# MODELING CANOPY INTERCEPTION OF *PICEA CRASSLIOLIA* FOREST IN QILIAN MOUNTAINS USING QUICKBIRD SATELLITE DATA

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## 1. INTRODUCTION

Canopy interception plays an important role in hydrological cycling and water balance of ecosystems in the arid and semi-arid region ecosystems. Interception process modelling is one of main components in forest hydrology. Models of simulating interception are the crucial links between hydrological and ecological processes coupling. At present, most researches are concentrating on the characteristics of interception at stand or plot scale. Models of canopy interception on river basin or landscape scale based on RS and GIS are lacking because the factors influencing canopy interception such as precipitation, vegetation are difficult to spatialize. The statistical model of canopy interception was improved based on investigation in the study area. Considering the important influence of canopy structure, LAI was introduced to the model. After parameters in the model were spatialized, the estimation of canopy interception was upscaled from the plot to the catchment using remote sensing data and GIS.

## 2. MATERIALS AND METHODS

### 2.1. Study area

The study area (Pailugou river basin, 100°17′6″-100°18′26″E， 38°31′52″-38°33′37″N) is located in Xishui natural reserve of Qilian Mountains, northwest China.

### 2.2 Data collection

Rainfall inside and outside forest were measured in 2008. Leaf area index (LAI) was obtained by hemispherical photography (fisheye camera). Remote sensing image (QuickBird) with high resolution was collected from China remote sensing satellite ground station. The distribution of *Picea crassliolia* forest in the study area was extracted from remote sensing image using Maximum likelihood supervised classification.

### 2.3 Method

To simulate the spatial distribution of rainfall interception, flow chart of methods is showed in Fig.1. The statistical model of canopy interception was improved. The spatial distribution of precipitation was obtained by the relationship between precipitation and altitude in the study area. The spatial distribution of LAI was derived from the relationship between LAI and Normalized Difference Vegetation Index (NDVI) extracted from remote sensing image.

## 3. RESULTS AND DISCUSSION

The model of rainfall interception by canopy is expressed as:

$$I = 0.45149 * LAI[1 - \exp(-\frac{P}{0.45149 LAI})] + 0.27327 P \quad (1)$$

where I is single interception, LAI is  leaf area index , and P is single precipitation. There is good (r=0.845, SD=0.711, t<0.05) agreement between measured interception and estimated result. The statistical model between LAI and Normalized Difference Vegetation Index (NDVI) is given as:

$$LAI=28.7015*NDVI-11.6243 \quad (2)$$

show a good linear correlation coefficient (r=0.875,t<0.05) of these variables. The relationship between precipitation and altitude was that elevation value increased 100m lead to 4.9% increase of precipitation in Pailugou catchment. As it can be used for modelling the distribution of precipitation.

After simulating the spatial distribution of LAI and precipitation, the spatial distribution of rainfall interception was calculated by the equation (1).  The outputs estimated showed that the canopy interception in study area is between 97.9-236.6 mm and mean interception is 161.8 mm. The minimum interception appeared at the lower altitude area and the maximum interception presented at the higher altitude area. The interception percentage of *Picea crassifolia* forest in Pailugou catchment was 27.92%-58.00% and increased then decreased along with the raising of altitude.

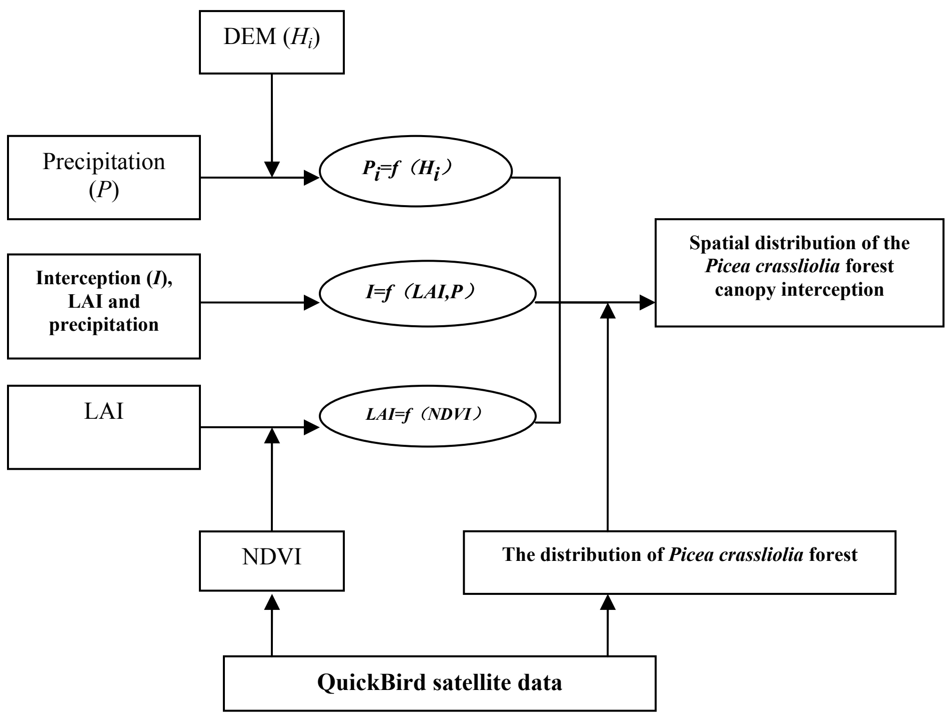


Fig.1 Flow chart of methodology in the study

## 4. CONCLUSION