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表 2.1 Green-Ampt 入滲參數

| Soil class | Porosity $\eta$ | Effective Porosity $\theta_e$ | Wetting front soil suction head $\Psi$(cm) | Hydraulic conductivity $K$(cm/h) |
|---|---|---|---|---|
| Sand | 0.437 (0.374-0.500) | 0.417 (0.354-0.480) | 4.95 (0.97-25.36) | 11.78 |
| Loamy sand | 0.437 (0.363-0.506) | 0.401 (0.329-0.473) | 6.13 (1.35-27.94) | 2.99 |
| Sandy loam | 0.453 (0.351-0.555) | 0.412 (0.283-0.541) | 11.01 (2.67-45.47) | 1.09 |
| Loam | 0.463 (0.375-0.551) | 0.434 (0.334-0.534) | 8.89 (1.33-59.38) | 0.34 |
| Silt loam | 0.501 (0.420-0.582) | 0.486 (0.394-0.578) | 16.68 (2.92-95.39) | 0.65 |
| Sandy clay loam | 0.398 (0.332-0.464) | 0.330 (0.235-0.425) | 21.85 (4.42-108.0) | 0.15 |
| Clay loam | 0.464 (0.409-0.519) | 0.309 (0.279-0.501) | 20.88 (4.79-91.10) | 0.10 |
| Silty clay loam | 0.471 (0.418-0.524) | 0.432 (0.347-0.517) | 27.30 (5.67-131.50) | 0.10 |
| Sandy clay | 0.430 (0.370-0.490) | 0.321 (0.207-0.435) | 23.90 (4.08-140.2) | 0.06 |
| Silty clay | 0.479 (0.425-0.533) | 0.423 (0.334-0.512) | 29.22 (6.13-139.4) | 0.05 |
| Clay | 0.475 (0.427-0.523) | 0.385 (0.269-0.501) | 31.63 (6.39-156.5) | 0.03 |

The numbers in parentheses below each parameter are one standard deviation around the parameter value given. (資造來源：Rawls, Brakensiek, and Miller, 1983.)
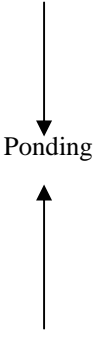
表 3.1 曼寧粗糙係數

| Source | Ground Cover | $n$ | Range |
|---|---|---|---|
| | Smooth asphalt | 0.012 | |
| | Asphalt of concrete paving | 0.014 | |
| Crawford and Linsley(1966) | Packed clay | 0.03 | |
| | Light turf | 0.20 | |
| | Dense turf | 0.35 | |
| | Dense shrubbery and forest litter | 0.4 | |
| | Concrete or asphalt | 0.011 | 0.01-0.13 |
| | Bare sand | 0.01 | 0.01-0.016 |
| | Graveled surface | 0.02 | 0.012-0.03 |
| | Bare clay-loam(eroded) | 0.02 | 0.012-0.033 |
| Engman(1986) | Range(natural) | 0.13 | 0.01-0.32 |
| | Bluegrass sod | 0.45 | 0.39-0.63 |
| | Short-grass prairie | 0.15 | 0.10-0.20 |
| | Bermuda grass | 0.41 | 0.30-0.48 |

資料來源：Obtained by calibration of Stanford Watershed Model.
Computed by Engman(1986)by kinematic wave and storage analysis of measured rainfall-runoff data.

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表 3.2 降雨強度表

| Column | 1 | 2 | 3 | 4 |
|--------|-----|------------|------------|-----------|
|        |     |            | Rainfall   |           |
|        | Time | Incremental | Cumulative | Intensity |
|        | (min) | (cm)      | (cm)       | (cm/h)    |
|        | 0   |            | 0.00       | 1.08      |
|        | 10  | 0.18       | 0.18       | 1.26      |
|        | 20  | 0.21       | 0.39       | 1.56      |
|        | 30  | 0.26       | 0.65       | 1.92      |
|        | 40  | 0.32       | 0.97       | 2.22      |
|        | 50  | 0.37       | 1.34       | 2.58      |
|        | 60  | 0.43       | 1.77       | 3.84      |
|        | 70  | 0.64       | 2.41       | 6.84      |
|        | 80  | 1.14       | 3.55       | 19.08     |
|        | 90  | 3.18       | 6.73       | 9.90      |
| Ponding | 100 | 1.65      | 8.38       | 4.86      |
|        | 110 | 0.81       | 9.19       | 3.12      |
|        | 120 | 0.52       | 9.71       | 2.52      |
|        | 130 | 0.42       | 10.13      | 2.16      |
|        | 140 | 0.36       | 10.49      | 1.68      |
|        | 150 | 0.28       | 10.77      | 1.44      |
|        | 160 | 0.24       | 11.01      | 1.14      |
|        | 170 | 0.19       | 11.20      | 1.02      |
|        | 180 | 0.17       | 11.37      |           |

（資料來源：Chow, Maidment, and Mays, 1988, Applied Hydrology）

表 4.1 下游 100 公尺處之最大單位寬度流量及發生時間

|  |  | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| 降雨延時<br>D=0.5 小時 | K=0.34 | 0.00093<br>(1830s) | 0.00092<br>(1405s) | 0.00106<br>(1890s) | 0.00102<br>(1720s) |
|  | K=0.03 | 0.00122<br>(1800s) | 0.00131<br>(1260s) | 0.00156<br>(1880s) | 0.00149<br>(1595s) |
|  | K=0.0 | 0.00139<br>(1470s) | 0.00165<br>(1145s) | 0.00202<br>(1800s) | 0.00186<br>(1485s) |

|  |  | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| 降雨延時<br>D=1.0 小時 | K=0.34 | 0.00041<br>(3600s) | 0.00046<br>(2160s) | 0.00072<br>(3640s) | 0.00061<br>(2905s) |
|  | K=0.03 | 0.00059<br>(2540s) | 0.00076<br>(1750s) | 0.00103<br>(3600s) | 0.00094<br>(2560s) |
|  | K=0.0 | 0.00069<br>(1980s) | 0.00102<br>(1490s) | 0.00116<br>(3600s) | 0.00113<br>(2410s) |

|  |  | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| 降雨延時<br>D=1.5 小時 | K=0.34 | 0.00012<br>(7200s) | 0.00014<br>(3985s) | 0.00034<br>(7205s) | 0.00024<br>(5320s) |
|  | K=0.03 | 0.00027<br>(4405s) | 0.00038<br>(2605s) | 0.00053<br>(7200s) | 0.00049<br>(4505s) |
|  | K=0.0 | 0.00035<br>(2590s) | 0.00057<br>(1955s) | 0.00062<br>(7200s) | 0.00061<br>(4295s) |

註：最大單位寬度流量之單位為 $m^3/s$。

表 4.2 坡地下游 400 公尺處之最大單位寬度流量及發生時間

| | | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| 降雨延時<br>D=0.5 小時 | K=0.34 | 0.00093<br>(1755s) | 0.00095<br>(1590s) | 0.00106<br>(1800s) | 0.00102<br>(1690s) |
| | K=0.03 | 0.00151<br>(1790s) | 0.00152<br>(1710s) | 0.00156<br>(1800s) | 0.00154<br>(1720s) |
| | K=0.0 | 0.00214<br>(1900s) | 0.00214<br>(1900s) | 0.00214<br>(1900s) | 0.00214<br>(1900s) |

| | | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| 降雨延時<br>D=1.0 小時 | K=0.34 | 0.00052<br>(3605s) | 0.00055<br>(2925s) | 0.00072<br>(3605s) | 0.00066<br>(3300s) |
| | K=0.03 | 0.00127<br>(3605s) | 0.00128<br>(3345s) | 0.00135<br>(3605s) | 0.00132<br>(3470s) |
| | K=0.0 | 0.00214<br>(3660s) | 0.00214<br>(3660s) | 0.00214<br>(3660s) | 0.00214<br>(3660s) |

| | | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| 降雨延時<br>D=1.5 小時 | K=0.34 | 0.00013<br>(7205s) | 0.00016<br>(4920s) | 0.00035<br>(7200s) | 0.00027<br>(6025s) |
| | K=0.03 | 0.00097<br>(7200s) | 0.00096<br>(5705s) | 0.00109<br>(7200s) | 0.00105<br>(6720s) |
| | K=0.0 | 0.00139<br>(5675s) | 0.00167<br>(4595s) | 0.00202<br>(7200s) | 0.00188<br>(5875s) |

註：最大單位寬度流量之單位為 $m^3/s$。

表 4.3 時變降雨之最終累積入滲深度表

| | | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| 降雨延時<br>D=0.5 小時 | K=0.34 | 0.9890<br>(1800s) | 0.8630<br>(1801s) | 0.9690<br>(1774s) | 0.9000<br>(1788s) |
| | K=0.03 | 0.4850<br>(1796s) | 0.4460<br>(1795s) | 0.4800<br>(1769s) | 0.45800<br>(1777s) |
| | | 均勻型 | 後退型 | 前進型 | 中央型 |
| 降雨延時<br>D=1.0 小時 | K=0.34 | 1.4367<br>(3601s) | 1.2086<br>(3601s) | 1.3997<br>(3599s) | 1.2749<br>(3600s) |
| | K=0.03 | 0.6940<br>(3594s) | 0.6240<br>(3593s) | 0.6850<br>(3553s) | 0.6460<br>(3575s) |
| | | 均勻型 | 後退型 | 前進型 | 中央型 |
| 降雨延時<br>D=1.5 小時 | K=0.34 | 2.0471<br>(7201s) | 1.6663<br>(7201s) | 1.9923<br>(7197s) | 1.7806<br>(7199s) |
| | K=0.03 | 0.9950<br>(7197s) | 0.8700<br>(7198s) | 0.9770<br>(7031s) | 0.9080<br>(7138s) |

註：累積入滲深度之單位為 cm。

表 4.4 最大單位寬度流量及發生時間(總降雨量不同且暴雨往下游移動)

| | | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| V$_S$=0.5m/s D=1600s | K=0.34 | 0.00073 (605s) | 0.00129 (390s) | 0.00153 (1590s) | 0.00149 (915s) |
| | K=0.03 | 0.00082 (525s) | 0.00143 (370s) | 0.00162 (1590s) | 0.00159 (915s) |
| | K=0.0 | 0.00083 (465s) | 0.00151 (350s) | 0.00164 (1590s) | 0.00162 (910s) |

| | | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| V$_S$=1.0m/s D=800s | K=0.34 | 0.00072 (535s) | 0.00100 (390s) | 0.00134 (800s) | 0.00126 (545s) |
| | K=0.03 | 0.00081 (515s) | 0.00115 (360s) | 0.00145 (800s) | 0.00138 (525s) |
| | K=0.0 | 0.00084 (465s) | 0.00125 (350s) | 0.00148 (800s) | 0.00142 (520s) |

| | | 均勻型 | 後退型 | 前進型 | 中央型 |
|---|---|---|---|---|---|
| V$_S$=1.5m/s D=534s | K=0.34 | 0.00070 (530s) | 0.00071 (385s) | 0.00091 (535s) | 0.00085 (475s) |
| | K=0.03 | 0.00080 (480s) | 0.00087 (360s) | 0.00117 (535s) | 0.00103 (455s) |
| | K=0.0 | 0.00083 (450s) | 0.00098 (350s) | 0.00125 (530s) | 0.00112 (450s) |

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| V$_S$=2.0m/s D=400s | K=0.34 | 0.00046 (420s) | 0.00046 (360s) | 0.00049 (420s) | 0.00048 (405s) |
| | K=0.03 | 0.00062 (420s) | 0.00060 (355s) | 0.00063 (420s) | 0.00062 (400s) |
| | K=0.0 | 0.00073 (420s) | 0.00071 (350s) | 0.00073 (420s) | 0.00072 (400s) |

註：最大單位寬度流量之單位為 $m^3/s$。

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表 4.5 最大單位寬度流量及發生時間(總降雨量不同且暴雨往上游移動)

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=0.5m/s<br>D=1600s | K=0.34 | 0.00073<br>(800s) | 0.00114<br>(560s) | 0.00127<br>(1400s) | 0.00124<br>(945s) |
| | K=0.03 | 0.00081<br>(760s) | 0.00124<br>(550s) | 0.00137<br>(1400s) | 0.00134<br>(935s) |
| | K=0.0 | 0.00083<br>(660s) | 0.00128<br>(540s) | 0.00139<br>(1400s) | 0.00136<br>(925s) |

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=1.0m/s<br>D=800s | K=0.34 | 0.00071<br>(600s) | 0.00086<br>(465s) | 0.00098<br>(705s) | 0.00094<br>(605s) |
| | K=0.03 | 0.00080<br>(575s) | 0.00097<br>(450s) | 0.00114<br>(700s) | 0.00107<br>(585s) |
| | K=0.0 | 0.00083<br>(555s) | 0.00102<br>(445s) | 0.00118<br>(700s) | 0.00112<br>(570s) |

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=1.5m/s<br>D=534s | K=0.34 | 0.00056<br>(520s) | 0.00057<br>(450s) | 0.00057<br>(535s) | 0.00057<br>(515s) |
| | K=0.03 | 0.00070<br>(485s) | 0.00070<br>(430s) | 0.00070<br>(520s) | 0.00070<br>(510s) |
| | K=0.0 | 0.00076<br>(470s) | 0.00075<br>(420s) | 0.00077<br>(470s) | 0.00076<br>(470s) |

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=2.0m/s<br>D=400s | K=0.34 | 0.00037<br>(415s) | 0.00037<br>(410s) | 0.00037<br>(415s) | 0.00037<br>(410s) |
| | K=0.03 | 0.00046<br>(415s) | 0.00046<br>(400s) | 0.00046<br>(415s) | 0.00046<br>(405s) |
| | K=0.0 | 0.00051<br>(415s) | 0.00051<br>(400s) | 0.00051<br>(410s) | 0.00051<br>(405s) |

註：最大單位寬度流量之單位為 $m^3/s$ 。

表 4.6 最大單位寬度流量及發生時間(總降雨量相同且暴雨往下游移動)

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=0.3m/s Ls=210m D=1034s | K=0.34 | 0.00079 (605s) | 0.00121 (410s) | 0.00146 (965s) | 0.00146 (650s) |
| | K=0.03 | 0.00081 (545s) | 0.00137 (390s) | 0.00155 (960s) | 0.00155 (645s) |
| | K=0.0 | 0.00084 (505s) | 0.00146 (380s) | 0.00158 (950s) | 0.00158 (635s) |
| | | 均勻型 | 前進型 | 後退型 | 中央型 |
| $V_S$=0.5m/s Ls=350m D=900s | K=0.34 | 0.00072 (550s) | 0.00109 (395s) | 0.00148 (895s) | 0.00140 (570s) |
| | K=0.03 | 0.00081 (530s) | 0.00125 (365s) | 0.00158 (895s) | 0.00151 (560s) |
| | K=0.0 | 0.00083 (480s) | 0.00136 (345s) | 0.00160 (890s) | 0.00155 (555s) |
| | | 均勻型 | 前進型 | 後退型 | 中央型 |
| $V_S$=1.0m/s Ls=700m D=800s | K=0.34 | 0.00072 (540s) | 0.00100 (385s) | 0.00134 (800s) | 0.00126 (545s) |
| | K=0.03 | 0.00081 (515s) | 0.00115 (360s) | 0.00145 (800s) | 0.00138 (525s) |
| | K=0.0 | 0.00083 (480s) | 0.00125 (345s) | 0.00148 (800s) | 0.00142 (515s) |
| | | 均勻型 | 前進型 | 後退型 | 中央型 |
| $V_S$=2.0m/s Ls=1400m D=750s | K=0.34 | 0.00071 (520s) | 0.00097 (385s) | 0.00126 (745s) | 0.00118 (525s) |
| | K=0.03 | 0.00081 (490s) | 0.00111 (360s) | 0.00137 (745s) | 0.00130 (505s) |
| | K=0.0 | 0.00083 (480s) | 0.00119 (345s) | 0.00140 (745s) | 0.00135 (500s) |

註：最大單位寬度流量之單位為 $m^3/s$。

表 4.7 最大單位寬度流量及發生時間(總降雨量相同且暴雨往上游移動)

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=0.3m/s<br>Ls=210m<br>D=1034s | K=0.34 | 0.00060<br>(770s) | 0.00061<br>(705s) | 0.00061<br>(805s) | 0.00061<br>(745s) |
| | K=0.03 | 0.00071<br>(745s) | 0.00071<br>(700s) | 0.00071<br>(755s) | 0.00071<br>(725s) |
| | K=0.0 | 0.00075<br>(715s) | 0.00075<br>(680s) | 0.00075<br>(720s) | 0.00075<br>(710s) |

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=0.5m/s<br>Ls=350m<br>D=900s | K=0.34 | 0.00071<br>(700s) | 0.00075<br>(565s) | 0.00077<br>(795s) | 0.00077<br>(690s) |
| | K=0.03 | 0.00080<br>(660s) | 0.00086<br>(555s) | 0.00091<br>(750s) | 0.00091<br>(670s) |
| | K=0.0 | 0.00083<br>(640s) | 0.00090<br>(550s) | 0.00097<br>(700s) | 0.00096<br>(660s) |

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=1.0m/s<br>Ls=700m<br>D=800s | K=0.34 | 0.00071<br>(600s) | 0.00086<br>(465s) | 0.00098<br>(705s) | 0.00094<br>(610s) |
| | K=0.03 | 0.00080<br>(580s) | 0.00097<br>(455s) | 0.00114<br>(700s) | 0.00107<br>(585s) |
| | K=0.0 | 0.00083<br>(565s) | 0.00102<br>(450s) | 0.00118<br>(700s) | 0.00112<br>(575s) |

| | | 均勻型 | 前進型 | 後退型 | 中央型 |
|---|---|---|---|---|---|
| $V_S$=2.0m/s<br>Ls=1400m<br>D=750s | K=0.34 | 0.00071<br>(550s) | 0.00091<br>(420s) | 0.00111<br>(700s) | 0.00102<br>(565s) |
| | K=0.03 | 0.00080<br>(530s) | 0.00102<br>(405s) | 0.00122<br>(700s) | 0.00115<br>(550s) |
| | K=0.0 | 0.00083<br>(510s) | 0.00108<br>(400s) | 0.00126<br>(700s) | 0.00120<br>(535s) |

註：最大單位寬度流量之單位為 $m^3/s$。