

Research on Global Carbon Emission and Sequestration

Prof. Fang Jingyun, member of the Chinese Academy of Science, of Peking University and colleagues published an online article on *Science* in July, 2011 introducing the findings of an international research group about the global carbon emission and sequestration which will produce significant influence on researches on climate change as well as the international climate change policies. The research project was funded by NSFC and MOST.

As early as in 2007, Prof. Fang initiated the project in collaboration with experts in USDA Forest Service, Princeton University, Duke University and other institutions. In 2009 and 2010, two workshops were held in Peking University and Princeton University successfully which made progress for this project.

The terrestrial ecosystem removes CO₂ from the atmosphere via photosynthesis and plays an important role in balancing the CO₂ density in the atmosphere and slowing down the rise of global temperature. It is an effective approach for us to tackle the global climate change and all countries in the world have attached great importance to researches on ecosystem carbon sequestration.

The research provided with the most comprehensive and systematic evaluation of global forest carbon emission and sequestration so far in the world. Based on forest inventory data and long-term field observations and using ecological models and remote sensing technologies, researchers analyzed the carbon stocks and changes of various factors in forest ecosystems in different terrestrial eco-zones, such as biomass, dead wood, litter, soil and so on. It revealed that in the past 20 years, the world's forest carbon sink was 4 billion tons (about 14.7 billion tons of CO₂) annually, which equals to half of the fossil fuels emission in the corresponding period. However, due to tropical deforestation and degradation caused by human activities, carbon emission added about 2.9 billion tons each year and the net forest carbon sequestration was 1.1 billion tons annually.

The research also showed that factors such as global change notably sped up the growth of tropical forests and thus sequestered more CO₂. With rapid re-growth of tropical forests, tropical forest carbon sink almost compensated the carbon emission caused by deforestation and forest degradation. This result disproved the previous hypothesis that tropical forests were large sources of carbon emission and argued that the net carbon emission of tropical forests had been reversed and tropical forests had achieved "a balance of carbon emission and sequestration". In this sense, the net global forest carbon sink resided mainly in the temperate and boreal forests.

The research showed that China's forest was an important carbon sink. The average Chinese forest carbon sink increased from 130 million tons of the 1990s to the recent 180 million tons. The average carbon stock per area increased from 0.96 (Mg C ha⁻¹yr⁻¹) to 1.22 (Mg C ha⁻¹yr⁻¹). These statistics indicated that China's ecological improvement played an important role in slowing down the rise of atmospheric CO₂ density.

Prof. Fang Jingyun has been devoting to the research of terrestrial ecosystem carbon emission and sequestration as well as biodiversity. Many of his articles were published in *Science*, *Nature* and *PNAS*. In 2010, as one of the 12 members appointed by IAC, he jointed the independent evaluation on the IPCC Fourth Assessment Report. The evaluation created extensive influence in the international community and led to the reform of IPCC assessment procedure and organization.