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The Earth today stands in imminent peril

...and nothing short of a planetary rescue will save it from the environmental cataclysm of dangerous climate change. Those are not the words of eco-warriors but the considered opinion of a group of eminent scientists writing in a peer-reviewed scientific journal.

By **Steve Connor**, Science Editor

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Six scientists from some of the leading scientific institutions in the United States have issued what amounts to an unambiguous warning to the world: civilisation itself is threatened by global warming.

They also implicitly criticise the UN's Intergovernmental Panel on Climate Change (IPCC) for underestimating the scale of sea-level rises this century as a result of melting glaciers and polar ice sheets.

Instead of sea levels rising by about 40 centimetres, as the IPCC predicts in one of its computer forecasts, the true rise might be as great as several metres by 2100. That is why, they say, planet Earth today is in "imminent peril".

In a densely referenced scientific paper published in the Philosophical Transactions of the Royal Society A some of the world's leading climate researchers describe in detail why they believe that humanity can no longer afford to ignore the "gravest threat" of climate change.

"Recent greenhouse gas emissions place the Earth perilously close to dramatic climate change that could run out of control, with great dangers for humans and other creatures," the scientists say. Only intense efforts to curb man-made emissions of carbon dioxide emissions and other greenhouse gases can keep the climate within or near the range of the past one million years, they add.

The researchers were led by James Hansen, the director of Nasa's Goddard Institute for Space Studies, who was the first scientist to warn the US Congress about global warming.

The other scientists were Makiko Sato, Pushker Kharecha and Gary Russell, also of the Goddard Institute, David Lea of the University of California, Santa Barbara, and Mark Siddall of the Lamont-Doherty Earth Observatory at Columbia University in New York.

In their 29-page paper, "Climate Change and trace gases", the scientists frequently stray from the non-emotional language of science to emphasise the scale of the problems and dangers posed by climate change.

In an email to The Independent, Dr Hansen said: "In my opinion, among our papers this one probably does the best job of making clear that the Earth is getting perilously close to climate changes that could run out of our control."

The unnatural "forcing" of the climate as a result of man-made emissions of carbon dioxide and other greenhouse gases threatens to generate a "flip" in the climate that could "spark a cataclysm" in the massive ice sheets of Antarctica and Greenland, the scientists write.

Dramatic flips in the climate have occurred in the past but none has happened since the development of complex human societies and civilisation, which are unlikely to survive the same sort of environmental changes if they occurred now.

"Civilisation developed, and constructed extensive infrastructure, during a period of unusual climate stability, the Holocene, now almost 12,000 years in duration. That period is about to end," the scientists warn. Humanity cannot afford to burn the Earth's remaining underground reserves of fossil fuel. "To do so would guarantee dramatic climate change, yielding a different planet from the one on which civilisation developed and for which extensive physical infrastructure has been built," they say.

Dr Hansen said we have about 10 years to put into effect the draconian measures needed to curb CO2 emissions quickly enough to avert a dangerous rise in global temperature. Otherwise, the extra heat could trigger the rapid melting of polar ice sheets, made far worse by the "albedo flip" - when the sunlight reflected by white ice is suddenly absorbed as ice melts to become the dark surface of open water.

The glaciers and ice sheets of Greenland in the northern hemisphere, and the western Antarctic ice sheet in the south, both show signs of the rapid changes predicted with rising temperatures. "

The albedo flip property of ice/water provides a trigger mechanism. If the trigger mechanism is engaged long enough, multiple dynamical feedbacks will cause ice sheet collapse," the scientists say. "We argue that the required persistence for this trigger mechanism is at most a century, probably less."

The latest assessment of the IPCC published earlier this year predicts little or no contribution to 21st century sea level from Greenland or Antarctica, but the six scientists dispute this interpretation. "The IPCC analyses and projections do not well account for the nonlinear physics of wet ice sheet disintegration, ice streams and eroding ice shelves, nor are they consistent with the palaeoclimate evidence we have presented for the absence of discernible lag between ice sheet forcing and sea-level rise," the scientists say.

Their study looked back over more than 400,000 years of climate records from deep ice cores and found evidence to suggest that rapid climate change over a period of centuries, or even decades, have in the past occurred once the world began to heat up and ice sheets started melting. It is not possible to assess the dangerous level of man-made greenhouse gases.

"However, it is much lower than has commonly been assumed. If we have not already passed the dangerous level, the energy infrastructure in place ensures that we will pass it within several decades," the scientists say in their findings.

"We conclude that a feasible strategy for planetary rescue almost surely requires a means of extracting [greenhouse gases] from the air."

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