A Climatology of the Haines Index for North America Derived from NCEP/NCAR Reanalysis Fields

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Abstract:

Originally introduced in 1988 as the “Lower Atmospheric Severity Index”, the Haines Index (HI) characterizes the potential impact of dry, unstable air on wildfires. Although imperfect, HI remains a widely-used tool in wildfire forecasting and monitoring. HI is computed from lower-troposphere temperature and dewpoint observations and has three different versions (referred to as “low,” “mid” and “high”) that consider variations in surface elevation. The index values range from 2 (low risk) to 6 (high risk). In spite of its popularity, a comprehensive, long-term climatology of HI does not currently exist. To address this need, we have prepared a 40-year (1961-2000) climatology of HI for North America. The climatology uses 0000 UTC fields from the NCEP/NCAR reanalysis and was developed as a baseline for investigating historical variations and potential future changes in the atmospheric component of wildfire risk. The climatology includes an electronic atlas that focuses on the annual and seasonal spatial variations in the frequency and characteristics of HI. In addition to standard statistical summaries, the temporal persistence of HI is explicitly considered. Large spatial and seasonal variations in HI are evident from the climatology. The persistence of HI values >5 can be used to illustrate some of these variations. In eastern North America, the annual average persistence of HI values > 5 (calculated using the “low” version of the index) is only 1-2 days except for the southern Mississippi Valley and western Gulf coast where the average persistence increases to 3-5 days. Little seasonal variation is evident. In central North America, HI values > 5 (calculated using the “mid” version of the index) are more persistent, and seasonal variations are more pronounced. Annual average run lengths vary from 2-3 days in the eastern portion of this area to close to 6 days in the western Plains. Large index values are considerably more persistent in summer when the mean run length exceeds 10 days in the western Plains. In western North America, average run lengths of HI values > 5 (calculated using the “high” version of the index) are longest (> 3 days) in the Great Basin. During summer, the mean run length in this area increases to 6-7 days. In contrast, mean run lengths in the Pacific Northwest are generally shorter than 2 days throughout the year. These findings, along with those for the additional statistical measures included in the electronic atlas, can provide fire managers with useful information for interpreting and evaluating wildfire forecasts.