

## Full Length Research Paper

# Impact and simulation of soil organic carbon on soil water infiltration process

Jing Li<sup>1,2,3\*</sup>, Dandong Chang<sup>4</sup> and Xiaohui Yang<sup>1</sup><sup>1</sup>Forestry Research Institute, Chinese Academy of Forestry, 100091, Beijing, China.<sup>2</sup>M&F (Beijing) Soil and Water Conservation Technique Co., Ltd., 100038, Beijing, China.<sup>3</sup>Plant Development and Management Center for Soil and Water Conservation of Ministry of Water Resources, 100038, Beijing, China.<sup>4</sup>Soil and Water Conservational Monitor Center, Ministry of Water Resources, 100055, Beijing, China.

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**Based on the data of soil organic carbon content and soil water infiltration rates on four kinds of forest land, features of the organic carbon content distribution and the infiltration process of water in the soil were analyzed. It is found that, from large to small, the sorting of the four kinds of forest land on average soil organic carbon content are respectively: broad leaved mixed forest, mixed coniferous and broad leaved forest, coniferous mixed forest, and mixed arbor and shrub forest. The organic carbon has an uneven distribution in soil vertical direction. The content in surface soil is comparatively high, and with the increase of depth the content decreases gradually. And it is shown that water infiltration rate has close relation with the soil organic carbon which can be expressed as the following formula:**

**$i(t) = (i_f + (i_i - i_f)e^{-i_f t/10}) (1 - t \cdot e^{\text{SOC}/10}/100)$ . Compared with the Horton soil water infiltration model**

**simulation, the relative coefficients of the soil water infiltration rate simulation value and the practical measured value rise from 0.950, 0.951, 0.933, 0.921 to 0.968, 0.972, 0.961, 0.970. And the relative coefficients of the infiltration content simulation value and the practical measured value of a certain time period rise from 0.905, 0.628, 0.756, 0.898 to 0.941, 0.827, 0.905, 0.940. This model is much closer to the practical measured value and provides the estimation and simulation of the soil water infiltration process with a correct and effective approach.**

**Key words:** Soil organic carbon, soil water infiltration, infiltration rate, soil water infiltration model.

## INTRODUCTION

Soil water infiltration is a vital part of the water circulation and one of the approaches for the ground water to be transformed to soil water that can be absorbed by the plants. It determines the speed, quantity, efficiency, and distribution etc of the transformation from groundwater to

the soil water. Research on the infiltration issue is not only helpful for promoting the development of basic theoretical study of the soil water infiltration and migration, but also provides scientific basis for the comprehensive evaluation of the resources of the surface

\*Corresponding author. E-mail: lijingal26@126.com, Tel: +86 10 63204361. Fax: +86 10 63204359.

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water and ground water, and the reasonable determination of the technical parameters for farmland irrigation. Some scholars research the soil texture, soil water content, and the soil water content and soil structure's impact on the features of the soil water infiltration (Gang and Xiangyun 2008; Suhua, 2005; Zhang, 2007; Franzluebbers, 2002; Helalia et al, 1988). The initial soil water infiltration rate increased with the moisture content increased, while the stability infiltration rate accompanied with the increase of the moisture content is reduced (Liu et al., 2009). Soil water infiltration capacity increases with the density of initial decline, infiltration capacity attenuation increases with increasing speed bulk density (Li and Fan, 2009). And it is considered that under the pressure water infiltration condition, soil water infiltration capacity is not only influenced by the basic physical properties of soil (soil texture, the dry density and soil moisture content, etc), but also influenced by the infiltration water head (Li et al., 2009). Only Zhao Yonggang refer to the soil structure factor except bulk density, porosity and the capillary porosity outside, but also the organic carbon content influence the soil stability infiltration rate (Zhao et al., 2008). However, there is few research about how much degree the soil organic carbon impact on the soil water infiltration speed and progress,.

The soil organic matter has colloid feature. It can absorb large amount of positive ion. Therefore, it not only has the function of maintaining the fertility and buffering performance of the soil (Francisco et al., 2007), but also has the functions of loosening the soil, promoting soil porosity (Al Haijian, 2002), and promoting the forming of the aggregated structure (Guan et al., 1991). Thus soil organic matter may affect the soil water infiltration more or less. Generally, soil organic carbon is the index of soil organic matter. So it will perform analysis on the relation of the soil organic carbon and the soil water infiltration speed, which is based on the data of measuring organic carbon content in the soil and the test for the soil water infiltration on four kinds of forest standard plots. Combining the Horton soil water infiltration model, it establishes the soil water infiltration model containing the initial infiltration speed, stable infiltration speed, and soil organic carbon content.

### Sample plot overview

This institute sets the research sample plot in the middle part of Chongqing Simian Mountain of China. It is located at the end of the Three Gorges Reservoir Area, south part of Jiangjin District which is at the southwest of Chongqing City. It is of 1,150 m above sea level with the geographical location of E106°17' to 106°30', N28°31' to 28°43'. This area has good natural secondary forest and planted forest with total coverage of 95.41%.

The soil of the sample plot is of slightly acid yellow soil.

The base exchanging quantity of this forest area is comparatively low, so as the fertility. However, the raw organic matter accumulation is comparatively high and the nitrogen conversion rate is comparatively low; the soil has little clay content and is with good water infiltration performance, while the base can easily be eluviated. The soil is of bad water or fertilizer conservation performance. It has about 70 cm soil thickness.

## SAMPLE PLOT SELECTION AND TEST METHODS

### Sample plot selection

Comprehensively considering the factors as plant types, landform status, slope direction and sea level, four sample plots which cover an area of 20 m × 20 m each are set in Zhangjiashan forest area of Chongqing Simian Mountain, which are respectively the broad-leaved mixed forest (S1) taking *Lithocarpus glabra*, *Castanopsis fargesii*, and *Clethra fargesii* as the main plants, the mixed coniferous and broad-leaved forest (S2) taking the *Cunninghamia lanceolata* and *Pinus massoniana* as the main plants, the mixed coniferous and broad-leaved forest (S3) taking the liquidambar and *C. lanceolata* as the main plants, as well as the mixed arbor and shrub forest (YLMF3) (S4) taking the *C. fargesii* and *Eurya loquaiana* as the main plants. The soil matrix of the sample plots are as follows in Table 1.

### Test equipment and methods

Soil section can be dug in all types of sample plots for research and the soil layers taken as the basis; the soil slope can be divided into 3 layers, with each layer being 20 cm. Three repeated soil samples shall be collected on each layer for analysis of the soil organic carbon.

Double-ring method is adopted for testing the soil water infiltration. The external ring diameter of the double-ring instrument is 22 cm while the internal ring is of 10.5 cm diameter. Both the external and the internal rings are of 25 cm height. The depths into the soil of the internal and external rings during the test process are both 10 cm, maintaining 5 cm internal and external ring infiltration head water supply till it reaches stable infiltration. The water temperature during the test process is maintained at around 20°C.

Soil saturation hydraulic conductivity of the soil samples of each are tested by ST-70A Soil Water Infiltration Instrument and constant-head method.

## DATA ANALYSIS

### Soil water infiltration process analysis

From the double-ring infiltration test for the water content of the 4 plots for 12 times, it is found that all the plots needs about 200 min to reach stable infiltration. Table 2 shows the soil water double-ring infiltration processes of the 4 plots under the same hydrological and meteorological conditions at the early phase.

From the test result of Table 3, it can be found that the infiltration processes of the four plots are different. For the initial infiltration speed, from large to small, the sorting is: broad-leaved mixed forest> coniferous mixed forest>

**Table 1.** Basic information of standard land of forest stands.

Sample plot No.	Plant group	Main plants	Arbor closure	Shrub coverage	Herbage coverage	Slope direction	Slope position	Surface slope
S1	Broad-leaved forest	Robur ( <i>Lithocarpus glabra</i> ), Mangrove tree ( <i>Castanopsis fargesii</i> ), Alder ( <i>Clethra fargesii</i> )	0.6	40	30	SE29°	Downgrade	26°
S2	Coniferous forest	Chinese fir ( <i>Cunninghamia lanceolata</i> ), Masson pine ( <i>Pinus massoniana</i> )	0.6	25	30	SW65°	Middle slope	19°
S3	Mixed coniferous and broad-leaved forest	Sweetgum (Liquidambar), Chinese fir ( <i>Cunninghamia lanceolata</i> )	0.7	30	15	SE15°	Downgrade	27°
S4	mixed arbor and shrub forest	Mangrove tree ( <i>Castanopsis fargesii</i> ), Twigs Eurya ( <i>Eurya loquaiana</i> ), ovatum Planch ( <i>Rhododendron bachi</i> )	0.4	45	50	NW80°	Uprise	29°

mixed coniferous and broad leaved forest> mixed arbor and shrub forest. This is basically of the same trend as the change of the soil saturation hydraulic conductivity (except the mixed arbor and shrub forest) for the 0 to 20 cm surface layer forest soil. When it reaches stable infiltration speed, the speed ranking changes: Mixed arbor and shrub forest> broad-leaved mixed forest> coniferous mixed forest> mixed coniferous and broad leaved forest. Based on the analysis, the reason why the mixed arbor and shrub forest are having the fastest infiltration speed is that the soil of this land is of comparatively small soil bulk density but high total porosity so that the soil has rich pore space. However, at the front phase, the infiltration speed and the infiltration quantity are both small, therefore the soil still has space to contain more water content under certain soil water potential.

### Analysis on the feature of organic carbon distribution

Through the testing of the organic carbon contents for 48 soil samples from 4 sample plots, it is found that the distribution of the organic carbon in different forests has obvious space aberrance/difference. First, generally from large to small, the organic carbon contents of various types of forest land are: broad-leaved mixed forest> mixed coniferous and broad leaved forest> coniferous mixed forest> mixed arbor and shrub forest. The broad-leaved mixed forest is of the highest soil organic carbon content with average value of 20.1 g/kg. The following is the mixed coniferous and broad leaved forest whose organic carbon content is of 1.4 g/kg lower than that of the broad-leaved mixed forest and is 0.9 g/kg higher than that of the coniferous mixed forest. This indicates that the plant group structure inside the forest has obvious function on the organic carbon content in the soil.

Secondly, through the testing for the soil organic

carbon of the 4 sample plots, it can be found that there is obvious difference in surface soil organic carbon and first layer average soil organic carbon contents of different types of forest land. From the surface soil, the natural broad leaved mixed forest is of the largest organic carbon content. The followings are coniferous mixed forest and mixed coniferous and broad leaved forest, and the mixed arbor and shrub forest is of the minimum organic carbon content, namely the broad-leaved mixed forest> coniferous mixed forest> mixed coniferous and broad leaved forest>mixed arbor and shrub forest. Organic carbon contents of surface soil of the broad-leaved mixed forest, the coniferous mixed forest, and the mixed coniferous and broad leaved forest are respectively 2.47, 2.07, and 2.02 times of that for the mixed arbor and shrub forest. From large to small, the organic carbon contents of the first layer are: mixed coniferous and broad leaved forest> coniferous mixed forest> broad-leaved mixed forest> mixed arbor and shrub forest. Comparing the organic carbon contents of the surface layer and the first layer of soil, it can be found that the organic carbon content of the first layer of the broad-leaved mixed forest is 22% lower than the content in the surface layer; and the organic carbon content in the first layer soil of the mixed arbor and shrub forest is 29% higher than the content in the surface layer. This sufficiently indicates that the distribution of organic carbon in depth of 0 to 10 m is not even.

Third, the soil organic carbon contents of all the forest sample plots are of decrease status layer by layer, namely sharp decrease trend with the increase of soil depth. Sharp decrease of organic carbon content appears in soil layer with 0 to 20 cm depth and 20 to 40 cm depth. Maximum ratio of soil organic carbon contents in 0 to 20 cm soil depth and 40 to 60 cm soil depth reaches 24.77 while the minimum value is 6.59. That is because there is certain depth of dried up substances accumulated on the surface of the forest land which

**Table 2.** Selected soil properties of the experimental site (mean±SD).

Sample plot No.	Soil layer No.	Soil bulk density (g.cm <sup>-3</sup> )	Total porosity (%)	Capillary porosity (%)	Non-capillary porosity (%)	Saturation water content (%)	Saturation hydraulic conductivity
S1	1	0.990±0.06	48.280±9.55	42.605±9.24	5.675±0.30	49.168±12.58	1.831±0.16
	2	1.074±0.03	42.320±1.07	32.125±4.91	10.195±3.84	39.397±0.23	1.133±0.13
	3	1.156±0.01	26.565±1.68	18.060±1.48	8.505±0.19	22.985±1.64	0.327±0.14
S2	1	1.008±0.04	44.895±4.56	31.935±4.63	12.960±0.07	44.496±2.65	0.659±0.13
	2	1.383±0.02	39.530±0.07	31.695±1.00	7.835±0.93	28.593±0.55	0.942±0.24
	3	1.309±0.08	35.560±1.74	32.880±1.34	2.680±0.59	27.521±1.45	0.325±0.23
S3	1	0.742±0.01	50.120±1.09	33.625±1.20	16.495±0.11	67.5472.64±	0.587±0.00
	2	1.011±0.06	51.580±1.71	48.875±0.28	2.705±1.44	51.166±4.48	0.669±0.12
	3	1.409±0.06	40.765±7.97	38.965±7.54	1.800±0.42	29.075±6.84	0.041±0.01
S4	1	0.951±0.03	54.310±0.37	48.595±0.22	5.715±0.59	57.158±1.93	0.926±0.16
	2	1.042±0.04	46.630±1.44	44.470±1.41	2.160±0.03	44.810±3.11	0.646±0.07
	3	1.106±0.00	49.675±2.31	46.105±3.10	3.570±0.79	44.900±2.18	0.633±0.24

**Table 3.** Soil water infiltration process.

Time (min)	S1		S2		S3		S4	
	$I_i$ (cm)	$i_i$ (cm.min <sup>-1</sup> )	$I_i$ (cm)	$i_i$ (cm.min <sup>-1</sup> )	$I_i$ (cm)	$i_i$ (cm.min <sup>-1</sup> )	$I_i$ (cm)	$i_i$ (cm.min <sup>-1</sup> )
2	9.8	4.900	5.6	2.800	4.6	2.300	3.9	1.950
5	13.2	4.400	6.2	2.067	5.8	1.933	4.6	1.533
10	18.8	3.760	9.2	1.840	8.5	1.700	6.9	1.380
15	11.3	2.260	8.2	1.640	8.2	1.640	6.3	1.260
20	11.5	2.300	6.8	1.360	7.2	1.440	6.2	1.240
25	10.2	2.040	6.2	1.240	5.8	1.160	5.8	1.160
30	9.6	1.920	6.1	1.220	4.9	0.980	5.3	1.060
35	8.4	1.680	5.8	1.160	3.8	0.760	5.2	1.040
40	8.1	1.620	5.2	1.040	3.6	0.720	5.1	1.020
45	7.5	1.500	5.1	1.020	3.2	0.640	5	1.000
50	6.8	1.360	4.7	0.940	3	0.600	4.9	0.980
55	5.5	1.100	4.1	0.820	2.6	0.520	4.6	0.920
60	5.3	1.060	3.2	0.640	2.6	0.520	4.5	0.900
70	9.6	0.960	6.0	0.600	4.4	0.440	9.3	0.930
80	8.3	0.830	5.3	0.530	4.8	0.480	9	0.900
90	7.8	0.780	4.9	0.490	4.4	0.440	8.1	0.810
100	7.5	0.750	4.3	0.430	3.8	0.380	7.2	0.720
110	5.5	0.550	4.1	0.410	3.3	0.330	7.1	0.710
120	4.9	0.490	3.8	0.380	3.2	0.320	7.3	0.730
130	3.6	0.360	3.6	0.360	2.8	0.280	6.9	0.690
140	3.9	0.390	3.4	0.340	2.5	0.250	6.6	0.660
150	3	0.300	3.1	0.310	2.5	0.250	6.3	0.630
160	3.6	0.360	2.8	0.280	2.2	0.220	6.1	0.610
170	3.6	0.360	2.4	0.240	1.9	0.190	5.5	0.550
180	2.5	0.250	2.2	0.220	1.8	0.180	5.3	0.530
200	5.2	0.260	4.1	0.205	3.4	0.170	10.5	0.525

$I_i$  is infiltration quantity of certain time period.  $i_i$  is infiltration speed

provides large amount of organic matters. And the organic matter can be decomposed or transformed

**Table 4.** Soil organic carbon content of different sorts.

Soil layer	Depth (cm)	Sample plot			
		S1 (g.kg <sup>-1</sup> )	S2 (g.kg <sup>-1</sup> )	S3 (g.kg <sup>-1</sup> )	S4 (g.kg <sup>-1</sup> )
0	0	56.19±0.53	47.10±0.46	45.93±0.47	22.67±0.23
1	20	43.85±0.22	46.94±0.38	47.48±2.00	29.32±1.21
2	40	9.65±0.41	3.38±0.35	5.97±0.27	12.80±0.6
3	60	6.66±0.12	2.92±0.07	2.67±0.04	1.18±0.04

through physical and chemical effect in certain soil environment (Huang et al., 2002; Wang et al., 1999; Yang et al., 2005). If the decomposing speed is fast, the content of the soil organic carbon will be low. And if decomposing speed is slow, the content of the soil organic carbon will be high. Therefore, if the undecomposed organic matter on the surface is of comparatively large amount, the organic carbon content will be high. However, the soil in depth layer has little organic matter sources and the organic matters are decomposed all the time, so that the organic carbon content is not much. Therefore, the organic carbon content distribution phenomenon of "much in upper layer and less in the lower layer" appears.

#### **Response of the infiltration rate to the organic carbon**

##### ***Response of the initial infiltration rate to the organic carbon***

It is found through the test (Table 3) that, from large to small, the initial infiltration rates of different forest plots are broad-leaved mixed forest > coniferous mixed forest > mixed coniferous and broad leaved forest > mixed arbor and shrub forest. And the change trends of the surface soil layer organic carbon content and the initial infiltration rate are the same. The initial infiltration rate of the broad-leaved mixed forest which has the highest organic carbon content reaches 4.9 cm/min. Such rate is over 1.5 times of rates of other plots. The initial infiltration speed of the mixed arbor and shrub forest which is of the lowest organic carbon content is also the slowest, only 1.95 cm/min. This indicates that the initial infiltration speed is of positive correlation with the organic carbon content of the surface layer. It affects the initial infiltration speed together with other factors like the soil texture, structure, and pore space, etc. The initial infiltration speeds of different types of forest sample plots increase or decrease in the same direction as the changes of the organic carbon contents of the surface soil layer.

##### ***Response of the stable infiltration speed to the organic carbon***

Through the regressive analysis on the soil infiltration

speeds of different types of land use and the organic carbon content, it can be found that the stable infiltration speed has comparatively strong relativity with the organic carbon content of the lower layer. It can be deemed that the stable infiltration speed is obviously related with the organic carbon content of the lower soil layer (soil layer 30 cm under surface), which is also a major factor that determines the stable speed.

##### ***Response of the infiltration process to the soil organic carbon***

During the soil water infiltration process, before the speed becoming stable, all the speeds of the 4 plots are decreased with the increasing of time. However, the infiltration speed is not evenly changed which results in different soil water infiltration speeds of the 4 plots.

The representation of the infiltration rate at the initial infiltration phase is: Broad-leaved mixed forest > coniferous mixed forest > mixed coniferous and broad leaved forest > mixed arbor and shrub forest. After 25 min of infiltration, the speed in soil of the mixed coniferous and broad leaved forest sample plot decreases suddenly. At this time, it replaces the mixed arbor and shrub forest to become the soil with minimum infiltration speed among the four sample plots. After 55 min, the infiltration speed becomes S1>S4>S2>S3, namely, broad-leaved mixed forest > mixed arbor and shrub forest > coniferous mixed forest > mixed coniferous and broad leaved forest. After 80 min, the mixed arbor and shrub forest becomes the plot with fastest infiltration speed among the four plots, leaving the sorting of speeds of other plots remain unchanged. From Table 4, the organic carbon content in the second soil layer of the mixed arbor and shrub forest is much higher than the organic carbon content in the second soil layer of other plots, which shows that the soil aggregates formed under the effect of the soil organic matter in the second soil layer of the mixed arbor and shrub forest are of comparatively large amount which help to form a certain amount of pore space groups. The change of the organic carbon content among soil layers is comparatively small; the amount of pore space among the soil layers is comparatively stable with good successive performance to thus guarantee relative stability of the infiltration speed of the mixed arbor and shrub forest. However, the organic carbon contents in the

**Table 5.** Regression analysis of soil infiltration rate.

Sample plot No.	Independent variable	R	Mean square	Residual mean square	F	Sig.	Constant term	Regression coefficient
S1	1	0.950	36.429	0.164	222.104	0.000	-0.327	0.878
	2	0.968	37.792	0.107	352.519	0.000	-0.106	0.857
S2	1	0.951	10.009	0.034	292.922	0.000	-0.185	0.834
	2	0.972	10.237	0.025	414.877	0.000	-0.064	0.807
S3	1	0.933	7.883	0.049	160.911	0.000	-0.354	0.932
	2	0.961	8.372	0.029	292.862	0.000	-0.133	0.947
S4	1	0.921	2.412	0.018	133.281	0.000	-0.597	1.042
	2	0.970	2.187	0.027	79.610	0.000	0.143	0.857

Independent variable 1 is the computed value of infiltration rate of Horton infiltration model while 2 is the modified infiltration rate value.

**Table 6.** Regression analysis of soil infiltration.

Sample plot No.	Independent variable	R	Mean square	Residual mean square	F	Sig.	Constant term	Regression coefficient
S1	1	0.905	280.817	2.597	108.140	0.000	-0.852	0.747
	2	0.941	303.968	1.632	186.238	0.000	0.476	0.730
S2	1	0.628	13127.662	840.854	15.612	0.001	148.841	-9.735
	2	0.827	17610.240	654.080	26.924	0.000	146.261	-10.578
S3	1	0.756	47.163	1.470	32.090	0.000	-1.135	0.728
	2	0.905	67.479	0.623	108.281	0.000	-0.473	0.871
S4	1	0.898	56.748	0.321	176.903	0.000	1.446	0.465
	2	0.940	42.502	0.914	46.484	0.000	3.316	0.456

Independent variable 1 is the computed value of infiltration rate of Horton infiltration model while 2 is the modified infiltration rate value.

second soil layers of other plots are obviously reduced by over 78% which greatly reduces the amounts of the soil aggregates and the pore space. Under the condition that the water content in soil improves greatly while the soil water potential is reduced, the infiltration speeds of other forest plots except the mixed arbor and shrub forest plot are greatly decreased.

#### Soil water infiltration model simulation and modification

Presently there are a number of models about soil water infiltration. Horton soil water infiltration model (Ma et al., 2005; Horton, 1940), Philip infiltration model (Wang et al., 2002; William Detar, 1989; Philip, 1957), Green-Ampt infiltration model (Juanjuan et al., 2010; John and Selker, 1999; Swartzendruber, 2000; Shlomo and Neuman,

1976) and so on are the most frequently seen. Though they can simulate progress of soil water infiltration, there exists difference between progress simulation and actual value, which is not accurate enough. Horton soil water infiltration model shall be calculated according to initial infiltration speed, stable infiltration speed, infiltration time and rated parameter *c* value. There exists difference between actual infiltration progress and simulated infiltration progress of models within the same period; especially accumulated infiltration content within period through calculation. Infiltration rate and infiltration content shall be respectively analyzed by means of SPSS software. The correlation coefficient of the actual and calculated infiltration content within period is respectively 0.905, 0.628, 0.756, 0.898.

Due to the fact that there are obvious correlativity between organic carbon and infiltration speed of different forest plots, it is considered that organic carbon shall be

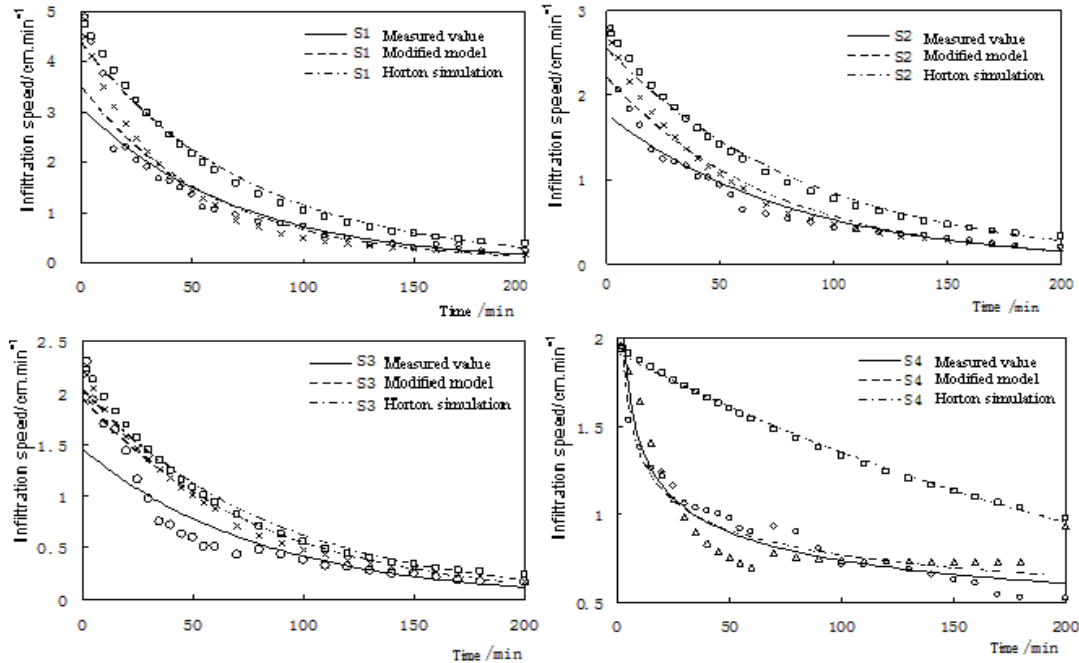


Figure 1. Soil infiltration process Simulation of 4 plots in the forest.

introduced into soil water infiltration model as an impact factor. By means of calculation of Matlab software, soil water infiltration model can be revised as,

$$i(t) = (i_f + (i_i - i_f)e^{-i_f t/10}) (1 - t \cdot e^{SOC/10}/100) \quad (1)$$

among which  $i_i$  is the initial infiltration rate,  $i_f$  is the stable infiltration rate, and SOC is organic carbon content of the lower layer of the soil.

The revised soil water infiltration model shall be adopted for simulation (Figure 1); related analysis shall be carried out in combination with actual data (Tables 5 and 6). Correlation coefficient of infiltration rate by means of actual measurement and simulated calculation of four forest plot have been improved from 0.950, 0.951, 0.933, 0.921 to 0.968, 0.972, 0.961, 0.970. Correlation coefficient of infiltration content within period by means of actual measurement and simulated calculation of four forest plots have been improved from 0.905, 0.628, 0.756, 0.898 to 0.941, 0.827, 0.905, 0.940.

### Conclusions

The research conducts determination test on four forest plots on all-round hills by means of observation on the spot. By analysis of organic carbon and soil water infiltration progress, it is discovered that there is obvious correlation between soil organic carbon and soil water infiltration progress. The calculation result will be more

accurate by means of certain model description. The detailed conclusions are as follows.

(1) Surface soil organic carbon contents are variable according to different types of forest plots. The soil organic carbon contents, in proper order, are broad leaved mixed forest, coniferous broad mixed forest, coniferous mixed forest, mixed arbor and shrub forest in which are mostly shrubs. Organic carbon is not evenly distributed in soil for the same land. Soil organic carbon contents are high for general surface and will reduce with the increasing soil depth.

(2) In tests, due to the fact that there exist obvious differences among organic carbon contents of different type of forest plots, it is concluded by analysis that initial infiltration speed of forest plots with high content of organic carbon is generally above that of forest plots with low reserve of surface soil organic carbon. At the same time, infiltration rate in the process of soil water infiltration for different forest plots will reduce with time increase. However, digression rates vary according to different forest plot soils, the above which is closely related to organic carbon content in the soil.

(3) Correlation coefficient between simulated value and actual value of soil water infiltration rate have been improved from 0.950, 0.951, 0.933, 0.921 to 0.968, 0.972, 0.961, 0.970 after soil organic carbon content indicator of soil water infiltration model is increased. Correlation coefficient between simulated value and actual value of water soil infiltration content within period have been improved from 0.905, 0.628, 0.756, 0.898 to

0.941, 0.827, 0.905, 0.940. This model does not require rated parameter and is nearer to actual value, which provides an accurate and effective method for prediction and simulation of soil water infiltration process.

### Conflict of Interest

The authors have not declared any conflict of interests.

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