Formulation of the atmosphere layer in distributed runoff models

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## 1. Abstract

An accurate evaluation of grid hydroclimatic parameters is described for distributed hydrological models. The method presented in this paper uses the hourly records at a few locations to derive the physical parameters that describe the spatial and temporal variability. The spatial and temporal vertical temperature, pressure, and wind filed in each grid are calculated. Also the output data at a point source height is used for simulating the plume rise according to Gaussian plume model. The horizontal and vertical wind speeds and directions are calculated by using the linear interpolation scheme for the horizontal pressure gradients, and the Ekman layer approach.

## 2. Distribution of temperature

The amount of solar energy received by a grid depends on time of day, seasonality, latitude, altitude and dynamic behaviors of land. The vertical ambient temperature is assumed to be linear, and the vertical profile of temperature is calculated by using the lapse rate;

$$T_{i,j} = T^{*}_{i,j} - \Gamma.\Delta z \qquad (1)$$

In order to select the best Γ for the distributing $T_{i,j}$, $T^{*}_{i,j}$ was analyzed in order to identify ( $R^2$) among the weather stations;

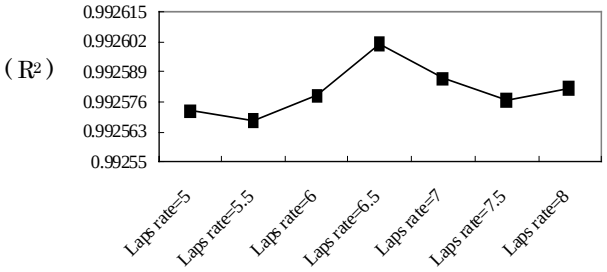


Figure 1 Correlation coefficients considering different lapse rates.

The correlation analysis doesn't fully account for the spatial and temporal characteristics of the watershed. therefore precipitation is used in order to identify seasonality of Γ.

## 2. Distribution of pressure

The distribution of air pressure is obtained by,

$$P_{i,j} = P^{*}_{i,j}\left(\frac{T_{i,j}}{T^{*}_{i,j}}\right)^{\frac{g}{R\Gamma}} \qquad (2)$$

## 3. Distribution of wind

Wind field is needed for calculating of the turbulent flux terms in the heat budget equation, and for calculating the concentration of air pollutants in the equation of diffusion. The wind velocity, which is observed at the ground level, is distributed in the vertical direction by using the Ekman boundary layer approach. The mean wind changes direction with height and approaches the geostrophic wind, at the top of the transition layer as illustrated by Fig. 2.

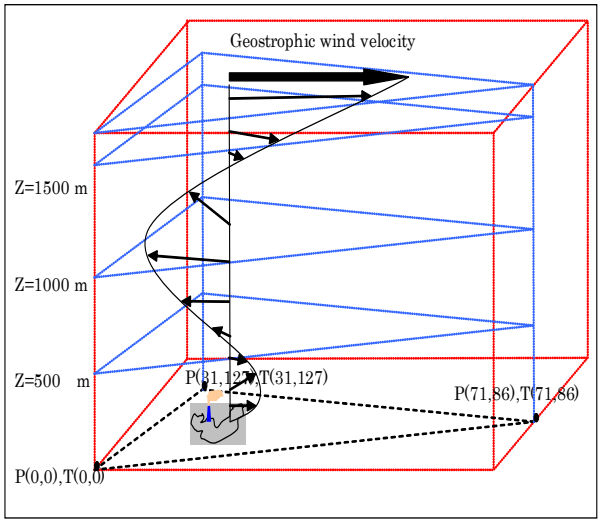


Figure 2 A plot of the vertical profile of the Ekman wind velocity.