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A New Relative Moisture Demand Index to Assess Field Sites

James Dyer & Gaurav Sinha

Department of Geography, Ohio University, Athens, OH 45701 USA

Biogeographers often wish to assess the relative moisture conditions of study sites in the field, as attested by the availability of a number of indices used to categorize sites. These indices assign weights to factors observed to influence moisture demand (e.g., aspect, slope) and availability (e.g., soil water-holding capacity, slope configuration). However, indices do not directly account for the interactive effects between slope, aspect, latitude, and time of year that influence a site's radiation load (and hence moisture demand). We present a field-based relative moisture index that incorporates interactive effects, based on theoretical direct radiation equations and a GIS-based water balance model. We compare our results to two widely used moisture indices: TRMI and IMI. Our modeling efforts focused on the growing season, defined as March equinox - September equinox, and considered the theoretical radiation load for all combinations of slope and aspect for latitudes 30-60°N. These theoretical calculations were compared to four "real-world" study areas in which radiation load was modeled in GIS. Results indicate that sites can be assigned to moisture demand categories based on combinations of slope and aspect, but that these patterns vary significantly by latitude in a non-linear fashion. For this reason, our index is presented as a series of look-up tables. The “moisture availability” component of the index is much less tractable, and requires an assessment of available water-holding capacity. The advantage of our relative moisture index is that it employs a biologically meaningful water-balance approach to objectively assign weights to topo-edaphic factors.