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Quantifying the ITCZ using wind convergence

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The intertropical convergence zone (ITCZ) expresses itself as a band of strong convection around the equator with associated heavy precipitation. The ITCZ migrates annually to the warmer hemisphere, and the extent to which it ventures away from the equator varies from year to year and across the different oceans and continents. These variations drastically affect rainfall and droughts in the equatorial area and beyond.Till now, various approaches have been proposed to quantify the ITCZ, e.g. based on maximum precipitation or energy budgets. However, a robust quantifier of the actual convergence of surface winds around the equator is still lacking. Here, we propose to quantify ITCZ mid position with a fundamental and intuitive definition using surface wind data and wind convergence only. We use surface wind data from ERA5 reanalysis at 0.25 degree grid resolution as a proxy for calculating the ITCZ mid position on a global scale. Given the u and v components of the wind we calculate the convergence of the windfields around the equator between 20° North and 20° South. We define the latitudinal ITCZ mid position as the maximum convergence on each longitude. We then validate our approach by comparing it to the ITCZ location as given by existing ITCZ position proxies. We also look at characteristics of the ITCZ width to learn more about the influence of wind fields on the extent of the ITCZ. Our results reveal the interannual variability and trends in the ITCZ in the last half century. It also highlights the different characteristics of the ITCZ over the different oceans and continents.