Major fires an increasing risk as the air gets thirstier, research shows

November 30 2022

Credit: Pixabay/CC0 Public Domain

Greater atmospheric demand for water means a dramatic increase in the risk of major fires in global forests unless we take urgent and effective climate action, new research finds.

Published in *Nature Communications*, researchers have examined global climate and fire records in all of the world's forests over the last 20 years.

The researchers found that in all kinds of forests, there is a strong link between fire activity and vapour pressure deficit (VPD), which is a measure of the atmosphere's thirst.

VPD is calculated from temperature and humidity. It describes the difference between how much moisture is in the air, and how much moisture the air can hold when it's saturated (which is when dew forms.) The greater this difference, or deficit, the the greater the air's drying power on fuels.

Importantly, warmer air can hold more water, which means that VPD increases—and fuels will dry out more often—with rising temperatures due to climate change.

The researchers used satellite records of fire activity and a global climate dataset to find the maximum daily VPD for every fire detection—over 30 million records in the last 20 years, including almost one million in Australia.

They then measured the strength of the relationship between VPD and fire activity for different forest types in each continent on earth.

The researchers showed for the first time that in many forests around the world, from temperate eucalypt forests to boreal coniferous forests and tropical rainforests, there is a strong link between fire activity and how thirsty the air is at a daily timescale.

The results show that forest fire is much more likely above a certain threshold in VPD. This threshold was found to differ predictably

between forest types, being lower in boreal (predominantly northern European and American coniferous forests) and temperate forests, and higher in Mediterranean, subtropical and tropical forests.

Research lead, Dr. Hamish Clarke from the University of Melbourne FLARE Wildlife Research group, said that all around the world we're likely to see more of the conditions under which forests dry out and become flammable.

"Some of the biggest areas of concern are the Amazon rainforest and other tropical forests, as well as northern hemisphere temperate and boreal forests," Dr. Clarke said.

Increasing forest fire activity could have major implications for carbon storage and human health via wildfire smoke impacts.

"Without strong climate action, there will be many more days each year—at least 30—when Earth's forests cross over into this critical flammability zone. This means we're likely to see more major fires, with all the risks that come with them," Dr. Clarke said.

"It is currently estimated that over 330,000 annual deaths globally are attributable to smoke inhalation, a number that could increase notably by the turn of the century, particularly in the most populated areas of east Asia."

Researchers said the presence of reliable links between atmospheric dryness and forest fire risk means that we should be able to develop better fire predictions, at both seasonal and near-term scales.

"This could have significant benefits for those currently trying to fight, manage or coexist with fire," Dr. Clarke said.

More information: Hamish Clarke et al, Forest fire threatens global carbon sinks and population centres under rising atmospheric water demand, *Nature Communications* (2022). DOI: 10.1038/s41467-022-34966-3

Provided by University of Melbourne