Simulation of astronomical solar radiation over Yellow River Basin based on DEM

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Based on the developed distributed model for calculating astronomical solar radiation (ASR), monthly ASR with a resolution of 1 km×1 km for the rugged terrains of Yellow River Basin was calculated, with DEM data as the general characterization of terrain. This model gives an all-sided consideration on factors that influence the ASR. Results suggest that (1) Annual ASR has a progressive decrease trend from south to north; (2) the magnitude order of seasonal ASR is: summer>spring>autumn>winter; (3) topographical factors have robust effect on the spatial distribution of ASR, particularly in winter when a lower sun elevation angle exists; (4) the ASR of slopes with a sunny exposure is generally 2 or 3 times that of slopes with a shading exposure and the extreme difference of ASR for different terrains is over 10 times in January; (5) the spatial differences of ASR are relatively small in summer when a higher sun elevation angle exists and the extreme difference of ASR for different terrains is only 16% in July; and (6) the sequence of topographical influence strength is: winter>autumn>spring>summer.

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