



Alternative Aridity Index for Dryland Expansion Prediction Model

Theme – Ecohydrology and micrometeorology

Type of project: Research

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In the anthropocene, questions have emerged as to whether climate change is causing certain ecosystem types to expand or contract. For instance, Feng & Fu (2013) concluded that drylands, water-scarce areas with sporadic vegetation, had both expanded historically and were projected to expand. This expansion was predicted using a moisture metric known as the Aridity Index (AI). However, the AI's lack of consideration for vegetation and limited ties to mechanical processes has brought its validity (and that of studies based on it) into question (Berg & McColl, 2022). There remains a lack of consensus on the AI or on a viable replacement for it. Here, we propose one such alternative aridity metric, the Equilibrium Aridity Index (EAI), instead. This is a moisture metric that uses the surface flux equilibrium theory (McColl, Salvucci & Gentine, 2019) to physically classify drylands where the land surface is drier than atmospheric conditions (Kim et al., 2021). Using 26 climate simulations from the Coupled Model Intercomparison Project Phase 6 (CMIP6) (Eyring et al., 2016), we analyzed trends in drylands based on AI and EAI under a high GHG emission scenario (SSP5-8.5). We predict that, while the degree of change may vary, drylands will still be globally projected to expand significantly. Drylands host a third of the global population and are an important pillar in global agriculture, accounting 60% of international food supplies (Wang et al., 2022). Lack of knowledge about future dryland expansion can leave policy makers ill-prepared to make informed land-use & conservation decisions.