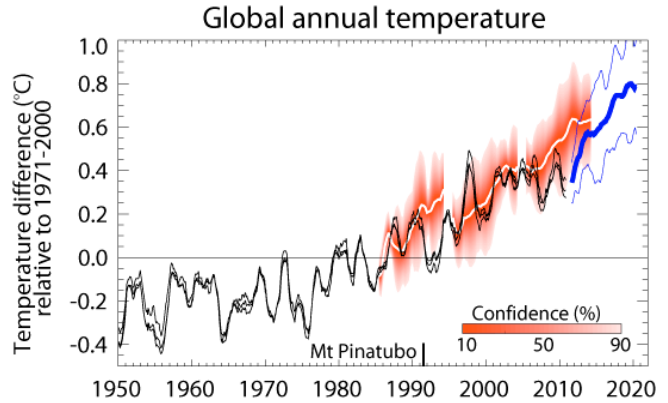
Although temperatures may have reached a temporary plateau, they are amongst the highest since records began and this period of apparent temperature stability contains some of the hottest years in recorded history.

The reason for the reduction in claims appears to be related to the associated increase in atmospheric humidity. The result has been a trend towards wetter summers.

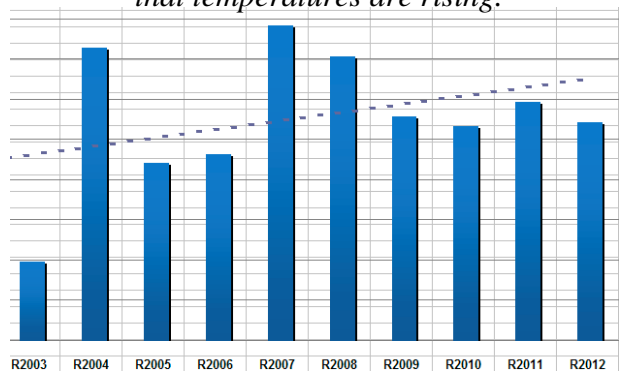
The figure, centre right, plots the total rainfall in July, August and September. It's little use summing rainfall throughout the winter when many trees are out of leaf. Here we have attempted to see what happens in the summer months using Met Office data gathered from their station at Heathrow.

See also editions 94 & 95 for rainfall analysis by Cyril Nazareth.

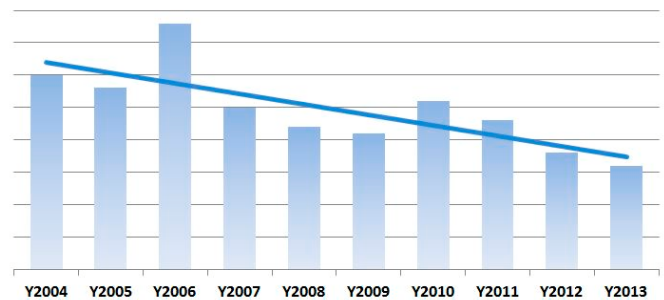
If this is the case, the hotter we get, the fewer claims the industry receives.



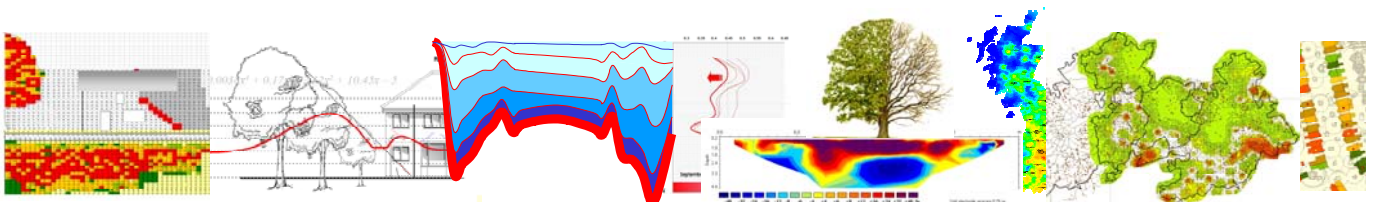
A range of temperature graphs exist but setting aside any dispute around causation, station variability and methodology, there is agreement that temperatures are rising.



Rainfall in the summer months of July, August and September showing an increasing trend.



Subsidence claim numbers from the ABI showing a diminishing trend over the 10 year period plotted.



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Claim Incidence - Conservatories

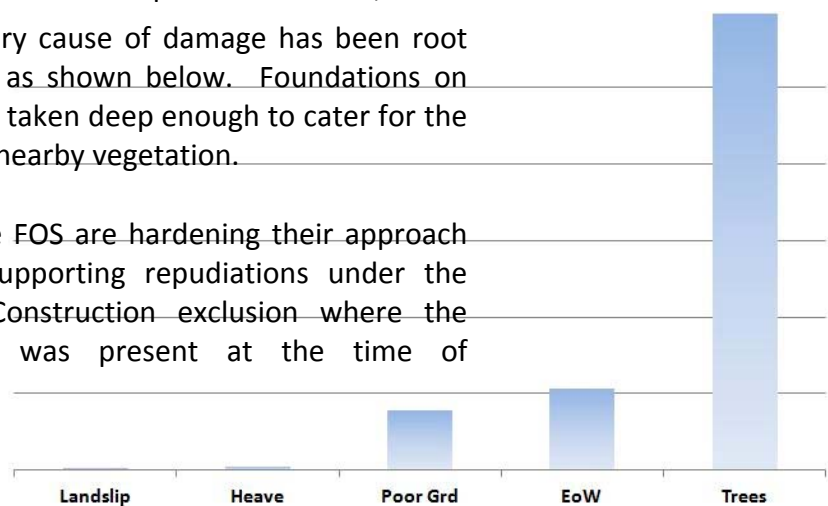
The number of valid subsidence claims relating to damaged conservatories is plotted below, by year of notification, rather than date of construction. Although subsidence claim numbers in general have been reducing over recent years, the percentage where conservatories are involved is rising steadily.



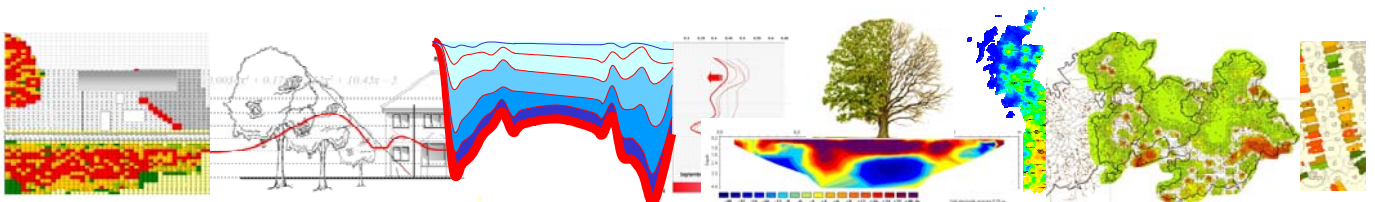
The data has been taken from a sample of around 36,000 valid claims.

Interestingly, the primary cause of damage has been root induced clay shrinkage as shown below. Foundations on clay soils have not been taken deep enough to cater for the influence of roots from nearby vegetation.

It also appears that the FOS are hardening their approach to such claims and supporting repudiations under the Defective Design or Construction exclusion where the implicated vegetation was present at the time of construction.



We would be interested to hear from anyone willing to share FOS decisions on this topic.



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Aerial Survey Update

Bluesky are updating their aerial survey of the UK.

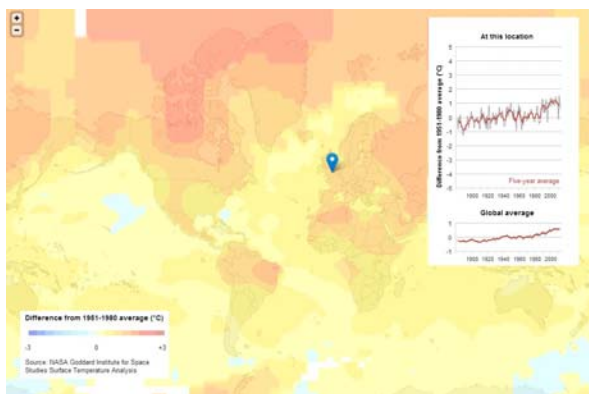
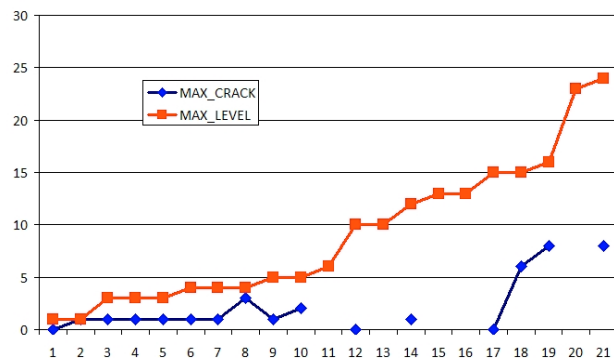
James Eddy, Technical Director of Bluesky International explains on their web site, “previous estimates of tree cover were around 10 per cent for England and 13 per cent for the UK as a whole,” commented

Bluesky completed the National tree Map in 2013. “It includes three individual map layers, detailing more than 280 million trees with a canopy cover in the region of 20,000 square kilometres.”
<http://www.bluesky-world.com/>

“Using our National Tree Map we have estimated this figure to be marginally higher at around 13.5 per cent for England and Wales.”

Levels –v- Cracks

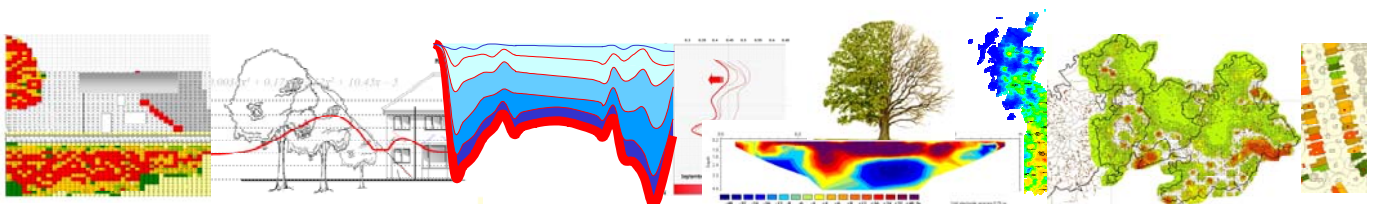
Plotting a small sample of crack and level readings undertaken by GeoServ (see right) reveals an apparent relationship. We are hopeful that Tim Freeman, their MD, will have time to plot data from his library of claims and provide a more detailed report to understand if the relationship is robust over a larger sample.



A Global View

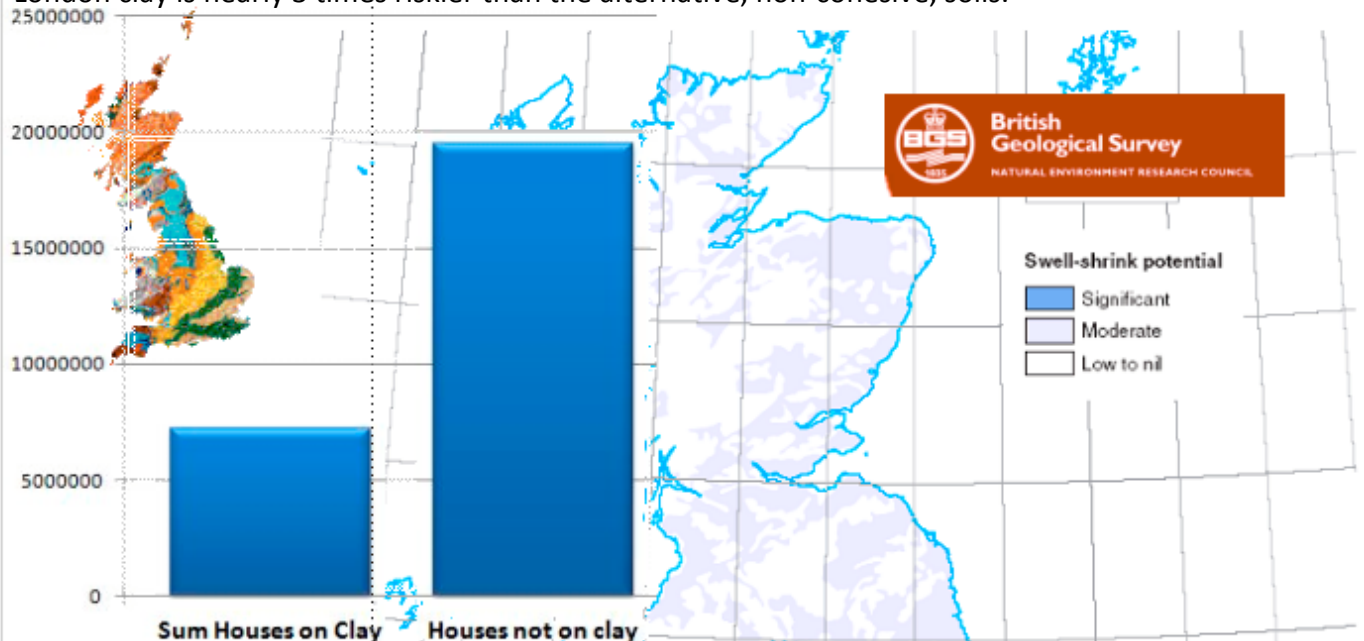
An application from New Scientist is well worth a look. Drag the blue marker to any part in the world, and the temperature line for the last 100 years appears in the top, right hand corner. See the variations around the world

<http://warmingworld.newscientistapps.com/>

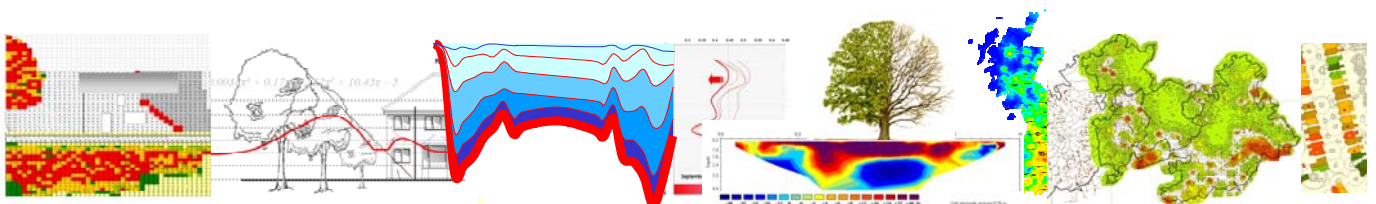
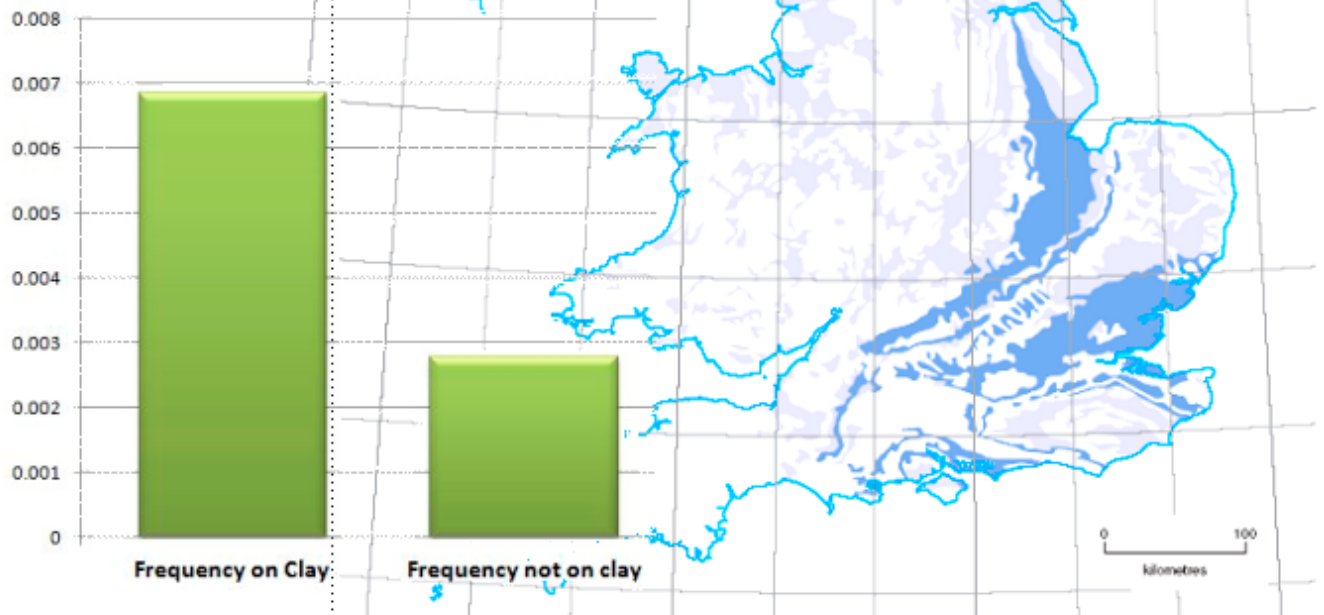


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In last months edition we saw that the frequency of valid claims relating to houses built on clay soil was 0.2% (for the sample we hold), compared with 0.07% for 'other' soil types, indicating that London clay is nearly 3 times riskier than the alternative, non-cohesive, soils.



Across the UK, the picture isn't very different. Although there are over 2.5 times the number of houses not built on clay soil than 'other' (mixtures of sands, gravels rock and so forth) the frequency of subsidence claims related to houses on clay soils is 2.5 times greater than houses built on these non-clay soils.



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Private Housing -v- Social Housing

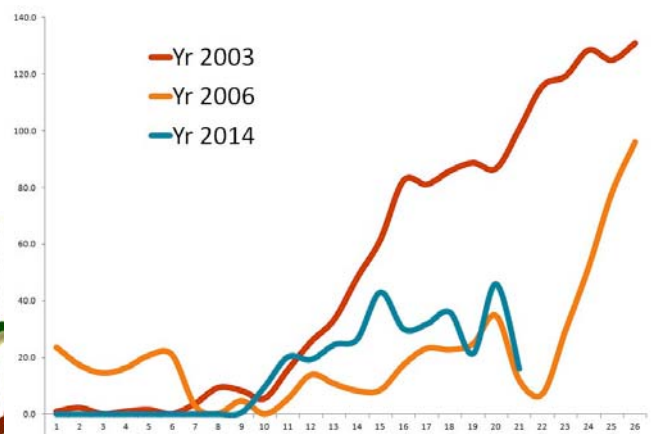
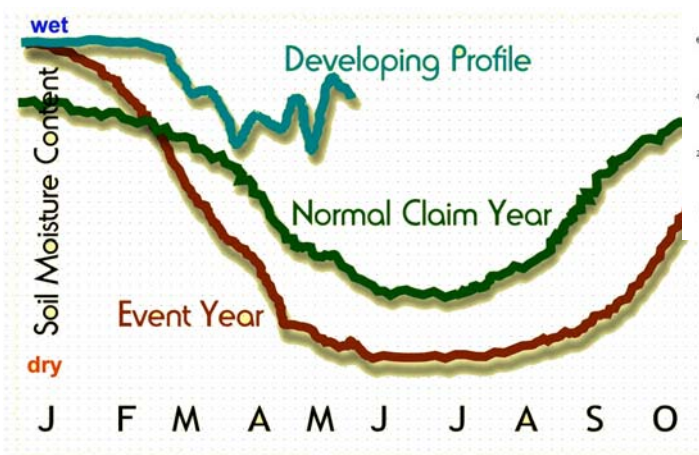
Using the same UK sample from the previous page, but excluding social and Local Authority housing, we see the risk to the insurer of private residential housing increases by just over 22% on 'other' soil types, and just under 26% for houses on clay.

This is because a frequency calculating including all houses, insured or not, distorts the risk factor significantly.

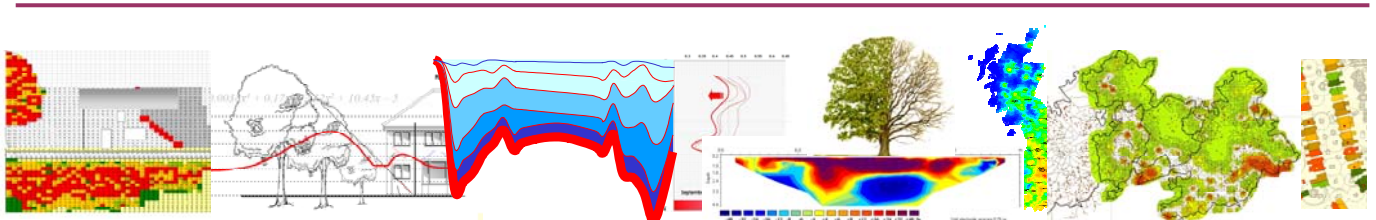
SMD Update

Data Courtesy of the Met Office

Soils in the south east are still quite wet (see below) and there is no suggestion yet of a surge year.



The caveat is shown above. 2006 started late and followed the current profile before rapid drying took place later in June to deliver high claim numbers.



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Constant Change and Development

The Aston Subsidence Conference has been running for 10 years in its present form. Earlier conferences were largely directed towards describing underpinning techniques, or the need for sleeving and anti-heave measures when piling.

If we cast our mind back to how things used to be, we can see just how much things have changed.

In the 1990 surge, an adjuster would make an initial inspection and report back to insurers using what was referred to as a Preliminary Advice. If the claim was likely to be valid, they would request permission to appoint an engineer.

The engineer would inspect, produce a report and pass it back to the adjuster who, in turn, would forward it on to the insurer with their comments on liability. Often they would be asking permission to undertake further investigations - trial holes and testing drains. Possibly sink boreholes.

Little industry data was available for the practitioners. The insurance claims handler would be working off the company mainframe. They would log policy details, claim validity and register payments, but they would have little objective idea of how adjusters and engineers were actually performing.

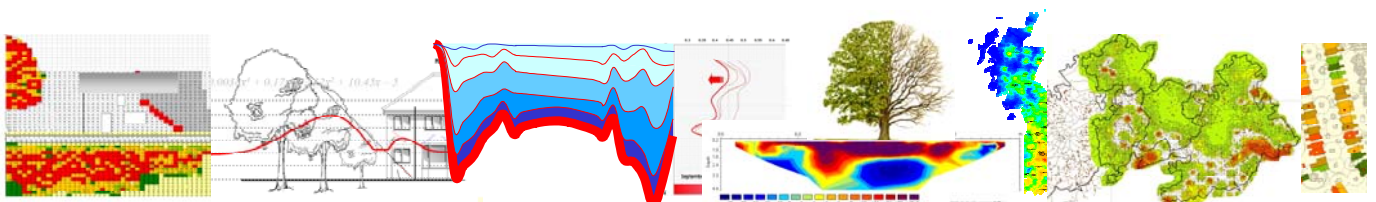
The absence of data also hampered the adjuster and engineers development.

The large number of subsidence claims notified in 1990 was a wake-up call to the industry and led to significant change. The roles of adjuster and engineer were merged over the next five to ten years and adjusting practices started to employ engineers and train them in policy interpretation and insurance law.

Claim departments and adjusting practices started to build their own computer application to measure performance and produce MI. This wasn't always a pleasant experience. Questions were asked – “why does ‘x’ engineer, living in a safer part of the country in terms of subsidence risk, underpin more properties than his or her counterpart living in a riskier part of the UK?” and “How do the spends compare?”.

These changes combined with the controls enabled by IT systems (together with the advantage offered by a VAT free service) led to the introduction of Delegated Authority. The adjuster/engineer no longer had to refer back to the insurer for instructions at every stage. They could take decisions. Decisions that would be measured by all parties to provide a degree of comfort and speed the claims process.

On the technical side and in parallel, excellent work was being undertaken by the Building Research Establishment. A series of informative Digests supported the idea that underpinning wasn't always necessary.



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Changes ... continued

The BRE provided advice on how site investigations might be conducted, explained the use of precise levels and promoted improvements in soil testing and interpretation. They measured ground movement over a period of years using ground rods set at differing depths to improve our understanding of root induced clay shrinkage.

This was supplemented by the work of consultants from across the industry. Giles Biddle's "Tree Root Damage to Buildings" is still a reference work for us all and is often used by experts in litigation.

Clive Bennett from MatLab developed new methods to detect desiccation in clay soils faster and at less cost.

The net benefit of exploring new technologies and business procedures has led to a 50% reduction in the settled cost of claims, taking into account inflation. Fewer houses are underpinned and piling is exceptional.

Education, technology and systems led to an improvement in claims handling. No more 'it's in the post' communication delays. Costs fell. Companies knew where they were – those that had built systems at least.

Some still clung to the idea that progress is a step in the wrong direction. Too much automation is an issue. Measuring the advice provided by professionals using MI is regarded by some as an affront to their skills.

The fact of the matter is, there are no training courses dealing with domestic subsidence or small scale geotechnics for engineers, adjusters or surveyors. Practitioners are often left to learn on the job. This lack of experience and expertise no doubt had a role in the apparent over-spend 20 years ago.

Professionals would see a black, silty muddy soil beneath a foundation damaged by a leaking drain, and would almost certainly have underpinned on the basis that the ground would not recover. This wasn't based on any particular geotechnical expertise, although some geotechnicians may have said the same thing.

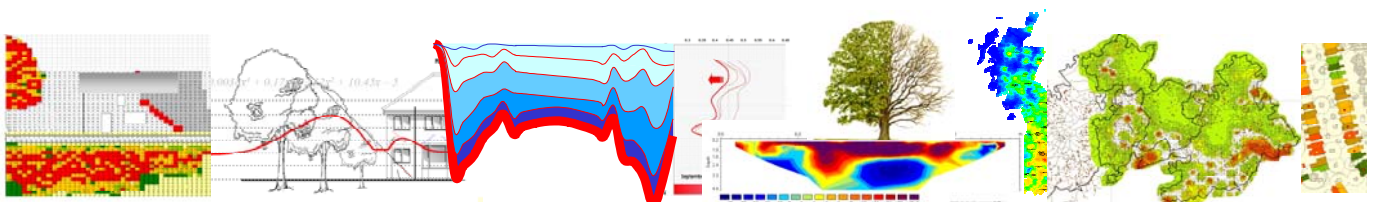
Empirically we discovered that, in most cases at least, by repairing the drain and allowing the soil to dry stability usually returned.

So, back to Aston. What is the point?

Claim numbers have been falling steadily over a period of time when the speed of change has been increasing rapidly. It would be easy to lose interest. After all, subsidence is one of the lower value (although more technical) perils for insurers.

There have been many exciting developments over the last 10 years, and Aston has showcased most of them.

LEGAL - tree root litigation is being refined with almost every new case, and interpretation remains central when assessing liability. Aston has had a legal expert addressing the audience most years to keep us abreast of developments.



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Aston – 10 year review – Topics and Speakers

ARBORICULTURAL. Arboriculturalists and plant physiologists carry out a huge amount of research. Given that 70% of claims relate to trees in a busy year, their role is central and they have been represented nearly every year, sharing their expertise in terms of risk, diagnosis and litigation.

One of the more interesting talks in this field was delivered by Jake Tibbetts, the Tree Officer from Islington Council.

Jake described in detail the issues faced by Tree Officers on a daily basis and identified some of the areas where insurers and local authorities can reduce the conflict by talking to one another in a language everyone understands.

Simply presenting a bundle of technical papers and asking for a tree to be felled doesn't help when the Tree Officer has to deal with objections from residents, Councillors and so forth.

His slides illustrated cases where the homeowner with the damaged house was objecting strongly to the tree that was causing the damage to be felled. He wanted his insurers to underpin his home.

In a similar vein, Paul Harris reinforced the problems faced by tree officers when engineers submit technical reports without explanation. Not everyone is a geotechnical engineer, or can understand monitoring records.

Paul also found the automation of report production unhelpful. Detailed description of geological series for example, taken from standard text, didn't add much in his view.

GEOTECHNICS – Methods of testing clay soils for desiccation have moved on. Progress has been made refining the suction test and identifying some initial teething problems associated with filter paper calibration. MatLab led the field when they refined the oedometer tests to cater for disturbed sampling and delivered a fast service with improved estimates of swell.

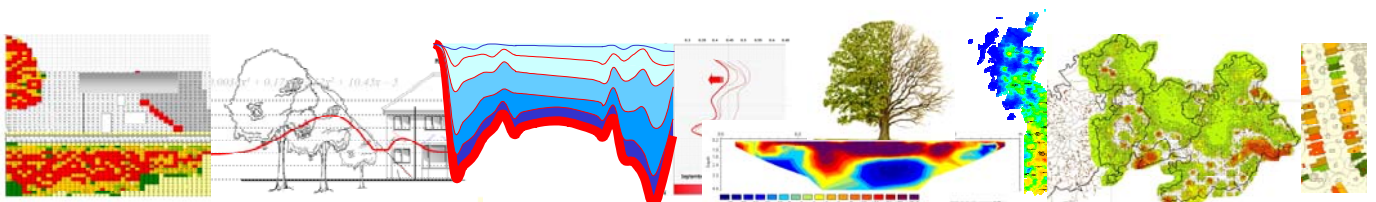
Clive Bennett then went on to develop a new sensor that would allow samples to be tested whilst in the back of the van on their way to the laboratory from the test site.

All of these developments have been supported and explored at conferences.

CLAIMS HANDLING has also been overhauled and this year's conference touches on some recent innovations.

Now we have improved communications and a choice of how we make contact between the various parties.

These coincide with the current thinking of the FCA who have recently asked for alternative communication routes to be introduced. Again, Aston is where we have the opportunity to see this new technology as applied to insurance claims.



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Aston – 10 year review. Why Aston?

Risk modelling software has improved and supporting applications have kept pace. The Viscat style of modelling, building a unique geology of the UK specific to risk, data reading software, models that take account of tree species, metrics, climate, soil and property have all been displayed at Aston.

RESEARCH - several alternative ground treatments are being explored and our current thinking is they may well be combined in one form or another to resolve root induced clay shrinkage claims quickly and cheaply.

Recognising the environmental issues we face, the objective is to retain the tree wherever possible. This means replacing underpinning and piling with less intrusive solutions that are easy to apply, and cost effective.

BUSINESS - Knowing more of what we do, where and 'counting the beans' has led to the introduction of new business models. Data analytics – the world of Big Data – is with us and every month the CRG share the output from their analysis, some of which is delivered at Aston.

Hopefully the CRG newsletter helps those with limited access to subsidence data. The articles describe 'how many of what, where, when' and sometimes even, 'why'. They associate geology and trees with risk and deliver it as a numeric value as we see in this edition.



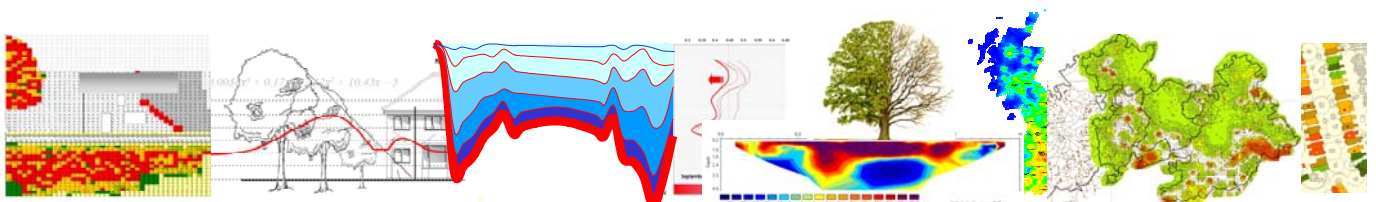
So, 'Why Aston?' Well, the conference isn't sponsored by anyone for commercial gain.

The speakers are giving their time without charge to share their knowledge. It is a meeting place for the subsidence industry with the objective of improving standards through innovation and to share breaking news on current developments.

We welcome hearing from anyone who would like to speak at future events. If you have advice on how we might improve the day, or topics you would like covered, please let us know.

A welcome pack will be sent through shortly providing details on how to get there together with the program. On the day attendees will receive copies of summary papers provided by speakers.

A program can also be downloaded from our web site at www.theclayresearchgroup.org together with issues covering past conferences. Please contact us if you require any help.



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"Arctic study sheds light on tree-ring divergence problem: Changes in light intensity may impact density of tree rings."
 ScienceDaily. 7 May 2014



Stine, an assistant professor of Earth & climate sciences at San Francisco State University explains that tree rings consist of a low density ring, which forms early in the growing season, and a high density ring that forms late in the growing season. In colder parts of the world, the dense latewood rings tend to be denser during warm years.

"Temperature records inferred from Arctic tree rings do a good job of tracking temperature up until the 1960s, but subsequent Arctic tree-ring densities did not correspond with increases in temperature, a discrepancy that is called the divergence problem."

The divergence is not a problem for understanding modern climate change in the Arctic, Stine explained, "because we have thermometers and those thermometers tell us it's warming."

"But it's a problem because if we want to use these tree rings as a proxy for temperatures of the past, we need to make sure that we understand what's happening now."

Stine hopes the new findings will lead to a more informed discussion about climate change.

Ding, et al., "Tropical forcing of the recent rapid Arctic warming in northeastern Canada and Greenland".
 Nature, 2014

Atmospheric scientists from the University of Washington have estimated that up to half of the recent warming in Greenland and surrounding areas may be due to climate variations that originate in the tropical Pacific and are not connected with the overall warming of the planet. Still, at least half the warming remains attributable to global warming caused by rising carbon dioxide emissions.

Greenland and parts of neighbouring Canada have experienced some of the most extreme warming since 1979, at a rate of about 1 degree Celsius per decade, or twice the global average.

"Our work shows that about half of the warming signal in Greenland comes from the predictable part - forcing of climate by anthropogenic greenhouse gases - but about half comes from the unpredictable part," Steig said. "This makes shorter-term forecasts difficult, but helps scientists to make more accurate long-range projections."

On the face of it, a perverse view given that in the UK certainly, the Met Office say the opposite.

It is also questioned by some why CO2 gets such a bad press when, although it continues to rise unabated, the temperature is fairly steady and has been for the last 17 years or so.

