

**ATS/CIRA Colloquium**

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**Revisiting the Rectifier: How CALIPSO LIDAR Data Help  
Quantify the Global Carbon Budget**

**Friday, April 25, 2014**

**ATS room 101; Discussion will begin at 11:15am  
Refreshments will be served at 10:45am in the weather lab**

About half the CO<sub>2</sub> emitted by burning fossil fuels is removed from the atmosphere by sink processes, dramatically reducing the rate of accumulation, but quantifying and predicting future sink behavior (especially on land) has proved difficult. Measurements of small variations in atmospheric CO<sub>2</sub> are an important source of information about sinks, requiring an accurate account of the influence of atmospheric transport. These calculations are complicated by the fact that terrestrial ecosystems systematically emit CO<sub>2</sub> when vertical transport is weak (night and winter) and take up CO<sub>2</sub> when vertical transport is strong (day and summer). The covariance between large-scale ecosystem metabolism and atmospheric transport is analogous to an electronic rectifier, and simulation of the "rectifier effect" has traditionally been one of the largest sources of uncertainty when mapping land sinks in the global carbon budget.

Recent global estimates of the depth of the planetary boundary layer from CALIPSO LIDAR backscatter allow systematic evaluation of variations in the CO<sub>2</sub> rectifier effect for the first time. Seven years of PBL retrievals from CALIPSO show strong seasonal rectification over North America and especially Asia, and favor a terrestrial carbon sink in northern middle latitudes that is more likely to saturate in coming decades than a tropical sink driven by CO<sub>2</sub> fertilization.

Link to colloquium videos and announcement page: <http://www.atmos.colostate.edu/dept/colloquia.php>