

Hadley and Walker Circulation variability based on 150 years of historical observations

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How are the large-scale features of the tropical-subtropical atmospheric general circulation expected to change with greenhouse forcing? There are at least two approaches to answering the question: (1) Climate modeling simulations with realistic external forcing functions; and (2) Analysis of the response of the system to internal and external forcings, based on climate history. Here we investigate the latter strategy, using simple diagnostics calculated from large-scale analyses of surface winds, sea surface temperature, sea level pressure, and rainfall (GOSTA: Bottomley et al., 1990; COADS: Woodruff et al., 1987) data sets. We use these indices to estimate variations in the meridional (Hadley) and zonal (Walker) components of the tropical-subtropical overturning circulation over the past 150 years, and to speculate on the response of the system to the natural forcing provided by the global ENSO. Ideally, similar studies could be extended into the past using paleoproxy observations of near-surface conditions. Design of a small sampling network which might be developed to further address such questions will be discussed.