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RESEARCH ARTICLE

Utilization of the Google Earth Engine for the evaluation of daily soil temperature derived from Global Land Data Assimilation System in two different depths over a semiarid region

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Abstract

The Google Earth Engine (GEE) was used to investigate the performance of the Global Land Data Assimilation System (GLDAS) soil temperature (ST) data against observed ST from 13 synoptic stations over a semiarid region in Iran. Three-hourly ST data were collected and analyzed in two depths (0–10 cm; 40–100 cm) and 5 years. In each depth, GLDAS-Noah ST data were evaluated for daily minimum, maximum, and average ST (i.e., T_{min}, T_{max}, and T_{avg}). Based on the correlation coefficient, Kling–Gupta Efficiency, and Nash–Sutcliffe Efficiency the overall performance of the GLDAS-Noah is 0.96, 0.66, and 0.79 for T_{min}; 0.97, 0.84, and 0.89 for T_{avg}; and 0.95, 0.89, and 0.89 for T_{max}, respectively in the first layer. Likewise, 0.97, 0.85, and 0.86 for T_{min}; 0.97, 0.77, and 0.80 for T_{avg}; and 0.97, 0.69, and 0.69 for T_{max} are obtained in the second layer. However, there is a significant negative bias which tends to underestimate ST in the two investigated layers, given by an average bias over all the stations analyzed of −24%, −12%, and −5% for T_{min}, T_{avg}, and T_{max} in the first layer, and average bias of −8%, −13%, and −17% for T_{min}, T_{avg}, and T_{max} in the second layer. This study reveals that GLDAS-Noah-derived ST can be used in arid regions where little or no observation data is available. Moreover, GEE performed as an advanced geospatial processing tool in regional scale analysis of ST in different layers.

KEYWORDS

GLDAS-Noah, Google Earth Engine, semiarid region, soil temperature, synoptic station