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UM SCIENTIST HELPS INVENT WORLDWIDE CLIMATE CHANGE INDEX

MISSOULA –

Steve Running, Regents Professor of Ecology at The University of Montana, was a key player in creating a new worldwide climate change index to be unveiled Wednesday, Dec. 9, at the United Nations Climate Change Conference in Copenhagen, Denmark.

The new index distills the complexity of the Earth’s climate down to one number, much like the Dow Jones industrial average condenses volumes of data from the business world into a single figure. The index uses key indicators of global change – carbon dioxide, temperature, sea level and sea ice – to obtain its results.

“Some people still question whether the Earth’s climate is changing as rapidly and profoundly as the majority of climate scientists suggest,” Running said. “I think this index will help nonscientists understand why people in my line of work are so concerned about the major planetary-scale changes taking place.”

The index was produced by a group Running is affiliated with, the International Geosphere-Biosphere Programme, which studies climate change phenomenon. IGBP is headquartered with the Royal Swedish Academy of Sciences in Stockholm, and Running was among a core group of eight who developed the idea.

Running said the index gives an annual snapshot of how the planet’s complex systems – the ice, the oceans, the land surface and the atmosphere – are responding to changing climate.
The index rises steadily from 1980, the earliest date the index has been calculated, dipping only in 1982, 1992 and 1996 – years when the world experienced major volcanic eruptions.

He said the index provides an excellent visual tool that shows how external events can have rapid planetary-scale effects. The climbing cumulative index also highlights the extent human activities are affecting the planet’s climate system.

How were the four variables that make up the index chosen? “The iconic Mauna Loa atmospheric CO₂ concentration was obvious,” Running said. “Global air temperature is already widely reported at the end of each calendar year, so that was a logical choice, too.

“We needed an oceanic measure and chose sea-level rise because the impact is global and of high public interest,” he said. “The fourth metric concerns the cryosphere. Growing concern about the rate of loss of summer sea-ice in the Arctic led us to choose this metric. This parameter broadly represents the Earth system, and it is interesting the summer sea-ice extent is shrinking much faster than models predicted five, 10 years ago.”

In the future other variables could be added. “We did not identify any good land-surface variable, because no good standard exists,” Running said. “But some day we may have annual albedo or land-cover change.”

Each parameter is normalized between -100 and +100. Zero is no annual change. One hundred is the maximum recorded annual change since 1980. The normalized parameters are averaged. This gives the index for the year. The value for each year is added to that of the previous year to show the cumulative effect of annual change.

“Some of us thought we’d need a five-year rolling average to help dampen fluctuations and to elucidate core trends,” Running said. “But when we first produced the index, it was obvious this was unnecessary: The index highlights the trend extremely effectively.”
The index has been developed with input from a large number of scientists involved in global change research. Some scientists questioned whether atmospheric carbon dioxide levels should be included. They argued that because carbon dioxide drives changes in the three other parameters it should be excluded. But others argue that it is human activity that is the external forcing agent. Additionally, as atmospheric carbon dioxide levels fluctuate, this in turn affects the effectiveness of other major carbon sinks – the oceans and the land. So, given the size of its influence on the climate, the arguments to include atmospheric carbon dioxide levels outweighed arguments for exclusion. And recalculating the index without carbon dioxide shows that carbon dioxide does not dominate the trend.

Running said IGBP scientists may develop other indices relating to global change such as land use, fisheries exploitation, population, fire and extreme events, as well as backdating the new index. The overall index will be updated annually.

Running is a professor in UM’s College of Forestry and Conservation and directs the University’s Numerical Terradynamic Simulation Group, which has written software for NASA environmental satellites. He was a lead author for the North American section of the 2007 Intergovernmental Panel on Climate Change Report, and his IPCC committee shared a Nobel Peace Prize with Al Gore that year.

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