Global Representativeness Mapping of FluxNet Tower Sites

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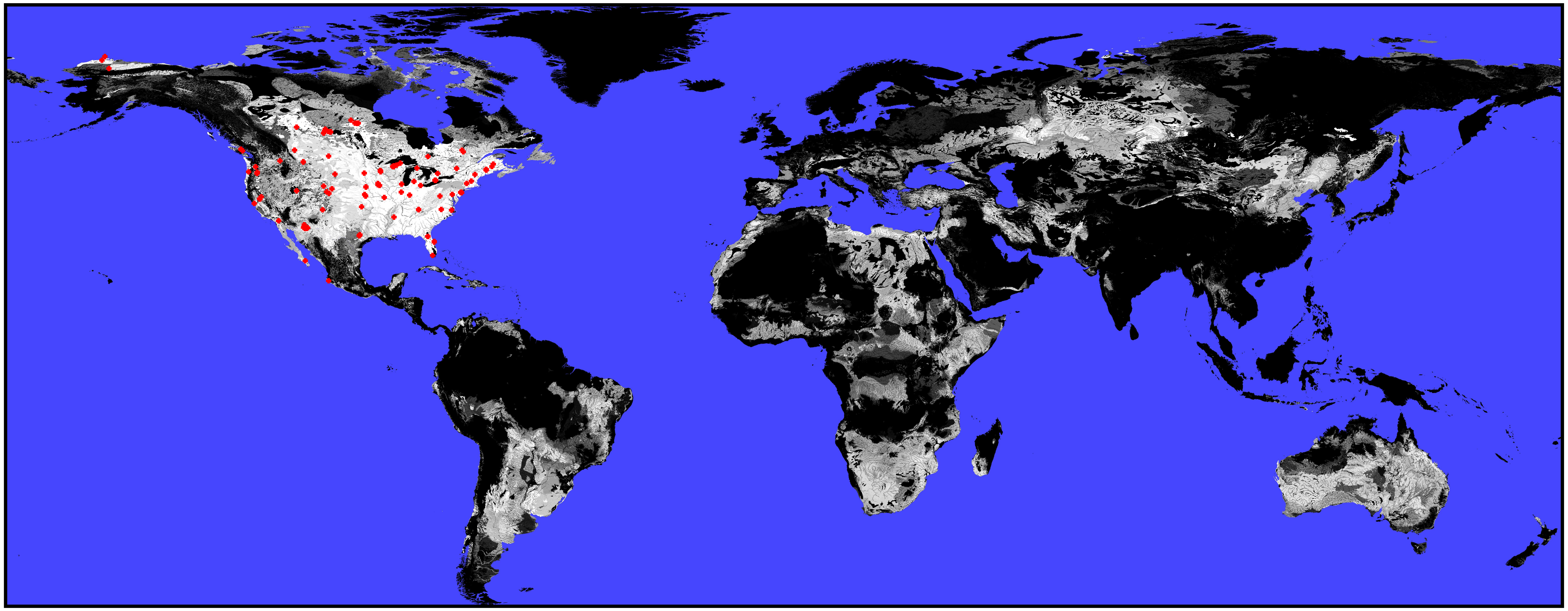
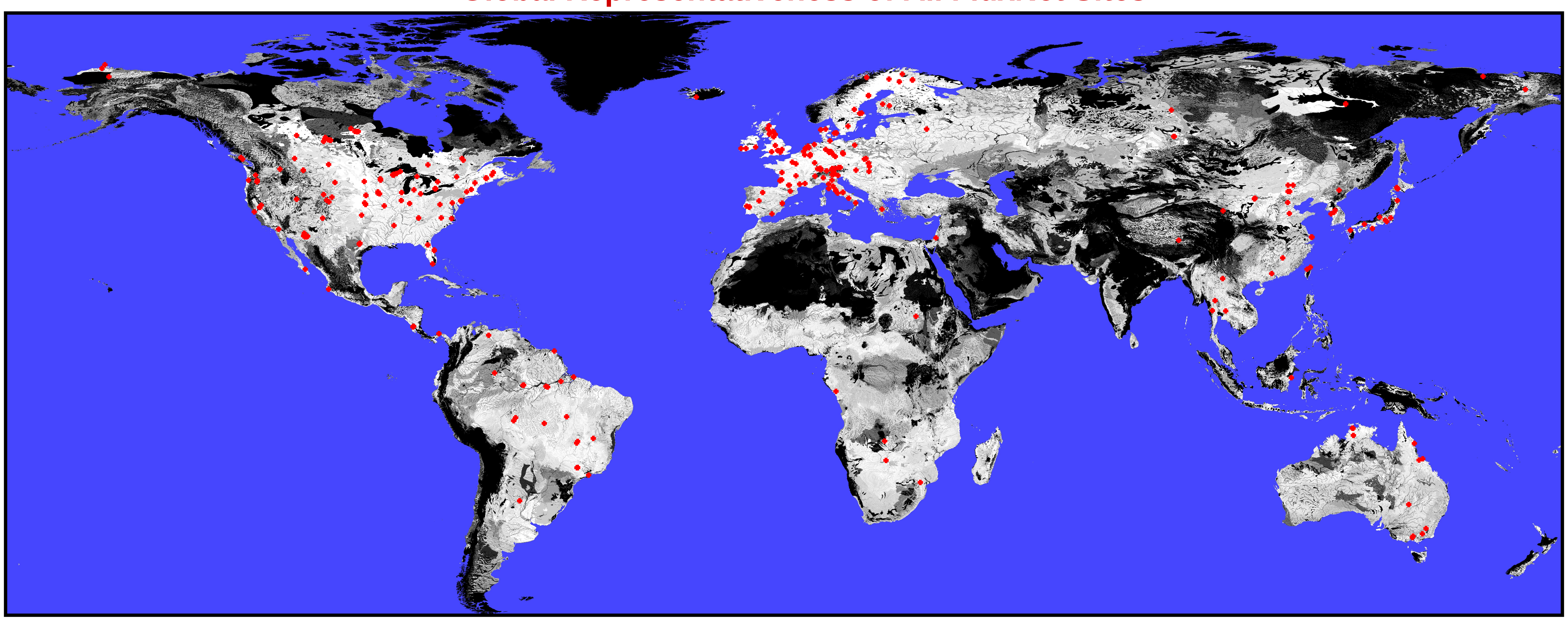
Global Representativeness of the North and Central American FluxNet Sites



Global Representativeness of All FluxNet Sites



Environmental Factors Used for Multivariate Cluster Analysis

A total of 14 environmental factors, at a resolution of 2 arc min (about 4 km at the equator), were used for the multivariate cluster analysis that underlies the global representativeness analysis. The climate, soil, and physiographic input layers are:

1. Elevation (Shuttle Radar Topography Mission (SRTM))
2. Compound Topographic Index (CTI) (Moore et al. 1993)
3. Solar Flux (Rich et al. 1994)
4. Potential Plant Available Water Capacity (Global Soil Data Task 2000)
5. Bulk Density (GSDT2000)
6. Total Soil Carbon (GSDT2000)
7. Total Soil Nitrogen (GSDT2000)
8. Bio−temperature
9. Diurnal Temperature Range
10. Moisture Stress
11. Precipitation of Driest Quarter
12. Precipitation of Wettest Quarter
13. Temperature of Coolest Quarter
14. Temperature of Warmest Quarter

Global Representativeness Maps

The top grayscale map shows the degree to which the official FluxNet sites in North and Central America represent environmental conditions globally. The light/white areas have environmental conditions that are well−represented by the geographic constellation of towers (shown in red), even on continents not containing a tower site, while the dark areas are poorly represented by the current network of FluxNet sites in North and Central America. For example, most of Europe is poorly represented by the existing FluxNet sites in North and Central America. Environmental similarities are characterized by the 14 factors listed above. By per−forming such a global network analysis, it is possible to select locations for new towers in the Americas that will maximize the representation of environmental conditions not only within the Americas, but also globally.

Similarly, the bottom grayscale map shows the degree to which all the official FluxNet sites represent all global environmental conditions. The light/white areas are well−represented by the FluxNet towers (shown in red), even in regions not containing a site, while the dark areas are poorly represented by the FluxNet network. With such a global network analysis, it is possible to identify additional FluxNet tower locations that will maximize the degree to which FluxNet represents environmental conditions globally. By comparing the maps, one can see the incremental representativeness provided by the additional FluxNet sites. For example, some areas of high latitude North America are incidentally represented by current sites elsewhere on the globe.

Conclusions

Our Ameriflux network analysis has been extended to the globe, providing more infor−mation about how far measurements can be applied and the representativeness of flux tower networks. The global network analysis is useful not only for future site selection, but also for providing quantitative infor−mation about the importance of any single tower site in the network. Additional global representativeness mapping is needed to develop basemap products for synthesis analyses and assimilation/inversion studies. We are seeking support to continue the pursuit of this research and the development of these products.

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