ECOLOGY

Fire starter

Proc. Natl Acad. Sci. USA **108,** 13165–13170 (2011)

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By the end of the century, the ecosystem of Yellowstone National Park in the US Rocky Mountains will be fundamentally different, because of the impact of larger and more frequent fires resulting from climate change.

This finding by Anthony Westerling, of the University of California's Sierra Nevada Research Institute in Merced, and his colleagues is the product of several carefully constructed models that relate the occurrence of fires that spread over more than 200 hectares with monthly climate data in the northern Rockies between 1972 and 1999.

Yellowstone's dense conifer canopies can be potent fuel for growing fires. Their flammability depends on their dryness, so it varies with the climate. As the park's average temperatures become warmer and snowmelt occurs earlier, fires will be able to spread faster and grow more severe across the dry forest. Sequential fires will take just 30 years to burn throughout Yellowstone's entire area, compared with the historical norm of 100–300 years. This means that there will be insufficient time for the current suite of conifer species to regrow. *AP*

CLIMATOLOGY

Positively helping rains

Environ. Res. Lett. **6,** 034006 (2011)

In recent decades, the correlation between El Niño and the strength of India's summer monsoon has weakened — now a study shows why. A climate phenomenon known as the Indian Ocean dipole interacts with El Niño to moderate the monsoon rainfall.

Caroline Ummenhofer, a climate scientist at the University of New South Wales in Sydney, and her colleagues analysed summer rainfall records for west central India from 1877 to 2006 and looked for the effect of the so-called positive phase of the Indian Ocean dipole, in which sea surface temperatures north and east of Australia are about 0.5 °C cooler than average and those of the surface waters in the western Indian Ocean are slightly above normal.

The researchers found that in years when El Niño appeared alone, average precipitation was reduced by about 2.4 m over the monsoon season. But when the positive phase of the Indian Ocean dipole accompanied El Niño, monsoon rains were normal. This is because the positive phase of the dipole tends to strengthen winds flowing eastwards across the northern Indian Ocean, which counteracts the weakening of the winds typically brought about by El Niño. The team's analyses suggest that this situation has occurred more often in recent decades, weakening El Niño's impact on the Indian monsoon. *SP*

CARBON STORAGE

Tundra blaze

Nature **475,** 489–492 (2011)

Arctic tundra soils can contain thick deposits of organic material, often hundreds to thousands of years old, which store large quantities of carbon. Fire frequency and extent is increasing as the climate warms, making quantification of the magnitude of carbon released by these fires an important research goal.

Michelle Mack, of the Department of Biology at the University of Florida, and co-workers measured the carbon loss from a 2007 Alaskan wildfire — the largest on record for Arctic tundra. Based on these measurements they estimated the magnitude of ecosystem carbon released to the atmosphere across the entire 1,039 km^2 fire scar.

Results indicate that about 2.1 Tg of carbon was lost to the atmosphere by the fire — a quantity similar to the net amount of carbon sequestered each year across the entire Arctic tundra. These results show the importance of fire disturbance on the carbon balance of the tundra, demonstrating a mechanism of climate change amplification. *AB*

MITIGATION

White roofs

Environ. Res. Lett. **6,** 034001 (2011)

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Using highly reflective 'cool' roofs and pavements can substantially decrease temperatures in urban areas and have an effect on the local climate in nearby rural areas, but not always for the better, a study suggests.

Dev Millstein and Surabi Menon, atmospheric scientists at Lawrence Berkeley National Laboratory in Berkeley, California, used a regional climate model to assess how changing the amount of radiation reflected from Earth's surface might have affected climate in the continental US from 1998 to 2009. Roofs and pavements occupy 25% and

POLITICS

Rich man's burden

Climatic Change **107,** 635–641 (2011)

Why should developed countries cut their greenhouse-gas emissions while developing countries do nothing? It's a question that has become more prominent in policy debates as developing nations have grown richer and the sum of their emissions has overtaken that of developed nations.

Stephanie Waldhoff and Allen Fawcett of the US Environmental Protection Agency provide a neat answer in their estimates of global average temperature change over this century. They consider three scenarios: full compliance, whereby developed countries reduce emissions to 83% below 2005 levels by 2050 and developing countries cap their emissions at 2015 levels from 2025; delayed participation, whereby developed nations adopt full compliance, but developing countries do nothing until 2050, thereafter maintaining their 2050 emissions levels; and 'business as usual'.

The likelihood that global mean temperatures do not increase by 2 °C or more by 2100 is estimated as 75% under full compliance, 11% under delayed participation and 1% if there is no international policy. The chance of avoiding a more disastrous 4 °C rise is 100% for full compliance, 85% under delayed participation and 68% for 'business as usual'. Therefore, developed countries have good reason to cut emissions without waiting for poorer nations to adopt related policies, the researchers argue. *AP*