

Shock tactics point to risk after quake

An analysis of the seismic stress changes in China's Sichuan basin has been published just 8 weeks after a magnitude 7.9 earthquake there killed more than 60,000 people and left millions homeless. The rapid calculation and publication¹ brings accurate forecasting of aftershocks a step closer, experts say.

Tom Parsons of the US Geological Survey in Menlo Park, California, and his colleagues describe several large faults in the basin that faced increases in stress as a result of the earthquake's main shock on 12 May. These fault sections are more likely than others to produce large aftershocks in the near future.

It is still not possible to accurately predict whether and when massive after- quakes might occur, such as the 6.0 aftershock northeast of the original epicentre that killed eight people and destroyed thousands of buildings. But experts say the study shows that it is now feasible to rapidly calculate the propagation of stress in the crust in the immediate aftermath of a major earthquake, even in areas as geologically complex as the Sichuan basin.



China devastation: measuring stress build-up can help predict aftershocks.

Such data could be used to produce large-scale maps of high-risk zones, significantly improving efforts to protect civilians in disaster regions. "We can't predict earthquakes — many scientists think we may never be able to — but we can do a lot better than nothing," says John McCloskey, a geophysicist at the University of Ulster in Colerain, UK.

Current global earthquake hazard maps are

too vague to help local emergency planners mitigate risks effectively. So a main goal of earthquake physics is to identify zones of particularly high seismic risk.

McCloskey and his colleagues analysed seismic stress perturbations in the surrounding crust after the devastating 2004 Sumatra earthquake and tsunami². Using essentially the same methods that Parsons and his team applied in estimating the stress redistribution after the Sichuan rupture, McCloskey's team successfully forecast the large quake in Sumatra in March 2005 that was triggered by the earlier rupture.

The geology of the Sichuan region is poorly understood and much more complex than the Sumatran zone, making it harder to forecast aftershocks. The seismic history of the region is also unclear. Large earthquakes are much less frequent there — every 2,000 to 10,000 years, according to an analysis published this month³ — than in Sumatra.

"It is easy to retrospectively explain why an earthquake has happened at a particular place,"

N. ELIAS/REUTERS

Super-sensitive tool key to dark-matter claim

It's one of the most controversial experiments in physics, but an Italian group's claim to have seen dark matter may be vindicated after all. A spate of theoretical papers can explain why the Italians see a signal where others do not.

Dark matter interacts rarely — if at all — with everyday molecules and atoms. Although it is thought to make up some 82% of the matter in the cosmos, scientists have so far only seen dark matter indirectly, through its gravitational pull on more conventional objects, such as galaxies.

Groups around the world are racing to spot dark matter directly, but only one claims to have actually seen it. In April, the DAMA/LIBRA (Dark Matter/Large Sodium Iodide Bulk for Rare Processes) experiment, located deep beneath Italy's Gran Sasso mountain, announced that it had evidence of dark-matter particles. The claim, the group's second in less

than a decade, was criticized for being incompatible with rival work (see *Nature* 452, 918; 2008).

"It looked at the time like they were completely inconsistent," says Kathryn Zurek, a theorist at the University of Wisconsin at Madison. But over the past three months, Zurek and other theorists have begun to find reasons why DAMA might be seeing dark matter that their rivals cannot. The papers¹⁻³ have been trickling onto the popular arXiv preprint server.

At the core of most of the papers is a previously unknown effect that DAMA claims to have seen. Known as 'channelling', it means that DAMA is much more sensitive to lightweight particles than previously thought. If dark matter were made of these lighter particles, then DAMA would see it but its rivals would not.

Just what those particles could be is at the centre of the papers now peppering

the arXiv. For her part, Zurek thinks that they could be unusually light neutralinos¹, partners of neutrinos predicted by a popular theory known as super-symmetry.

Other papers wander farther afield to explain the discrepancy. Robert Foot, a theorist at the University of Melbourne in Australia, says that the particles would be consistent with his theory of mirror matter², in which a hidden world of mirror atoms and molecules exist alongside our own. The hypothesis is part of a broader set of theories known as 'hidden-sector' models, which postulate a range of exotic hidden particles that interact with each other but not with the visible Universe.

Hints of hidden sectors would also show up in future γ -ray experiments and at the Large Hadron Collider at CERN, the European particle-physics laboratory, says Jonathan Feng, at the University of California in Irvine. "If this is the right



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McCloskey says. "But prospectively, what Parson and his colleagues have done is the best science we have at the moment."

McCloskey is setting up a group to systematically analyse changes in seismic stress in the immediate aftermath of future large earthquakes. The goal is to forecast within 12 hours the likelihood of big aftershocks, and map the high-risk 'red zones'.

"We have the methods to say strong things about what might happen days, months or years after the main shock," he says. "Aftershock forecasts will never be perfect. But in the absence of knowing something definite we're still able to advise people on the balance of probabilities."

McCloskey hopes that a scientific journal, such as *Nature*, will provide a forum for rapid dissemination of information such as daily hazard maps after a major quake.

But Philip Campbell, editor-in-chief of *Nature*, thinks such information would be better placed elsewhere because the peer-review process can slow things down. "Rushing the publication of such studies would not be good, as they usually improve quite a bit during peer review," he says. ■

Quirin Schiermeier

1. Parsons, T., Ji, C. & Kirby, E. *Nature* Advance online publication doi:10.1038/nature07177 (2008).
2. McCloskey, J., Nalbant, S. S. & Steacy, S. *Nature* **434**, 291 (2005).
3. Burchfiel, B. C. *et al.* *GSA Today* **18**, 4-11 (2008).

explanation, it's going to be strongly verified in the next 6-12 months," he says.

"Theoretical and phenomenological papers are always very useful," says Rita Bernabei, a physicist at the National Institute of Nuclear Physics in Rome, who heads the DAMA experiment and stands by its findings.

But other experimentalists remain sceptical. Smaller experiments using sodium iodide have failed to see the channelling effect, says Timothy Sumner, a physicist at Imperial College London. And the theoretical solutions that require lighter-weight particles do not fit with the favourite versions of supersymmetry theory. "I suspect it will be necessary to get additional data to bring the community around," he says. ■

Geoff Brumfiel

1. Petriello, F. & Zurek, K. M. Preprint at <http://arxiv.org/abs/0806.3989> (2008).
2. Foot, R. Preprint at <http://arxiv.org/abs/0804.4518> (2008).
3. Feng, J. L., Kumar, J. & Strigari, L. E. Preprint at <http://arxiv.org/abs/0806.3746> (2008).

Boyz 2 pipettemen

In a dreary, lonely lab a young female postdoc puts down her pipette to massage her aching latexed hands. Sounds like the perfect set-up for a hot new music video. Well at least it does to Tyler Kay, creative director at Compare Networks Production Group (CNPNG) in San Francisco, California.

A recent release from CNPNG features a group of five winsome young men singing the praises of a new automated pipetting system called epMotion, made by international biotech company Eppendorf. As the lab heroine is whisked to a beach under the Golden Gate Bridge, the band members gyrate around her and her glasses are shed along with her inhibitions, just before the chorus. "Girl you need epMotion" (whispered: "yeah girl it's time to automate.")

Stefanie Noehren, online project manager at Eppendorf in Hamburg, says the company was looking for a 'viral marketing' campaign that would spread the word about the epMotion product rapidly through the Internet. And CNPNG, the video production company of online biotech marketers Biocompare, was the obvious choice. In January, it created a minor internet sensation with *The PCR Song* by the mock group, Scientists for Better PCR — PCR (the polymerase chain reaction) is a lab technique used to amplify DNA. This advertisement from Bio-Rad Laboratories, based in Hercules, California, was styled after megastar group recordings of the 1980s like Band Aid's chart topping *Do They Know It's Christmas*. In *The PCR Song*, crooners mawkishly sing their way through lyrics like: "PCR, when you need to find out who the daddy is (who's your daddy?)" In the finale, one singer lovingly smooches a thermal cyclor.

"That thing took a life of its own," says Kay. It attracted more than 700,000 webpage views and spawned several homage videos from fans, singing or lip-synching the words. At Eppendorf, says Noehren, marketers decided in March to try out the music video format, this time aping one of

the prototypical manufactured male pop groups known colloquially as boy-bands — standard-bearers include 'N Sync, Take That, 98° and the Backstreet Boys.

Kay, a self-taught film-maker with Biocompare since near its inception, wrote the song with a list of product features and intense background research. "I had to listen to a whole lot of boy-band songs," says Kay. "I started to gain an appreciation for it. Those guys really know how to crank out the hits on a few chords." The result is *It's Called epMotion*, a saccharine-sweet parody of songs like 98°'s *Because of You*. Next they



Could these five men persuade you to buy their automated pipette?

COMPARENETWORKS/EPPENDORF

needed a band to sing it.

In the true tradition of boy-band manufacture, the members represent a variety of races and styles: the tough-looking Asian, the Latin lover, the bad-boy surfer, the African American with a winning smile and an odd-looking skinny one with a surprisingly deep voice. The result is a slick, if inexpensively produced video. The cost to Eppendorf for the video was just US\$50,000, says Noehren.

But does it sell the product? Amy Wagers at Harvard's Joslin Diabetes Center in Boston, Massachusetts, says "It didn't tell me much about the product, if that's what they were going for, but it's working in that now I've gotten two of these videos via e-mail." YouTube shows nearly 22,500 views and counting. More may have found the video through other sites, and Noehren says a comparable number has clicked through to the website since the video was launched in early June. "We are quite satisfied," she says. ■

Brendan Maher

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