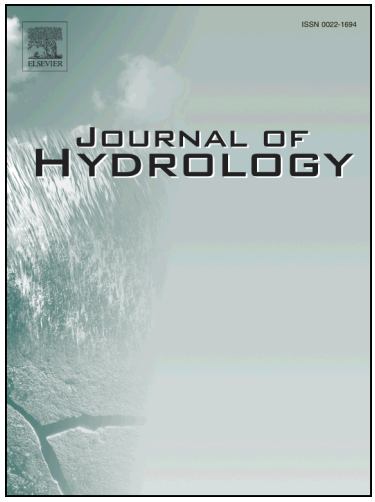

Long-Term Patterns of Air Temperatures, Daily Temperature Range, Precipitation, Grass-Reference Evapotranspiration and Aridity Index in the USA Great Plains: Part I. Spatial Trends

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LONG-TERM PATTERNS OF AIR TEMPERATURES, DAILY TEMPERATURE RANGE, PRECIPITATION, GRASS-REFERENCE EVAPOTRANSPIRATION AND ARIDITY INDEX IN THE USA GREAT PLAINS: PART I. SPATIAL TRENDS

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Abstract**: Due to their substantial spatio-temporal behavior, long-term quantification and analyses of important hydrological variables are essential for practical applications in water resources planning, evaluating the water use of agricultural crop production and quantifying crop evapotranspiration patterns and irrigation management vs. hydrologic balance relationships. Observed data at over 800 sites across the Great Plains of USA, comprising of 9 states and 2,307,410 km^2 of surface area, which is about 30% of the terrestrial area of the USA, were used to quantify and map large-scale and long-term (1968-2013) spatial trends of air temperatures, daily temperature range (DTR), precipitation, grass-reference evapotranspiration (ET_o) and aridity index (AI) at monthly, growing season and annual time steps. Air temperatures had a strong north to south increasing trend, with annual average varying from -1 to 24°C, and growing season average temperature varying from 8 to 30°C. DTR gradually decreased from western to eastern parts of the region, with a regional annual and growing season averages of 14.25°C and 14.79°C, respectively. Precipitation had a gradual shift towards higher magnitudes from west to east, with the average annual and growing season (May-September) precipitation ranging from 163 to 1,486 mm and from 98 to 746 mm, respectively. ET_o had a southwest- northeast increasing trend, with regional annual and growing season averages of 1,297 mm and 823 mm, respectively. AI increased from west to east, indicating higher humidity (less arid) towards the east, with regional annual and growing season averages of 0.49 and 0.44, respectively. The spatial datasets and maps for these important climate variables can serve as valuable background for climate change and hydrologic studies in the Great Plains region. Through identification of priority areas from the developed maps, efforts of the concerned personnel and agencies and resources can be diverted towards development of holistic strategies to address water supply and demand challenges under changing climate. These strategies can consist of, but not limited to, advancing water, crop and soil management, and genetic improvements and their relationships with the climatic variables on large scales.* ***Keywords. *Climate variables, air temperature, daily temperature range, evapotranspiration.*