

Greening of the Earth and Responsible Driving Mechanisms

Objective:

Understand how dynamics of terrestrial vegetation are responding to global environmental change.

Approach:

We applied three long-term satellite leaf area index (LAI) records and ten global ecosystem models for the period 1982–2009.

Results/Impacts:

- We identified a persistent and widespread increase of growing season integrated LAI (GSILAI) (greening) over 25–50% of the global vegetated area, whereas less than 4% of the globe shows decreasing GSILAI (browning) (Fig. A).
- Model-based interpretations of these data demonstrated significant correlation with CO₂ fertilization (70%), nitrogen deposition (9%), climate change (8%) and land cover change (LCC; 4%) (Figs. B and C).
- CO₂ fertilization effects dominated in the tropics, whereas climate change was the dominant driver in the Tibetan Plateau. LCC contributed most to regional greening in southeast China and the eastern United States (Fig. C).

Zhu, Z., S. Piao, R. B. Myneni, M. Huang, Z. Zeng, J. G. Canadell, P. Ciais, S. Sitch, P. Friedlingstein, A. Arneeth, C. Cao, L. Cheng, E. Kato, **C. D. Koven**, Y. Li, X. Lian, Y. Liu, R. Liu, **J. Mao**, Y. Pan, S. Peng, J. Peñuelas, B. Poulter, T. A. M. Pugh, B. D. Stocker, N. Viovy, X. Wang, Y.-P. Wang, Z. Xiao, H. Yang, S. Zaehle, and N. Zeng (2016), Greening of the Earth and its drivers, *Nature Clim. Change*, doi:[10.1038/nclimate3004](https://doi.org/10.1038/nclimate3004).

