Geophysical Research Abstracts
Vol. 14, EGU2012-6153, 2012
EGU General Assembly 2012

Carbon-water coupling

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The world's soils annually respire an order of magnitude more carbon than all anthropogenic emissions. Current modelling practice relates this flux by a first order decay rate to temperature, leading to the concern that increases in global mean temperatures will significantly increase terrestrial carbon emissions; a positive climate feedback. The present study utilizes the largest known global database of independently sampled site measurements of respiration. At regional scales there is a distinct absence of correlations between mean annual temperatures and respiration, in the presence of some fairly robust associations with mean annual precipitation.

These findings do not refute the well-established influence that temperature is proven to have on respiration. Instead, they highlight a hierarchy of controls that are scale-dependent; critically, that respiration is temperature dependent may be de jure at the site-scale, but the de facto extrapolation to the regional/global scale is not defensible.

A key finding reports the strong and significant correlation found between precipitation and respiration, especially at moderate temperatures (up to $r2 = 0.6$, $p < 0.001$), despite using the inadequate proxy of mean annual precipitation as a surrogate for bio-available soil moisture.

Curiously, site- and year-specific precipitation data (MODIS) does not improve upon the correlations observable between respiration and mean annual precipitation. This may lead one to infer the importance of substrate supply (from above-ground production) in driving consistent biome-specific respiration values, as this is the product of a longer time series of precipitation values, rather than one year.