

Climate change may affect East Asia differently from North Atlantic nations

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The extreme effects of climate change on the world depicted in the US blockbuster movie *The Day After Tomorrow* may not be quite true where East Asia is concerned, according to a new study.

In particular, the scene from the film depicting huge ice balls falling on Tokyo, causing death and destruction, is very unlikely. The research suggests that temperatures are unlikely to change as drastically in East Asia as they could do in countries bordering the North Atlantic, such as America and Great Britain.

The study was led by Newcastle University, with partners in Germany and Japan, and is published in the July issue of *Geology*, the journal from the *Geological Society of America*.

Researchers studied the period from 16,000 - 10,000 years ago as they believe that climate change patterns experienced in that period are similar to those we are experiencing today. This is because then, as now, temperatures were gradually increasing from cold to warm.

Around 12,000 years ago, the world experienced a huge surge in cold temperatures - known as the 'Younger Dryas' cold reversal event - that lasted around 1,000 years.

Warming caused ice from the polar cap to melt into the sea and destabilise the Gulf Stream, leading to a drastic drop in temperatures. The Gulf carries warm water from the tropics to the North Atlantic and

raises air temperatures (otherwise known as the North Atlantic drift).

Some scientists expect that current global warming will trigger a repeat of this cold surge in years to come, a scenario enacted in *The Day After Tomorrow*. In the film, the world experienced a massive global ‘superstorm’ which resulted in an ice age within days.

However, the Geology paper suggests that this scenario may not be experienced across the globe. For the study, researchers analysed fossilised pollen samples contained in the sediment taken the bottom of Lake Suigetsu in Japan.

Pollen samples can indicate the changes in the type of vegetation over time, which in turn indicates changes in the climate. By comparing information from this material with statistics from the present day, the researchers were able to determine the change in temperature and precipitation over time for the period from 16,000 years ago to 10,000 years ago.

The statistics reflected a cold surge at around 12,000 years but temperatures only fluctuated slightly - an estimated 5 degrees centigrade decrease in winter and no more than three degrees centigrade decrease in summer. It is believed the North Atlantic experienced a seven to 10 degrees centigrade decrease in temperatures during the same event.

These results suggest that East Asia reacted differently to global warming 12,000 years ago. If the pattern is repeated as researchers expect it to, the same effect is likely the next time a cold surge happens.

The researchers suggest that this is because the Asian monsoon front largely acts as a barrier from the effect of North Atlantic cooling, so temperature predictions will apply to Japan and other lands east of the monsoon barrier.

Tokyo itself is likely to experience an intensification of the winter monsoon during a cold surge, with slightly colder temperatures and more snow.

Lead researcher, Dr Takeshi Nakagawa, a palaeoclimatologist and lecturer with Newcastle University's School of Geography, Politics and Sociology, said: "The research suggests Asia will not be as severely affected by the destabilising of the Gulf stream as countries bordering the Northern Atlantic. The cooling effect will be more gradual than abrupt.

"There may be some changes in East Asia, too, but the changes will be mostly in winter. Economically this means that the crop in East Asia will be safe because changes in crop growing season, which is spring to summer, will be relatively minor.

"From the viewpoint of pure science, this research provides another key to understanding how the climate system works as a whole, which should be useful in international deliberations on tackling global warming."

Dr Nakagawa, who hails from Tokyo, added: "This doesn't mean that Asia can sit back, enjoy life and not take any responsibility for global warming. We should all be considering on how we can reduce the detrimental impact of human activity on the world as a whole which may be contributing to climate change."

Dr Nakagawa is due to embark on another research trip to Lake Suigetsu, which is part of a three-year project funded by the Natural Environment Research Council (NERC). His fieldwork will involve working with local and international scientists, using heavy drilling equipment installed on a floating platform in the lake.

Source: University of Newcastle upon Tyne

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