

## **Observed changes in surface solar radiation and cloudiness over the tropical rainforests, the cause and implication to the tropical ecosystem**

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### **Abstract:**

Changes in rainforest growth and mortality rates, especially in the deep and least perturbed forest areas, have been consistently observed across the global tropics in recent decades. Previous studies have suggested such a change may be caused by an elevated atmospheric CO<sub>2</sub> and increasing surface temperature. However, the former cannot explain the reduced increase in growth rate after 2000 and the latter is often determined by cloudiness and rainfall over the tropical rainforest region. Field measurements in recent decades have shown that rainforests in wet tropical regions are light limited. Thus, we explore whether cloudiness has changed, if so, what causes such a change and whether it is consistent with that expected from changes in forest growth rate. Our analysis shows a decadal-scale decrease of seasonal mean convection, cloudiness and shortwave (SW) downwelling radiation during 1984 to 2007 over the Amazon basin. These changes are consistent with an observed increase in atmospheric stability and reduction in vertically integrated moisture transport. Surface station data also indicate an increase in surface temperature over both basins, consistent with the reduction of cloudiness as detected by satellites. The implication of this observed change in cloudiness over the tropical rainforest will be discussed.

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