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# "Analyzing Seasonal, Annual, and Diurnal Dew Point Variability Along a North–South Transect in the Eastern United States"

INTRODUCTION: Dew point temperature is a key indicator of atmospheric moisture, essential for understanding weather, climate, and human health. Unlike relative humidity, dew point provides an absolute measure of moisture content and is linked to heat stress, storm potential, and energy demand. As climate change drives rising air and sea surface temperatures, the atmosphere's moisture capacity increases, potentially leading to higher dew point values. While this relationship is supported theoretically, few studies have examined long-term dew point trends across diverse U.S. climate regions. This study analyzes spatial and temporal changes in dew point across a five-station north–south transect in the eastern United States.

OBJECTIVES: This project investigates (1) whether annual and seasonal dew point temperatures have changed over time; (2) how monthly distributions vary throughout the year; and (3) how diurnal dew point cycles differ along a latitudinal climate gradient.

METHODS: Hourly dew point data (1973–present) were collected from five first-order weather stations: New Orleans (LA), Memphis (TN), St. Louis (MO), Minneapolis–St. Paul (MN), and International Falls (MN). These represent humid subtropical to continental climates. Data were used to calculate annual and seasonal means, monthly kernel density distributions, and hourly diurnal cycles. Pearson correlations assessed long-term trends, and two-sample t-tests compared seasonal values (e.g., summer vs. winter).

RESULTS: Trends varied by latitude. Northern stations—particularly International Falls ($R^2 \approx 0.33$) and Minneapolis—showed significant increases, especially in winter. Central stations (St. Louis and Memphis) were stable, while New Orleans showed no long-term change despite strong seasonal contrast. All stations exhibited expected monthly and diurnal cycles, with peak dew points in summer and afternoon hours. T-tests confirmed significant seasonal differences ($p < 0.001$) across all sites.

CONCLUSIONS: Dew point increases were most pronounced at northern stations in winter, suggesting climate-driven shifts in atmospheric moisture baselines. Southern stations remain humid but showed less change. These findings highlight the role of latitude in shaping regional climate responses and the need for continued monitoring to assess implications for public health, agriculture, and infrastructure.