

Deforestation impacts global food production: Reveals satellite data

Climate models predicting the effects of forests on climate change are largely available right now. But such models fail to reconstruct the effect of local climate as they lack delicacy in spatial resolution. Moreover, though inferences from such field observations are valuable and the field plot sizes are increased, in theory, they cover very limited global area. A very recent research based on satellite data provides insight into how large-scale deforestation could impact global food production by triggering changes in local climate. The results seem to be highly comprehensive as the researchers have focussed on tropical, temperate and boreal forests.

Anthropogenic activities and natural calamities are the principle forces accounting for reduced forest covers across the world. The worst face of anthropogenic influence witnessed in this century is deforestation. These changes act on climate through both biogeochemical and biophysical processes and contribute to climate change. Hence it is necessary to understand the impact of large-scale deforestation on local climate, which in turn will affect the global food production. For the first time, a high-resolution NASA global satellite data was used to predict the changes in local temperature which are influenced by deforestation and land use patterns. The researchers used satellite data from the Moderate resolution Imaging Spectroradiometer (MODIS) to observe the biophysical impact of forests on local temperature at a global coverage to explore the controlling mechanisms. The work is a result of combined effort of researchers from United States and China, headed by Dr. Yan Li of Peking University. Their findings were recently published in the journal Nature Communications.



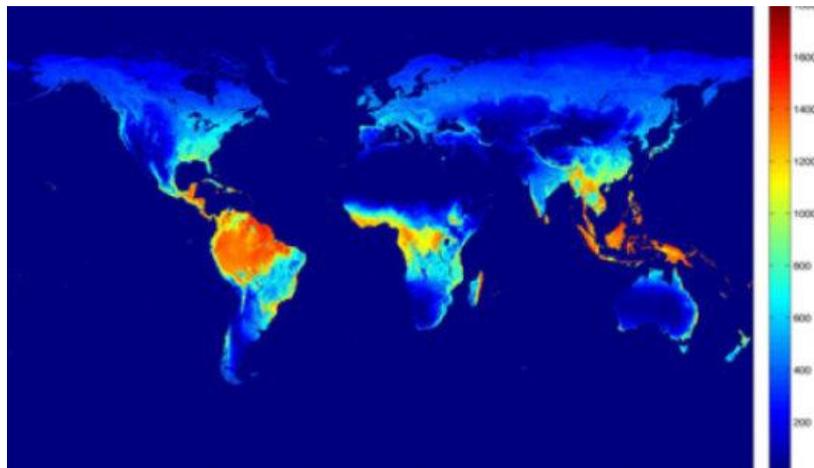
Satellite imagery assists researchers in tracking changes in forest cover

"Understanding the precise mechanisms of forest-generated warming or cooling could help regional management agencies anticipate changes in crop yields. Together with knowledge of other ecological factors, this information can help decision makers and stakeholders design policies that help to sustain local agricultural practices," said Safa Motesharrei, co-author of the paper and a systems scientist at the National Socio-Environmental Synthesis Center (SESYNC). It has been inferred that conversion of forest cover into plantations for oil palm, soy, rubber, coffee, tea, rice, and many other crops is chiefly believed to be one of the main causes of deforestation. The shocking information is that such change in land cover could drive a rise or fall in local temperature by as much as a few degrees. This kind of fluctuation could substantially impact yields of crops that are highly susceptible to specific climate conditions, resulting in harvests that are less productive and less profitable.

It is because of this major reason, researchers have stressed for a holistic understanding of forestry activities on local climate. The path to understanding these local impacts, the researchers say, is through 'albedo' and 'evapotranspiration'. Forests have a darker surface than, for example, an agricultural field--forests therefore have a lower albedo, which means less solar radiation is reflected

and more is absorbed. This phenomenon causes warming. On the other hand, forests absorb more rainwater and transpire it as water vapour later. This phenomenon, called evapotranspiration, causes cooling. "These two competing biophysical effects could determine whether--at a specific location or during a specific time of the day or season of the year--a forest could cause local cooling or warming. And, by extension, whether clearing a forest could lead to a rise or fall in local temperature," explained Yan Li.

For instance, the researchers found that tropical forests, which occur closest to the equator, have a strong cooling effect year-round. Boreal forests, which occur furthest from the equator, and temperate forests, which occur between tropical and boreal forests, show a seasonal variation. Boreal forests have strong warming in winter and moderate cooling in summer with net warming annually, and temperate forests show moderate cooling in summer and moderate warming in winter with net cooling annually. The scientists say this difference in cooling or warming can be largely explained by whether albedo or evapotranspiration is the dominant effect.



Evapotranspiration data (MODIS/NASA)

"We knew before that forests have an impact on temperature. But this study has provided a precise, quantitative estimation of the impact of forests depending on the geographical location, tracing it back to the changes in albedo and evapotranspiration," said Eugenia Kalnay, co-author of the paper and a Distinguished University Professor at the University of Maryland.

As the drastic deforestation rate couples with a shift in local climate, it is a prerequisite to understand the relationship between forest cover change and temperature. Nearly 130 million hectares of world's forest were lost in the past decade, shocks an FAO report. Inputs from the present study reveal that if reduction in forest cover is unchecked, it will surely affect global food production on a larger scale.

Source:

<http://www.sciencedaily.com/releases/2015/04/150401161638.htm>