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Technique for Determining Earth's Surface Evaporation

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Opinion

Considering evaporation and transpiration is strongly related to energy transfer mechanisms, accurate characterization of ET is critical for understanding climatic dynamics and terrestrial ecosystem productivity. It can also be used in fields such as water resource management and wildfire assessment. As a result of previous work, precise estimation of evaporation and transpiration is now possible using a variety of approaches based on surface meteorological and sounding observations. However, ground monitoring networks only constitute a limited percentage of the world's geographical surface. As a result, numerous efforts have been made to reduce the reliance on ground observations for predicting the spatial distribution of evapotranspiration at regional to global scales. For this reason, satellite remote sensing is a potential instrument. Nonetheless, most present strategies for estimating evapotranspiration from satellite remote sensing are inadequate since they rely on ground data.

As a result, consistent assessment of current global evapotranspiration distributions using satellite remote sensing that is independent of ground observations remains a complex issue. The use of reanalysis data from Global Circulation Models (GCM) as a proxy for ground observations is one feasible solution, but it is still problematic because the accuracy of the reanalysis is equally dependent on the ground observation network. Furthermore, the grid scale of reanalysis data is typically too coarse to be integrated with finer scale satellite observations. Using a combination of the vegetation index and the surface radiant temperature is a popular method for estimating evapotranspiration from a satellite. This method is known as the VI-Ts method. An example of the VI-surface radiant temperature scatter diagram illustrates the utility of a scatterplot of VI and surface radiant temperature of a collection of pixels inside a fixed square region (we call it a "window") in a satellite picture. A VI-Ts diagram, in general, depicts a linear or triangular distribution with a negative association between VI and surface radiant temperature.

During a growing season, changes in the slope of a VI-Ts scatterplot were shown to match simulated surface conductance in a semiarid habitat. In general, because thick vegetation has lower surface radiant temperature as the surface grows drier, sparse vegetation and bare soil become warmer relative to vegetation, resulting in greater negative values. Since then, research on VI-Ts approaches has developed at a rapid pace established an SVAT model inversion technique to estimate available soil moisture from VI-Ts triangle distributions in the absence of meteorological data developed an algorithm to estimate the “water deficit index ” using a simple geometric consideration on the VI-Ts diagram and a theoretical basis of crop water stress index proposed by developed another VI- Ts (surface radiant temperature) method using a linear decomposition of the triangular distribution of the VI-Ts diagram and estimated the “” parameter of the Priestley-equation Taylor's. This strategy offers obvious advantages in terms of simplicity and consistency.

It does not necessitate any surface meteorological data. However, the preceding VI-Ts approaches have numerous drawbacks. For starters, several of them still require surface meteorological data. Second, when implemented at global scales, numerical model inversion may necessitate a substantial amount of computer resources. Third, because of the low aerodynamic resistance of the vegetation canopy, Ts is near to the atmospheric temperature in dense vegetation, making estimating evapotranspiration from a temperature gradient difficult. Fourth, some models rely on a single-source big-leaf model, which may be challenging to adapt to complicated landscapes with mixed land cover. In this paper, we present a new version of the VI-Ts approach for estimating global evapotranspiration using moderate-resolution optical remote sensing data from the Aqua/MODIS sensor. Taking the aforementioned issues into consideration, we devised five policies for the development of the suggested algorithm. “Stand by yourself.” It is capable of operating in the absence of surface meteorological data, air temperature, and boundary layer stability).

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