Spatial/Temporal Patterns in the Atmosphere: The Carbon Cycle Revealed

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Since 1980, we have constructed north-south pattterns of CO_2 and later also of other gases, based on air samples collected at marine boundary layer sites (MBL). At these sites, we have access to "background" air that is well mixed and minimally influenced by nearby large emissions or removals of the trace gases. The measurements are representative of large areas. CO_2 is increasing everywhere at almost the same rate, but the approximate latitude and changing magnitude of sources/sinks is evident in changes of north-south gradients. A new way to highlight these patterns will be presented. Deseasonalized CO_2 gradients are dominated by two factors: fossil fuel burning and interannual variability of terrestrial ecosystems. We can use the observed patterns of sulfur hexafluoride (SF_6) to subtract the fossil fuel component from the observed total CO_2 patterns. It leaves the influence of terrestrial ecosystem variability on the carbon cycle, which stands out very clearly.

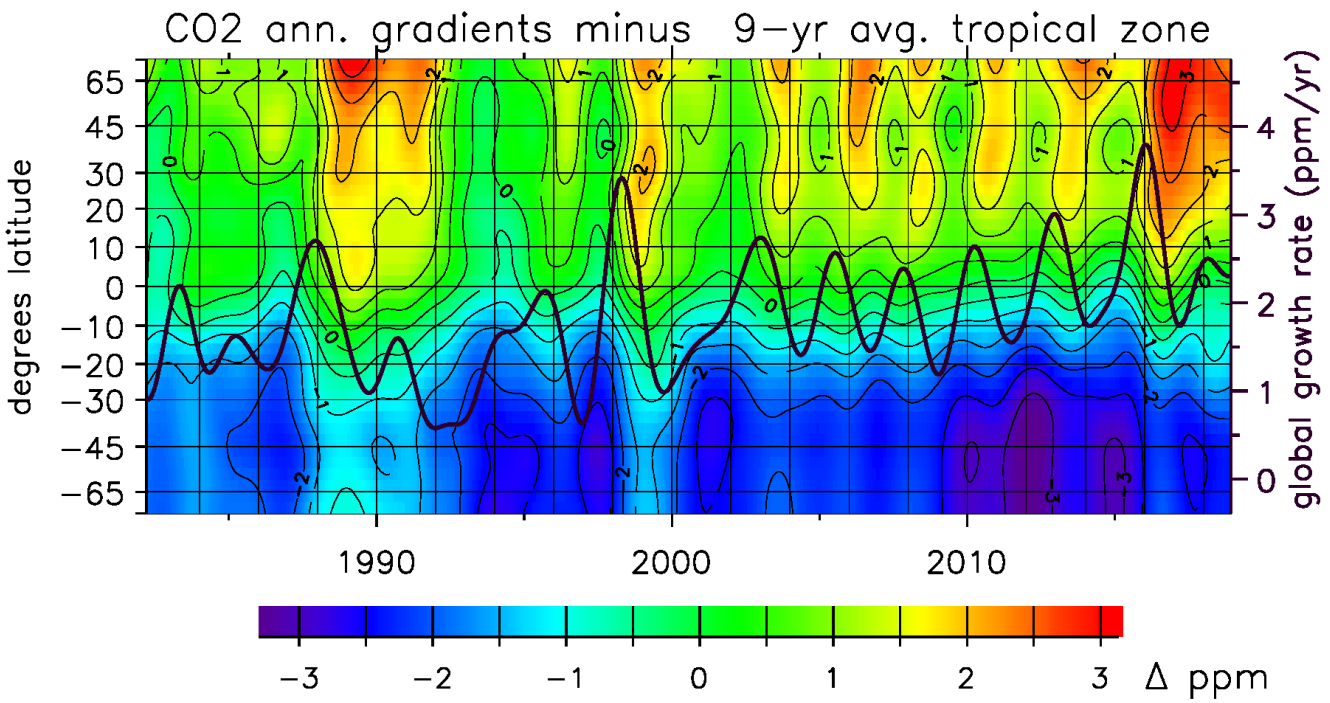

Figure 1. Deseasonalized, north-south gradients of CO_2 relative to the average of the tropical zone, defined here as -17.5 S to 17.5 N, which has been smoothed in time with a low pass filter with a width of nine years. This leaves interannual variability, incl. El Nino, in the tropics and elsewhere.