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Quantitative Flux Ecoregions for AmeriFlux Using MODIS

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Multivariate Geographic Clustering was used with maps of climate, soils, and physiography and MODIS remotely sensed data products to statistically produce a series of the 90 most-different homogeneous flux-relevant ecoregions in the conterminous United States using a parallel supercomputer. Nine separate sets of flux ecoregions were produced; only two will be discussed here. Both the IB and IIIB maps were quantitatively constructed from subsets of the input data integrated during the local growing season (frost-free period) in every 1 km cell. Each map is shown two ways — once with the 90 flux ecoregions colored randomly, and once using color combinations derived statistically from the first three Principal Component Axes. Although the underlying flux ecoregion polygons are the same in both cases, the statistically derived colors show the similarity of conditions within each flux ecoregion. Coloring the same map in this way shows the continuous gradient of changing flux environments across the US. The IB map, since it considers only abiotic environmental factors, represents flux-ecoregions based on potential vegetation. The IIIB map, since it contains remotely sensed MODIS information about existing vegetation, includes the effects of natural and anthropogenic disturbance, and represents actual or realized flux ecoregions. Thus, differences between the maps are attributable to human activity and natural disturbances. The addition of information on existing vegetation exerts a unifying effect on abiotic-only flux ecoregions. The Mississippi Valley and Corn Belt areas show large differences between the two maps. Map IIIB shows a mosaic of "speckles" in areas of intense human land use, ostensibly from disturbances like agriculture, irrigation, fertilization, and clearing. Such "speckles" are absent from areas devoid of intense human land use. Major cities are also evident in the IIIB map. We will use the quantitative similarity of the suite of flux-relevant ecosystem characteristics to modify existing flux measurements and estimate fluxes within unmeasured flux ecoregions. A number of investigators are trying to scale flux tower measurements up to represent larger geographic regions. The flux ecoregion approach is complementary to these bottom-up strategies, since it relies on remotely sensed data to scale flux tower measurements up to continental scales in a top-down way.

http://geobabble.ornl.gov/flux-ecoregions/

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