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Do SST gradients drive the monthly climatological surface wind convergence over the tropical Atlantic?

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We present a climatological study of the tropical Atlantic surface wind convergence, one of the main drivers of the marine inter-tropical convergence zone (ITCZ) precipitations, including coastal North-eastern Brazilian and west African rainfalls. Climatological monthly-mean surface wind convergence budget, as well as that of their month-to-month variations, are analyzed over the 2000-2009 decade, using ocean-atmosphere reanalyses and satellite-derived datasets. Sea surface temperature (SST) influence is particularly investigated, via comparison of its Laplacian with that of sea level pressure. Results for monthly-means reveal that the Lindzen-Nigam paradigm does hold in regions of deep convection but only on their flanks. In deep convection regions, the budget analysis suggests the entrainment due to elevated heating by cumulus convection as the leading term. Elsewhere, over the “open ocean ITCZ” meridional flanks, as well as over the “coastal one” (Gulf of Guinea and Northeastern Brazilian coasts), the pressure contribution is positive and largely dominated by its component below the boundary layer closely related to the SST. Horizontal advection is also found important over these areas, but with the pressure as the first-order driver. Otherwise, month-to-month variations of ITCZ are controlled by the geostrophy within the pressure contribution tightly dominated by the free tropospheric component.