

Global warming goes deep

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With theaters everywhere screening Al Gore's movie, "An Inconvenient Truth," and the National Research Council issuing a new report on global warming, you'd have to be hiding under a rock to be unaware that Earth is heating up.

Actually, you'd have to be hiding under 600 feet of rock, University of Michigan geophysicist Shaopeng Huang contends.

"My research tells me that even the rocks are feeling the heat, and that rocky fever is detectable down to a depth over 600 feet," said Huang, an associate research scientist in the Department of Geological Sciences. Along with U-M geophysicist Henry Pollack and Po-Yu Shen of the University of Western Ontario, Huang collaborated on a 2000 study, cited in the recent National Research Council report, showing that the 20th century was the warmest of the last five centuries. Earlier this year, he published work in *Geophysical Review Letters* showing that global climate change has intensified heating in subsurface rock.

Earth's climate is the product of a dynamic system encompassing interactions among the atmosphere, oceans and land. Consequently, any global-scale change in surface air temperature affects the other parts of the system, including the rocky continental landmasses.

Since the beginning of the 20th century, a significant amount of thermal energy has been injected into those landmasses, Huang said. Together, Asia, Africa, Australia, Europe, North America and South America have seen a surplus of 12 zeta joules in their thermal energy budget, 65

percent of which has been acquired since 1970. (A zeta joule is 1021 joules; a joule is standard international unit of energy equal to 0.2389 calories.)

"When a large amount of heat enters or leaves the ground, the temperature of the rocks changes accordingly," Huang said. "A change of 12 zeta joules is enough to raise the mean rock temperature of the top hundred feet of the world's landmasses by two degrees Fahrenheit. But because of the way heat flows from one object to another, the actual volume of rocks affected by global warming is much larger."

Data from experiments in which researchers take Earth's temperature by lowering sensitive thermometers into boreholes have documented the subsurface temperature changes, said Huang, and those changes go deep.

"Not to feel global warming, one would need to hide beneath 600 feet of rocks," Huang said. "Although its causes are debatable, recent global warming is indisputable."

Source: University of Michigan

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