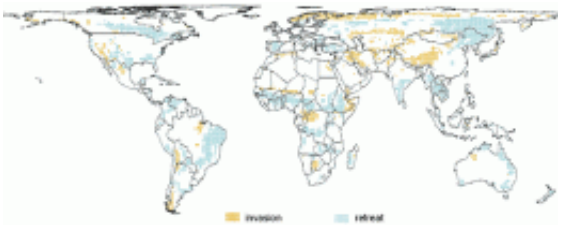
Climate change to spur rapid shifts in wildfire hotspots

April 8 2009, By Sarah Yang



This map shows the invasion (orange) and retreat (blue) of fire risk projected for 2010-2039 under a new climate model that looks at wildfire patterns on a global scale. (Meg Krawchuk, UC Berkeley)

(PhysOrg.com) -- Climate change will bring about major shifts in worldwide fire patterns, and those changes are coming fast, according to a first-of-its-kind analysis led by researchers at the University of California, Berkeley, in collaboration with scientists at Texas Tech University.

The findings are reported in the April 8 issue of PLoS ONE, an open-access, peer-reviewed journal of the Public Library of Science.

Researchers used thermal-infrared sensor data obtained between 1996 and 2006 from European Space Agency satellites in their study of pyrogeography - the distribution and behavior of wildfire - on a global scale. They not only got a global view of where wildfires occur, but they determined the common environmental characteristics associated with

the risk of those fires. They then incorporated those variables into projections for how future climate scenarios will impact wildfire occurrence worldwide.

The research was conducted with support from The Nature Conservancy as part of the organization's effort to integrate information about global fire regimes into planning for biodiversity conservation.

"This is the first attempt to quantitatively model why we see fire where we see it across the entire planet," said study author Max Moritz, assistant cooperative extension specialist in wildland fire at UC Berkeley's College of Natural Resources and co-director of the UC Center for Fire Research & Outreach. "What is startling in these findings is the relatively rapid rate at which we're likely to see very broad-scale changes in fire activity for large parts of the planet."

Moritz said the two essential suites of variables needed for fires describe the presence of sufficient vegetation to burn and the window in time when conditions are hot and dry enough for ignition to occur.

When the researchers used those environmental relationships and future climate projections to look at how these factors might change over time, under both lower and mid-range emissions scenarios developed by the Intergovernmental Panel on Climate Change, they found that much of the planet will incur changes in fire activity, and this includes increases as well as decreases in the likelihood of fire.

The researchers identified specific areas where wildfire occurrence was rare in the past and projected to experience large increases in fire activity in the period 2010-2039 as ecosystems at risk of fire invasion. Regions where fire was common in the past and projected to experience a large decrease were considered areas at risk of fire retreat.

These preliminary results show hotspots of fire invasion forming in parts of the western United States and the Tibetan plateau, while regions including northeast China and central Africa may become less fire-prone in the coming decades. The study authors noted that reliable predictions for specific regions would require incorporating a broader suite of climate models and accounting for specific regional factors that may influence fire in those locations, but that the overall scope of the shift will likely remain the same.

"Fire patterns are going to change, and we need to start thinking about what that means for ecosystems, and what our response should be," said the paper's lead author, Meg Krawchuk, a UC Berkeley post-doctoral fellow sponsored by The Nature Conservancy and by Canada's National Sciences & Engineering Research Council. "Fire will be a major driver of change. A large decrease in fire activity is not necessarily a good thing for an ecosystem that has adapted to periodic wildfires. Some species of trees rely upon fires occurring at specific times to regenerate, for example, so changes in a fire regime have the potential to dramatically alter the landscape over time."

Previous models of fire activity have focused on specific regions, including southern California and Australia. Notably, scientists warned in 2006 that climate change could increase bushfire risk across southeast Australia. Three years later, on top of years of drought, a blistering heat wave sent temperatures soaring up to 20 degrees above average in the region. These conditions, consistent with those expected under future climate change, set the stage for the deadliest fire in the country's history.

"What Australia showed us is that things can happen faster than we think," said study co-author Katharine Hayhoe, an atmospheric scientist and associate professor of geosciences at Texas Tech University. "Although we cannot say whether climate change played a role in the

February fires in Australia, we do know that climate change will increase the risk of conditions conducive to such devastating wildfires in the near future."

Hayhoe noted that the global-scale model used in this study can complement studies that focus on more specific regions. "What we did is comparable to a 'whole body' scan to identify hotspots that may need extra attention," she said. "It helps researchers focus in on the areas that are likely to be susceptible to the greatest changes in the near future."

The researchers said this paper is a first step towards creating a comprehensive picture of how climate change will alter fire risk around the world if drastic cuts in greenhouse gas emissions do not occur. Because rapid and extensive changes in fire regimes will alter many of the ecosystem services humans rely upon - affecting air and water quality, carbon stocks and habitat values - they argue that a wider range of climate models is needed to identify consistent patterns of change.

More information: dx.plos.org/10.1371/journal.pone.0005102

Source: University of California - Berkeley (news : web)