Volcano research backs nuclear winter theory

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'TRONG support for the nuclear-) winter hypothesis has come from the test study of how the Earth's atmosphere sponds to a major volcanic eruption.

The study has been carried out by Mick elly and Chris Sear, at the University of ast Anglia's Climatic Research Unit. It ows that several large volcanic eruptions the Northern Hemisphere during the esent century have produced a cooling in e continental interiors around the hemi-here of as much as 1·4° C within a few eeks of the eruption.

Climatologists have accepted for a long me that large volcanic eruptions do affect e climate, by throwing gas and dust high to the stratosphere, where it blocks heat om the Sun. But until recently they ought that the global effects of such a dust il took a year or more to become estab-shed. This mistaken impression was, it ow seems, partly due to the lack of month-y-month temperature data to study, and rtly an accident of history.

Because the experts only had figures on nual mean temperatures to work with, ey were bound to find the shortest effects erating on an annual time scale. And it happens that several of the most portant eruptions, such as that of Kraka-a in 1883, occurred in the Southern Hemisphere, from where it did take months for the dust veil to spread to Europe and North America.

The first hint that this combination of factors was giving a misleading impression came in 1982. Then, Kelly and Sear reported the first fruits of their investigation of the monthly temperature figures following eruptions in the Northern Hemisphere, such as those of Pelée in the West Indies in 1902 and Bezymianni in the eastern Soviet Union in 1956.

This study was stimulated by analysis of the consequences of the eruption of Mount St Helens in the US in 1980. Since then, the eruption of El Chichon in April 1982, and now the interest in the nuclear-winter scenario, have encouraged a more detailed statistical analysis of the records.

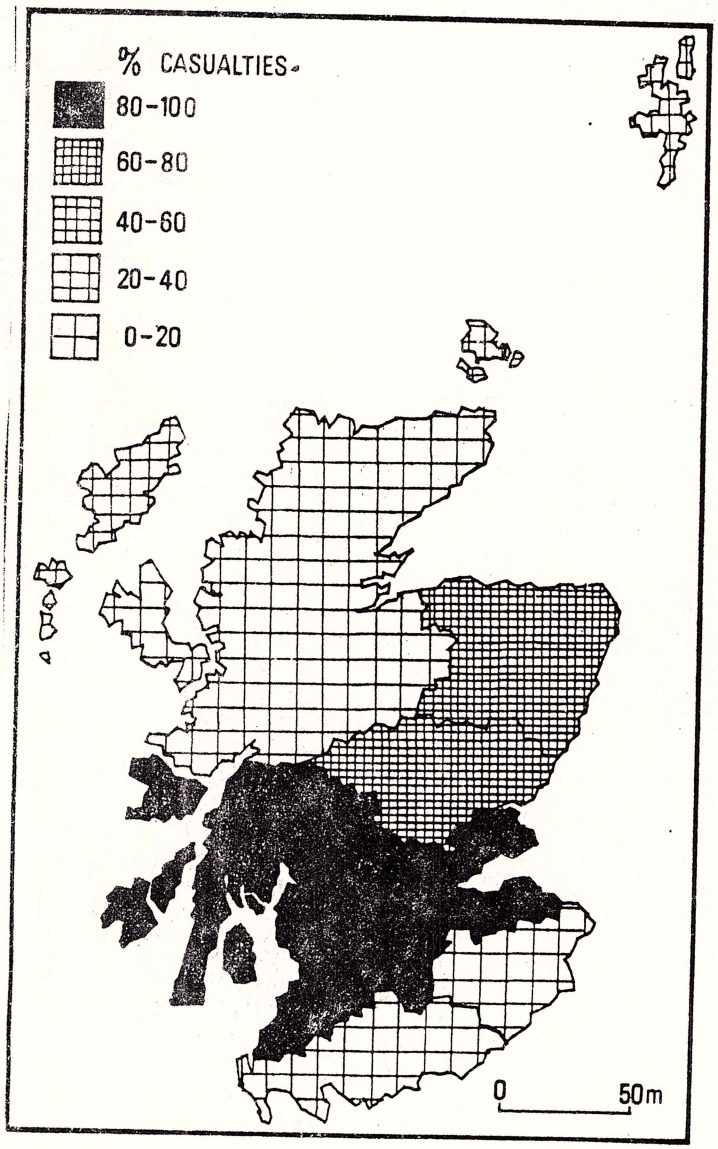
These show that when a major volcano erupts in the Northern Hemisphere there is an immediate, rapid decrease in surface temperatures across the hemisphere, reaching a lowest point in the second month after the eruption, and recovering only slowly over the next two years. If the eruption occurs in winter, the maximum depression of temperatures is about 1·4° C; in summer, the effect is about one third as great (*Nature*, vol 311 p 741).

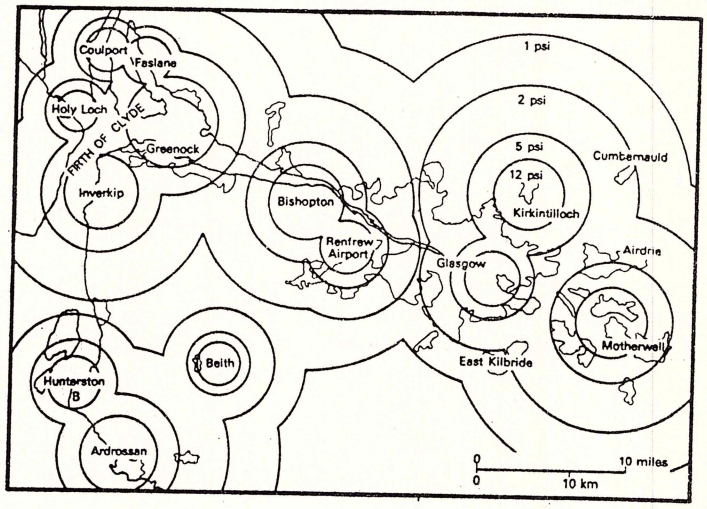
As yet the experts are unable to explain how a localised disturbance in the energy balance of the globe can provide such a swift response in temperatures around the hemisphere.

This is why the new study is so relevant to the nuclear winter debate. Computer models of the effects of even a limited nuclear strike suggest a massive cooling of the entire Northern Hemisphere within a matter of weeks (*New Scientist*, 13 September, p 33) Some objectors have said that this is so unrealistic that the prediction casts doubt on the validity of the whole nuclear-winter hypothesis.

But now that there is proof that the climate of the whole hemisphere does respond rapidly to a local injection of material into the stratosphere, the balance of that argument is tilted back in favour of the computer modellers.

As Kelly and Sear sum up: "The major significance of this work lies in the fact that it challenges commonly held beliefs concerning the response time and the sensitivity of the climate system to external forcing. Our results provide empirical support for the short response time suggested by recent attempts to simulate the climatic effects of a nuclear exchange." □





Left: Scotland after "attack H," *Doomsday's* "underestimate" of the most probable scale of a nuclear attack as it would affect Scotland. Above: the ripples of nuclear devastation in the Glasgow area as visualised by the *Doomsday* team in their "attack H" scenario.

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12/12/83