

## **Historical drought occurrences in Turkey: An analysis based on the standardized precipitation index (SPI)**

Ali Ümran Kömüşcü

Turkish State Meteorological Service, Ankara, Turkey

Ercan Kahya<sup>1</sup>

Professor, Istanbul Technical University, Civil Engineering Department, Hydraulic Division, 34469 Maslak Istanbul, Turkey

**Abstract.** Prolonged droughts experienced in Turkey highlighted need for addressing multi-scale nature of drought occurrences and their monitoring. In this study, meteorological droughts in Turkey have been investigated by Standardized Precipitation Index (SPI) method to document geographical variations of drought occurrences based on frequency and severity factors at multiple time steps. The Index is based on fitting a probability distribution to long term precipitation series, which is then transformed into a normal distribution. The SPI applied to long-term precipitation data at 101 stations across Turkey for the period 1951-2001 and drought occurrences in varying categories at 3, 6, 12-month and 2-year time steps were analysed on regional basis. The study concludes that drought occurrences in Turkey exhibit diverse spatial patterns with varying time steps. While the south eastern and eastern parts of the country are more vulnerable to moderate droughts at short time steps, the impact would be expected less at the coastal parts where the drought is only effective at longer durations and occur at moderate drought levels. On the other hand, the coastal and interior parts are more vulnerable to severe droughts as opposed to the eastern Turkey where the drought frequencies tend to lessen at short-time steps. At 12-month time step, moderate droughts occurred more frequently covering nearly two-thirds of the country. This severe drought characterization totally changes at longer time steps. Except the central Anatolia, majority of the country has low occurrences of severe droughts at 12-month time step. At 2-year step, no extended severe drought areas are identified, rather few localities display high severe drought occurrence. Very severe drought occurrences are more typical both in the coastal and interior parts at shorter time steps, except the eastern Anatolia where the drought occurs at low frequencies. As the time step increases, frequency of the severe droughts increases as well especially along the Mediterranean coast and some localities in the central parts. At longer time steps the hydrologic drought is likely to occur in the coastal parts while the interior parts will suffer from agricultural drought under severe drought conditions.

---

<sup>1</sup>Assoc. Prof., Hydraulic Division  
Civil Engineering Department  
Istanbul Technical University  
34469 Maslak Istanbul, Turkey  
Tel: + 90 (212) 285-3002  
e-mail: kahyae@itu.edu.tr