



# Statistiques des précipitations extrêmes des communes belges

## Houyet (INS 91072)

1. Niveau de retour estimé pour une durée de précipitations de 10 minutes à 30 jours (lignes) et une période de retour de 2 à 200 années (colonnes). Unités : mm.

| Durée  | Période de retour (années) |       |       |       |       |       |       |       |       |       |       |       |
|--------|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|        | 2                          | 5     | 10    | 15    | 20    | 25    | 30    | 40    | 50    | 75    | 100   | 200   |
| 10 min | 7.8                        | 11.2  | 13.8  | 15.4  | 16.5  | 17.4  | 18.2  | 19.4  | 20.4  | 22.3  | 23.7  | 27.3  |
| 20 min | 11.5                       | 16.6  | 20.4  | 22.7  | 24.4  | 25.8  | 26.9  | 28.7  | 30.2  | 33.0  | 35.1  | 40.3  |
| 30 min | 13.5                       | 19.7  | 24.2  | 27.0  | 29.1  | 30.7  | 32.1  | 34.3  | 36.0  | 39.4  | 41.8  | 48.1  |
| 1 h    | 16.8                       | 23.8  | 28.9  | 32.1  | 34.4  | 36.2  | 37.7  | 40.2  | 42.2  | 45.9  | 48.7  | 55.7  |
| 2 h    | 20.3                       | 28.1  | 33.9  | 37.5  | 40.1  | 42.1  | 43.8  | 46.6  | 48.8  | 53.0  | 56.1  | 64.0  |
| 3 h    | 22.5                       | 30.9  | 37.2  | 41.0  | 43.8  | 46.0  | 47.8  | 50.8  | 53.2  | 57.7  | 61.0  | 69.4  |
| 6 h    | 27.2                       | 35.6  | 41.9  | 45.6  | 48.4  | 50.6  | 52.4  | 55.3  | 57.7  | 62.1  | 65.4  | 73.6  |
| 12 h   | 33.4                       | 43.5  | 50.9  | 55.3  | 58.6  | 61.2  | 63.3  | 66.8  | 69.5  | 74.7  | 78.6  | 88.3  |
| 1 j    | 41.2                       | 52.8  | 61.1  | 66.1  | 69.7  | 72.5  | 74.8  | 78.6  | 81.6  | 87.1  | 91.1  | 101.3 |
| 2 j    | 53.2                       | 67.4  | 77.4  | 83.3  | 87.5  | 90.8  | 93.5  | 97.8  | 101.2 | 107.5 | 112.0 | 123.3 |
| 3 j    | 57.2                       | 72.6  | 83.2  | 89.4  | 93.8  | 97.3  | 100.1 | 104.6 | 108.1 | 114.6 | 119.2 | 130.7 |
| 4 j    | 62.5                       | 79.0  | 90.3  | 96.8  | 101.5 | 105.1 | 108.0 | 112.7 | 116.4 | 123.1 | 127.9 | 139.6 |
| 5 j    | 71.0                       | 89.1  | 101.4 | 108.4 | 113.4 | 117.3 | 120.5 | 125.5 | 129.4 | 136.6 | 141.7 | 154.1 |
| 7 j    | 82.3                       | 101.9 | 115.1 | 122.6 | 127.9 | 132.0 | 135.3 | 140.6 | 144.7 | 152.1 | 157.4 | 170.3 |
| 10 j   | 98.5                       | 121.3 | 136.5 | 145.0 | 151.0 | 155.6 | 159.4 | 165.3 | 169.9 | 178.2 | 184.1 | 198.3 |
| 15 j   | 119.5                      | 146.0 | 163.4 | 173.1 | 179.9 | 185.1 | 189.3 | 195.9 | 201.0 | 210.2 | 216.7 | 232.2 |
| 20 j   | 139.3                      | 170.3 | 190.5 | 201.7 | 209.5 | 215.4 | 220.2 | 227.8 | 233.6 | 244.0 | 251.3 | 268.8 |
| 25 j   | 149.3                      | 182.3 | 203.5 | 215.3 | 223.4 | 229.6 | 234.6 | 242.5 | 248.5 | 259.3 | 266.8 | 284.7 |
| 30 j   | 173.5                      | 208.5 | 230.9 | 243.2 | 251.7 | 258.2 | 263.5 | 271.7 | 277.9 | 289.1 | 296.9 | 315.4 |

2. Niveau de retour estimé et écart-type de l'estimation pour une durée de précipitations de 10 minutes à 30 jours (lignes) et une période de retour de 2 à 200 années (colonnes). Unités : mm.

| Durée  | Période de retour (années) |       |       |       |       |       |       |       |       |       |       |       |
|--------|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|        | 2                          | 5     | 10    | 15    | 20    | 25    | 30    | 40    | 50    | 75    | 100   | 200   |
| 10 min | 7.8                        | 11.2  | 13.8  | 15.4  | 16.5  | 17.4  | 18.2  | 19.4  | 20.4  | 22.3  | 23.7  | 27.3  |
|        | 0.2                        | 0.4   | 0.6   | 0.7   | 0.9   | 1.0   | 1.1   | 1.3   | 1.5   | 1.8   | 2.0   | 2.8   |
| 20 min | 11.5                       | 16.6  | 20.4  | 22.7  | 24.4  | 25.8  | 26.9  | 28.7  | 30.2  | 33.0  | 35.1  | 40.3  |
|        | 0.4                        | 0.6   | 0.9   | 1.1   | 1.3   | 1.5   | 1.7   | 1.9   | 2.2   | 2.6   | 3.0   | 4.1   |
| 30 min | 13.5                       | 19.7  | 24.2  | 27.0  | 29.1  | 30.7  | 32.1  | 34.3  | 36.0  | 39.4  | 41.8  | 48.1  |
|        | 0.4                        | 0.6   | 0.8   | 1.0   | 1.1   | 1.3   | 1.4   | 1.6   | 1.7   | 2.1   | 2.3   | 3.1   |
| 1 h    | 16.8                       | 23.8  | 28.9  | 32.1  | 34.4  | 36.2  | 37.7  | 40.2  | 42.2  | 45.9  | 48.7  | 55.7  |
|        | 0.5                        | 0.7   | 1.1   | 1.3   | 1.5   | 1.7   | 1.9   | 2.2   | 2.5   | 3.0   | 3.4   | 4.7   |
| 2 h    | 20.3                       | 28.1  | 33.9  | 37.5  | 40.1  | 42.1  | 43.8  | 46.6  | 48.8  | 53.0  | 56.1  | 64.0  |
|        | 0.6                        | 0.9   | 1.2   | 1.5   | 1.7   | 2.0   | 2.2   | 2.5   | 2.8   | 3.4   | 3.9   | 5.3   |
| 3 h    | 22.5                       | 30.9  | 37.2  | 41.0  | 43.8  | 46.0  | 47.8  | 50.8  | 53.2  | 57.7  | 61.0  | 69.4  |
|        | 0.7                        | 0.9   | 1.3   | 1.5   | 1.7   | 1.9   | 2.1   | 2.4   | 2.6   | 3.1   | 3.6   | 4.7   |
| 6 h    | 27.2                       | 35.6  | 41.9  | 45.6  | 48.4  | 50.6  | 52.4  | 55.3  | 57.7  | 62.1  | 65.4  | 73.6  |
|        | 0.7                        | 1.0   | 1.3   | 1.6   | 1.9   | 2.2   | 2.4   | 2.8   | 3.1   | 3.9   | 4.5   | 6.2   |
| 12 h   | 33.4                       | 43.5  | 50.9  | 55.3  | 58.6  | 61.2  | 63.3  | 66.8  | 69.5  | 74.7  | 78.6  | 88.3  |
|        | 1.0                        | 1.3   | 1.8   | 2.3   | 2.6   | 3.0   | 3.3   | 3.9   | 4.3   | 5.3   | 6.1   | 8.4   |
| 1 j    | 41.2                       | 52.8  | 61.1  | 66.1  | 69.7  | 72.5  | 74.8  | 78.6  | 81.6  | 87.1  | 91.1  | 101.3 |
|        | 1.0                        | 1.2   | 1.5   | 1.7   | 1.9   | 2.1   | 2.2   | 2.5   | 2.7   | 3.2   | 3.6   | 4.6   |
| 2 j    | 53.2                       | 67.4  | 77.4  | 83.3  | 87.5  | 90.8  | 93.5  | 97.8  | 101.2 | 107.5 | 112.0 | 123.3 |
|        | 1.5                        | 2.0   | 2.5   | 3.0   | 3.4   | 3.7   | 4.0   | 4.4   | 4.9   | 5.7   | 6.3   | 8.1   |
| 3 j    | 57.2                       | 72.6  | 83.2  | 89.4  | 93.8  | 97.3  | 100.1 | 104.6 | 108.1 | 114.6 | 119.2 | 130.7 |
|        | 1.9                        | 2.5   | 3.1   | 3.6   | 4.0   | 4.3   | 4.6   | 5.1   | 5.5   | 6.3   | 6.9   | 8.6   |
| 4 j    | 62.5                       | 79.0  | 90.3  | 96.8  | 101.5 | 105.1 | 108.0 | 112.7 | 116.4 | 123.1 | 127.9 | 139.6 |
|        | 2.1                        | 2.7   | 3.3   | 3.6   | 4.0   | 4.2   | 4.5   | 4.9   | 5.2   | 5.9   | 6.4   | 7.8   |
| 5 j    | 71.0                       | 89.1  | 101.4 | 108.4 | 113.4 | 117.3 | 120.5 | 125.5 | 129.4 | 136.6 | 141.7 | 154.1 |
|        | 2.5                        | 3.1   | 3.7   | 4.1   | 4.4   | 4.7   | 4.9   | 5.3   | 5.6   | 6.3   | 6.8   | 8.2   |
| 7 j    | 82.3                       | 101.9 | 115.1 | 122.6 | 127.9 | 132.0 | 135.3 | 140.6 | 144.7 | 152.1 | 157.4 | 170.3 |
|        | 3.0                        | 3.6   | 4.1   | 4.4   | 4.7   | 4.9   | 5.1   | 5.4   | 5.6   | 6.2   | 6.6   | 7.7   |
| 10 j   | 98.5                       | 121.3 | 136.5 | 145.0 | 151.0 | 155.6 | 159.4 | 165.3 | 169.9 | 178.2 | 184.1 | 198.3 |
|        | 3.7                        | 4.6   | 5.3   | 5.8   | 6.1   | 6.3   | 6.6   | 7.0   | 7.3   | 7.9   | 8.4   | 9.7   |
| 15 j   | 119.5                      | 146.0 | 163.4 | 173.1 | 179.9 | 185.1 | 189.3 | 195.9 | 201.0 | 210.2 | 216.7 | 232.2 |
|        | 4.6                        | 5.6   | 6.3   | 6.7   | 6.9   | 7.2   | 7.3   | 7.6   | 7.9   | 8.3   | 8.7   | 9.5   |
| 20 j   | 139.3                      | 170.3 | 190.5 | 201.7 | 209.5 | 215.4 | 220.2 | 227.8 | 233.6 | 244.0 | 251.3 | 268.8 |
|        | 5.4                        | 6.6   | 7.5   | 7.9   | 8.3   | 8.6   | 8.8   | 9.1   | 9.4   | 10.0  | 10.4  | 11.5  |
| 25 j   | 149.3                      | 182.3 | 203.5 | 215.3 | 223.4 | 229.6 | 234.6 | 242.5 | 248.5 | 259.3 | 266.8 | 284.7 |
|        | 6.0                        | 7.5   | 8.7   | 9.4   | 10.0  | 10.4  | 10.8  | 11.4  | 11.9  | 12.9  | 13.6  | 15.6  |
| 30 j   | 173.5                      | 208.5 | 230.9 | 243.2 | 251.7 | 258.2 | 263.5 | 271.7 | 277.9 | 289.1 | 296.9 | 315.4 |
|        | 6.5                        | 8.2   | 9.5   | 10.4  | 11.1  | 11.6  | 12.1  | 12.9  | 13.6  | 14.8  | 15.8  | 18.3  |

3. Intervalle de confiance à 95% de la période de retour estimée pour une durée de précipitations de 10 minutes à 30 jours (lignes) et une période de retour de 2 à 200 années (colonnes). Unités : mm.

| Durée  | Période de retour (années) |       |       |       |       |       |       |       |       |       |       |       |
|--------|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|        | 2                          | 5     | 10    | 15    | 20    | 25    | 30    | 40    | 50    | 75    | 100   | 200   |
| 10 min | 7.4                        | 10.5  | 12.7  | 13.9  | 14.8  | 15.5  | 16.0  | 16.9  | 17.6  | 18.8  | 19.7  | 21.8  |
|        | 8.3                        | 12.0  | 14.9  | 16.8  | 18.2  | 19.4  | 20.3  | 21.9  | 23.3  | 25.8  | 27.7  | 32.8  |
| 20 min | 10.8                       | 15.4  | 18.6  | 20.5  | 21.8  | 22.8  | 23.7  | 25.0  | 26.0  | 27.9  | 29.2  | 32.3  |
|        | 12.2                       | 17.7  | 22.1  | 24.9  | 27.0  | 28.7  | 30.1  | 32.5  | 34.4  | 38.1  | 40.9  | 48.3  |
| 30 min | 12.7                       | 18.5  | 22.6  | 25.1  | 26.8  | 28.2  | 29.4  | 31.2  | 32.6  | 35.3  | 37.3  | 42.1  |
|        | 14.4                       | 20.9  | 25.9  | 29.0  | 31.3  | 33.2  | 34.7  | 37.3  | 39.4  | 43.4  | 46.4  | 54.2  |
| 1 h    | 15.9                       | 22.3  | 26.8  | 29.5  | 31.3  | 32.8  | 34.0  | 35.9  | 37.4  | 40.0  | 41.9  | 46.6  |
|        | 17.8                       | 25.2  | 31.0  | 34.7  | 37.4  | 39.6  | 41.5  | 44.5  | 47.0  | 51.8  | 55.4  | 64.9  |
| 2 h    | 19.2                       | 26.4  | 31.6  | 34.5  | 36.6  | 38.3  | 39.6  | 41.7  | 43.4  | 46.4  | 48.5  | 53.7  |
|        | 21.4                       | 29.8  | 36.3  | 40.4  | 43.5  | 46.0  | 48.1  | 51.5  | 54.3  | 59.7  | 63.7  | 74.3  |
| 3 h    | 21.2                       | 29.1  | 34.8  | 38.1  | 40.4  | 42.3  | 43.8  | 46.2  | 48.1  | 51.5  | 54.0  | 60.1  |
|        | 23.8                       | 32.8  | 39.7  | 44.0  | 47.2  | 49.8  | 51.9  | 55.5  | 58.4  | 63.8  | 68.0  | 78.7  |
| 6 h    | 25.8                       | 33.8  | 39.3  | 42.5  | 44.7  | 46.4  | 47.7  | 49.9  | 51.5  | 54.5  | 56.6  | 61.5  |
|        | 28.7                       | 37.5  | 44.4  | 48.8  | 52.1  | 54.8  | 57.1  | 60.8  | 63.9  | 69.7  | 74.1  | 85.8  |
| 12 h   | 31.5                       | 40.9  | 47.3  | 50.9  | 53.4  | 55.3  | 56.8  | 59.2  | 61.0  | 64.3  | 66.6  | 71.9  |
|        | 35.4                       | 46.0  | 54.4  | 59.7  | 63.8  | 67.0  | 69.8  | 74.3  | 78.0  | 85.1  | 90.5  | 104.7 |
| 1 j    | 39.2                       | 50.4  | 58.2  | 62.7  | 65.9  | 68.4  | 70.5  | 73.7  | 76.2  | 80.8  | 84.1  | 92.2  |
|        | 43.2                       | 55.2  | 64.1  | 69.5  | 73.4  | 76.6  | 79.2  | 83.5  | 86.9  | 93.4  | 98.1  | 110.4 |
| 2 j    | 50.2                       | 63.5  | 72.4  | 77.4  | 80.9  | 83.6  | 85.7  | 89.1  | 91.7  | 96.3  | 99.6  | 107.3 |
|        | 56.1                       | 71.3  | 82.4  | 89.1  | 94.1  | 98.0  | 101.2 | 106.5 | 110.7 | 118.6 | 124.4 | 139.2 |
| 3 j    | 53.5                       | 67.8  | 77.2  | 82.4  | 86.1  | 88.9  | 91.1  | 94.7  | 97.4  | 102.3 | 105.7 | 113.7 |
|        | 60.8                       | 77.4  | 89.3  | 96.4  | 101.6 | 105.7 | 109.0 | 114.5 | 118.8 | 126.9 | 132.8 | 147.6 |
| 4 j    | 58.3                       | 73.7  | 83.9  | 89.7  | 93.7  | 96.8  | 99.3  | 103.2 | 106.2 | 111.6 | 115.3 | 124.3 |
|        | 66.7                       | 84.3  | 96.7  | 104.0 | 109.2 | 113.4 | 116.8 | 122.2 | 126.6 | 134.6 | 140.4 | 155.0 |
| 5 j    | 66.1                       | 82.9  | 94.1  | 100.4 | 104.8 | 108.2 | 110.9 | 115.1 | 118.4 | 124.3 | 128.4 | 138.1 |
|        | 75.9                       | 95.2  | 108.6 | 116.5 | 122.1 | 126.5 | 130.1 | 135.9 | 140.4 | 148.8 | 154.9 | 170.1 |
| 7 j    | 76.5                       | 94.9  | 107.1 | 114.0 | 118.8 | 122.4 | 125.4 | 130.1 | 133.6 | 140.0 | 144.5 | 155.2 |
|        | 88.1                       | 108.9 | 123.1 | 131.2 | 137.0 | 141.5 | 145.2 | 151.1 | 155.8 | 164.3 | 170.4 | 185.5 |
| 10 j   | 91.2                       | 112.2 | 126.0 | 133.7 | 139.1 | 143.2 | 146.5 | 151.7 | 155.7 | 162.7 | 167.7 | 179.3 |
|        | 105.8                      | 130.4 | 146.9 | 156.3 | 162.9 | 168.1 | 172.3 | 179.0 | 184.2 | 193.7 | 200.5 | 217.3 |
| 15 j   | 110.6                      | 135.1 | 151.1 | 160.0 | 166.2 | 171.0 | 174.9 | 180.9 | 185.6 | 193.9 | 199.7 | 213.5 |
|        | 128.5                      | 157.0 | 175.6 | 186.1 | 193.5 | 199.1 | 203.7 | 210.9 | 216.4 | 226.5 | 233.6 | 250.9 |
| 20 j   | 128.7                      | 157.3 | 175.8 | 186.1 | 193.2 | 198.7 | 203.0 | 209.9 | 215.1 | 224.5 | 231.0 | 246.2 |
|        | 149.9                      | 183.4 | 205.1 | 217.3 | 225.7 | 232.2 | 237.4 | 245.7 | 252.1 | 263.6 | 271.7 | 291.3 |
| 25 j   | 137.5                      | 167.5 | 186.5 | 196.8 | 203.9 | 209.2 | 213.5 | 220.2 | 225.2 | 234.0 | 240.1 | 254.1 |
|        | 161.1                      | 197.1 | 220.5 | 233.7 | 242.9 | 250.0 | 255.7 | 264.8 | 271.8 | 284.5 | 293.5 | 315.3 |
| 30 j   | 160.7                      | 192.5 | 212.2 | 222.8 | 230.0 | 235.4 | 239.7 | 246.4 | 251.3 | 260.1 | 266.0 | 279.5 |
|        | 186.3                      | 224.5 | 249.5 | 263.6 | 273.4 | 281.0 | 287.2 | 296.9 | 304.5 | 318.2 | 327.9 | 351.3 |

#### 4. Estimation des coefficients de Montana.

Formule de Montana : intensité[mm/h] =  $a \cdot \text{durée}[\text{min}]^{-b}$  pour une plage de durées

$a_1, b_1$  : durées < 25 min

$a_2, b_2$  : durées entre 25 min et 6000 min (= 100 h)

$a_3, b_3$  : durées > 6000 min (= 100 h)

| Période de retour (années) | $a_1$ | $b_1$  | $a_2$  | $b_2$  | $a_3$ | $b_3$  |
|----------------------------|-------|--------|--------|--------|-------|--------|
| 2                          | 139.6 | 0.4707 | 299.0  | 0.7074 | 50.8  | 0.5037 |
| 5                          | 197.3 | 0.4646 | 469.3  | 0.7338 | 72.3  | 0.5187 |
| 10                         | 239.1 | 0.4594 | 606.3  | 0.7484 | 91.6  | 0.5311 |
| 15                         | 264.1 | 0.4561 | 693.3  | 0.7560 | 104.7 | 0.5386 |
| 20                         | 282.2 | 0.4537 | 758.9  | 0.7611 | 114.9 | 0.5441 |
| 25                         | 296.4 | 0.4518 | 812.1  | 0.7649 | 123.5 | 0.5484 |
| 30                         | 308.3 | 0.4503 | 857.2  | 0.7680 | 130.9 | 0.5520 |
| 40                         | 327.3 | 0.4477 | 931.7  | 0.7727 | 143.4 | 0.5576 |
| 50                         | 342.4 | 0.4458 | 992.3  | 0.7763 | 153.9 | 0.5621 |
| 75                         | 370.6 | 0.4421 | 1109.3 | 0.7827 | 174.8 | 0.5703 |
| 100                        | 391.2 | 0.4394 | 1198.1 | 0.7871 | 191.2 | 0.5762 |
| 200                        | 443.1 | 0.4328 | 1433.6 | 0.7975 | 237.1 | 0.5907 |

## Références

Van de Vyver, H. (2012). Spatial regression models for extreme precipitation in Belgium, *Water Resour. Res.*, 48, W09549, doi :10.1029/2011WR011707.

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