



# Statistiques des précipitations extrêmes des communes belges

Zwijndrecht (INS 11056)

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 | 7.6                        | 10.9  | 13.4  | 14.9  | 16.0  | 16.9  | 17.6  | 18.8  | 19.8  | 21.6  | 23.0  | 26.4  |
| 20 min | 10.9                       | 15.7  | 19.2  | 21.4  | 23.0  | 24.3  | 25.3  | 27.0  | 28.4  | 31.0  | 32.9  | 37.9  |
| 30 min | 12.9                       | 18.8  | 23.1  | 25.8  | 27.7  | 29.3  | 30.6  | 32.7  | 34.4  | 37.6  | 39.9  | 46.0  |
| 1 h    | 16.0                       | 22.4  | 27.2  | 30.1  | 32.2  | 33.9  | 35.3  | 37.6  | 39.4  | 42.8  | 45.4  | 51.9  |
| 2 h    | 19.2                       | 26.4  | 31.8  | 35.0  | 37.4  | 39.3  | 40.9  | 43.4  | 45.5  | 49.3  | 52.1  | 59.4  |
| 3 h    | 21.3                       | 29.2  | 35.2  | 38.7  | 41.4  | 43.5  | 45.2  | 48.0  | 50.2  | 54.5  | 57.6  | 65.5  |
| 6 h    | 25.7                       | 33.9  | 40.1  | 43.8  | 46.5  | 48.6  | 50.4  | 53.3  | 55.6  | 59.9  | 63.1  | 71.2  |
| 12 h   | 31.2                       | 41.2  | 48.5  | 52.9  | 56.1  | 58.7  | 60.8  | 64.2  | 67.0  | 72.1  | 75.9  | 85.5  |
| 1 j    | 38.0                       | 49.4  | 57.6  | 62.5  | 66.0  | 68.8  | 71.1  | 74.8  | 77.7  | 83.1  | 87.1  | 97.1  |
| 2 j    | 47.9                       | 61.5  | 71.0  | 76.6  | 80.6  | 83.7  | 86.3  | 90.4  | 93.6  | 99.6  | 103.9 | 114.6 |
| 3 j    | 50.9                       | 65.2  | 75.2  | 80.9  | 85.1  | 88.3  | 90.9  | 95.1  | 98.4  | 104.4 | 108.7 | 119.4 |
| 4 j    | 55.2                       | 70.5  | 81.0  | 87.0  | 91.3  | 94.6  | 97.4  | 101.7 | 105.1 | 111.3 | 115.8 | 126.7 |
| 5 j    | 62.6                       | 79.1  | 90.3  | 96.7  | 101.3 | 104.8 | 107.7 | 112.3 | 115.9 | 122.4 | 127.0 | 138.4 |
| 7 j    | 72.0                       | 89.9  | 101.9 | 108.7 | 113.5 | 117.3 | 120.3 | 125.1 | 128.8 | 135.6 | 140.5 | 152.2 |
| 10 j   | 85.5                       | 105.5 | 118.8 | 126.3 | 131.5 | 135.6 | 138.9 | 144.1 | 148.1 | 155.3 | 160.5 | 172.9 |
| 15 j   | 103.6                      | 126.9 | 142.2 | 150.7 | 156.7 | 161.2 | 165.0 | 170.8 | 175.3 | 183.4 | 189.1 | 202.7 |
| 20 j   | 120.6                      | 147.8 | 165.4 | 175.2 | 182.0 | 187.2 | 191.4 | 198.0 | 203.1 | 212.2 | 218.6 | 233.8 |
| 25 j   | 128.4                      | 157.3 | 175.8 | 186.1 | 193.3 | 198.7 | 203.1 | 210.0 | 215.2 | 224.7 | 231.3 | 247.0 |
| 30 j   | 150.3                      | 181.4 | 201.3 | 212.3 | 219.8 | 225.6 | 230.3 | 237.5 | 243.1 | 253.0 | 260.0 | 276.4 |

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 | 7.6                        | 10.9  | 13.4  | 14.9  | 16.0  | 16.9  | 17.6  | 18.8  | 19.8  | 21.6  | 23.0  | 26.4  |
|        | 0.2                        | 0.3   | 0.5   | 0.7   | 0.8   | 0.9   | 1.0   | 1.2   | 1.4   | 1.7   | 1.9   | 2.7   |
| 20 min | 10.9                       | 15.7  | 19.2  | 21.4  | 23.0  | 24.3  | 25.3  | 27.0  | 28.4  | 31.0  | 32.9  | 37.9  |
|        | 0.3                        | 0.5   | 0.8   | 1.0   | 1.2   | 1.3   | 1.4   | 1.7   | 1.9   | 2.3   | 2.6   | 3.6   |
| 30 min | 12.9                       | 18.8  | 23.1  | 25.8  | 27.7  | 29.3  | 30.6  | 32.7  | 34.4  | 37.6  | 39.9  | 46.0  |
|        | 0.4                        | 0.6   | 0.9   | 1.0   | 1.2   | 1.3   | 1.5   | 1.7   | 1.8   | 2.2   | 2.5   | 3.3   |
| 1 h    | 16.0                       | 22.4  | 27.2  | 30.1  | 32.2  | 33.9  | 35.3  | 37.6  | 39.4  | 42.8  | 45.4  | 51.9  |
|        | 0.5                        | 0.8   | 1.1   | 1.4   | 1.6   | 1.8   | 1.9   | 2.2   | 2.5   | 3.0   | 3.4   | 4.6   |
| 2 h    | 19.2                       | 26.4  | 31.8  | 35.0  | 37.4  | 39.3  | 40.9  | 43.4  | 45.5  | 49.3  | 52.1  | 59.4  |
|        | 0.6                        | 0.9   | 1.3   | 1.6   | 1.8   | 2.0   | 2.2   | 2.5   | 2.8   | 3.4   | 3.9   | 5.2   |
| 3 h    | 21.3                       | 29.2  | 35.2  | 38.7  | 41.4  | 43.5  | 45.2  | 48.0  | 50.2  | 54.5  | 57.6  | 65.5  |
|        | 0.7                        | 1.0   | 1.3   | 1.6   | 1.8   | 2.0   | 2.2   | 2.5   | 2.7   | 3.3   | 3.7   | 4.9   |
| 6 h    | 25.7                       | 33.9  | 40.1  | 43.8  | 46.5  | 48.6  | 50.4  | 53.3  | 55.6  | 59.9  | 63.1  | 71.2  |
|        | 0.8                        | 1.1   | 1.4   | 1.7   | 2.0   | 2.3   | 2.5   | 2.9   | 3.3   | 4.0   | 4.6   | 6.3   |
| 12 h   | 31.2                       | 41.2  | 48.5  | 52.9  | 56.1  | 58.7  | 60.8  | 64.2  | 67.0  | 72.1  | 75.9  | 85.5  |
|        | 1.1                        | 1.5   | 1.9   | 2.4   | 2.7   | 3.1   | 3.4   | 3.9   | 4.3   | 5.3   | 6.1   | 8.3   |
| 1 j    | 38.0                       | 49.4  | 57.6  | 62.5  | 66.0  | 68.8  | 71.1  | 74.8  | 77.7  | 83.1  | 87.1  | 97.1  |
|        | 1.4                        | 1.6   | 1.9   | 2.2   | 2.4   | 2.5   | 2.7   | 3.0   | 3.2   | 3.7   | 4.1   | 5.2   |
| 2 j    | 47.9                       | 61.5  | 71.0  | 76.6  | 80.6  | 83.7  | 86.3  | 90.4  | 93.6  | 99.6  | 103.9 | 114.6 |
|        | 2.1                        | 2.6   | 3.3   | 3.8   | 4.2   | 4.5   | 4.8   | 5.3   | 5.7   | 6.6   | 7.2   | 9.1   |
| 3 j    | 50.9                       | 65.2  | 75.2  | 80.9  | 85.1  | 88.3  | 90.9  | 95.1  | 98.4  | 104.4 | 108.7 | 119.4 |
|        | 2.6                        | 3.3   | 4.0   | 4.5   | 4.9   | 5.2   | 5.5   | 6.0   | 6.4   | 7.2   | 7.9   | 9.6   |
| 4 j    | 55.2                       | 70.5  | 81.0  | 87.0  | 91.3  | 94.6  | 97.4  | 101.7 | 105.1 | 111.3 | 115.8 | 126.7 |
|        | 3.0                        | 3.6   | 4.2   | 4.6   | 5.0   | 5.2   | 5.5   | 5.9   | 6.2   | 6.9   | 7.4   | 8.8   |
| 5 j    | 62.6                       | 79.1  | 90.3  | 96.7  | 101.3 | 104.8 | 107.7 | 112.3 | 115.9 | 122.4 | 127.0 | 138.4 |
|        | 3.4                        | 4.2   | 4.8   | 5.2   | 5.5   | 5.8   | 6.0   | 6.4   | 6.7   | 7.3   | 7.8   | 9.1   |
| 7 j    | 72.0                       | 89.9  | 101.9 | 108.7 | 113.5 | 117.3 | 120.3 | 125.1 | 128.8 | 135.6 | 140.5 | 152.2 |
|        | 4.1                        | 4.9   | 5.5   | 5.9   | 6.1   | 6.4   | 6.6   | 6.9   | 7.2   | 7.8   | 8.2   | 9.3   |
| 10 j   | 85.5                       | 105.5 | 118.8 | 126.3 | 131.5 | 135.6 | 138.9 | 144.1 | 148.1 | 155.3 | 160.5 | 172.9 |
|        | 5.1                        | 6.3   | 7.1   | 7.6   | 8.0   | 8.3   | 8.6   | 9.0   | 9.3   | 10.0  | 10.5  | 11.8  |
| 15 j   | 103.6                      | 126.9 | 142.2 | 150.7 | 156.7 | 161.2 | 165.0 | 170.8 | 175.3 | 183.4 | 189.1 | 202.7 |
|        | 6.3                        | 7.6   | 8.5   | 9.0   | 9.3   | 9.6   | 9.8   | 10.2  | 10.4  | 10.9  | 11.3  | 12.3  |
| 20 j   | 120.6                      | 147.8 | 165.4 | 175.2 | 182.0 | 187.2 | 191.4 | 198.0 | 203.1 | 212.2 | 218.6 | 233.8 |
|        | 7.4                        | 9.0   | 10.1  | 10.7  | 11.2  | 11.5  | 11.8  | 12.2  | 12.6  | 13.2  | 13.7  | 14.9  |
| 25 j   | 128.4                      | 157.3 | 175.8 | 186.1 | 193.3 | 198.7 | 203.1 | 210.0 | 215.2 | 224.7 | 231.3 | 247.0 |
|        | 8.3                        | 10.1  | 11.4  | 12.2  | 12.7  | 13.2  | 13.6  | 14.2  | 14.7  | 15.7  | 16.4  | 18.2  |
| 30 j   | 150.3                      | 181.4 | 201.3 | 212.3 | 219.8 | 225.6 | 230.3 | 237.5 | 243.1 | 253.0 | 260.0 | 276.4 |
|        | 9.2                        | 11.1  | 12.5  | 13.4  | 14.1  | 14.7  | 15.1  | 15.9  | 16.5  | 17.8  | 18.7  | 21.1  |

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 | 7.2                        | 10.2  | 12.3  | 13.5  | 14.4  | 15.1  | 15.6  | 16.5  | 17.1  | 18.3  | 19.2  | 21.2  |
|        | 8.0                        | 11.6  | 14.4  | 16.2  | 17.6  | 18.7  | 19.6  | 21.2  | 22.5  | 24.9  | 26.8  | 31.7  |
| 20 min | 10.2                       | 14.6  | 17.7  | 19.5  | 20.7  | 21.7  | 22.5  | 23.8  | 24.7  | 26.5  | 27.8  | 30.8  |
|        | 11.6                       | 16.7  | 20.8  | 23.3  | 25.3  | 26.8  | 28.1  | 30.3  | 32.1  | 35.5  | 38.1  | 44.9  |
| 30 min | 12.1                       | 17.5  | 21.4  | 23.7  | 25.4  | 26.7  | 27.7  | 29.4  | 30.8  | 33.3  | 35.1  | 39.5  |
|        | 13.7                       | 20.0  | 24.8  | 27.8  | 30.1  | 31.9  | 33.5  | 36.0  | 38.0  | 41.9  | 44.8  | 52.4  |
| 1 h    | 15.1                       | 20.9  | 25.0  | 27.4  | 29.1  | 30.4  | 31.5  | 33.2  | 34.5  | 36.9  | 38.7  | 42.8  |
|        | 16.9                       | 23.9  | 29.3  | 32.7  | 35.3  | 37.3  | 39.1  | 41.9  | 44.3  | 48.7  | 52.1  | 60.9  |
| 2 h    | 18.0                       | 24.6  | 29.2  | 31.9  | 33.8  | 35.3  | 36.5  | 38.4  | 39.9  | 42.6  | 44.5  | 49.2  |
|        | 20.3                       | 28.2  | 34.3  | 38.1  | 40.9  | 43.2  | 45.2  | 48.4  | 51.0  | 56.0  | 59.7  | 69.6  |
| 3 h    | 19.9                       | 27.3  | 32.5  | 35.6  | 37.8  | 39.5  | 40.9  | 43.1  | 44.9  | 48.1  | 50.4  | 56.0  |
|        | 22.6                       | 31.2  | 37.8  | 41.9  | 44.9  | 47.4  | 49.5  | 52.9  | 55.6  | 60.9  | 64.8  | 75.1  |
| 6 h    | 24.1                       | 31.9  | 37.3  | 40.3  | 42.5  | 44.1  | 45.5  | 47.5  | 49.1  | 52.0  | 54.1  | 58.8  |
|        | 27.3                       | 36.0  | 42.8  | 47.2  | 50.4  | 53.1  | 55.3  | 59.0  | 62.0  | 67.8  | 72.1  | 83.6  |
| 12 h   | 29.0                       | 38.3  | 44.7  | 48.3  | 50.8  | 52.7  | 54.2  | 56.6  | 58.5  | 61.7  | 64.0  | 69.3  |
|        | 33.4                       | 44.0  | 52.3  | 57.5  | 61.4  | 64.6  | 67.4  | 71.8  | 75.5  | 82.5  | 87.8  | 101.7 |
| 1 j    | 35.3                       | 46.2  | 53.8  | 58.2  | 61.4  | 63.8  | 65.8  | 68.9  | 71.4  | 75.9  | 79.1  | 86.9  |
|        | 40.6                       | 52.5  | 61.3  | 66.7  | 70.6  | 73.7  | 76.3  | 80.6  | 84.0  | 90.4  | 95.1  | 107.3 |
| 2 j    | 43.9                       | 56.3  | 64.6  | 69.2  | 72.4  | 74.9  | 76.9  | 80.0  | 82.4  | 86.7  | 89.7  | 96.9  |
|        | 52.0                       | 66.7  | 77.4  | 84.0  | 88.7  | 92.5  | 95.7  | 100.8 | 104.8 | 112.5 | 118.1 | 132.4 |
| 3 j    | 45.8                       | 58.8  | 67.4  | 72.2  | 75.5  | 78.1  | 80.1  | 83.4  | 85.8  | 90.2  | 93.3  | 100.6 |
|        | 55.9                       | 71.6  | 82.9  | 89.7  | 94.6  | 98.4  | 101.7 | 106.8 | 110.9 | 118.6 | 124.2 | 138.2 |
| 4 j    | 49.4                       | 63.4  | 72.7  | 77.9  | 81.6  | 84.4  | 86.7  | 90.2  | 92.9  | 97.8  | 101.3 | 109.4 |
|        | 61.0                       | 77.6  | 89.2  | 96.1  | 101.0 | 104.9 | 108.1 | 113.2 | 117.3 | 124.8 | 130.3 | 143.9 |
| 5 j    | 56.0                       | 71.0  | 81.0  | 86.6  | 90.5  | 93.6  | 96.0  | 99.8  | 102.8 | 108.1 | 111.8 | 120.6 |
|        | 69.3                       | 87.2  | 99.7  | 106.9 | 112.1 | 116.1 | 119.4 | 124.8 | 129.0 | 136.7 | 142.3 | 156.3 |
| 7 j    | 64.0                       | 80.3  | 91.1  | 97.2  | 101.5 | 104.8 | 107.4 | 111.5 | 114.7 | 120.4 | 124.4 | 133.9 |
|        | 80.0                       | 99.4  | 112.6 | 120.2 | 125.6 | 129.8 | 133.2 | 138.7 | 143.0 | 150.9 | 156.5 | 170.5 |
| 10 j   | 75.5                       | 93.2  | 104.8 | 111.3 | 115.8 | 119.3 | 122.1 | 126.4 | 129.8 | 135.8 | 140.0 | 149.9 |
|        | 95.6                       | 117.9 | 132.8 | 141.3 | 147.2 | 151.9 | 155.7 | 161.7 | 166.4 | 174.9 | 181.0 | 195.9 |
| 15 j   | 91.2                       | 112.0 | 125.5 | 133.1 | 138.4 | 142.5 | 145.7 | 150.9 | 154.8 | 161.9 | 166.9 | 178.7 |
|        | 115.9                      | 141.8 | 158.8 | 168.3 | 174.9 | 180.0 | 184.2 | 190.7 | 195.7 | 204.8 | 211.3 | 226.7 |
| 20 j   | 106.1                      | 130.0 | 145.5 | 154.1 | 160.1 | 164.6 | 168.3 | 174.0 | 178.4 | 186.2 | 191.7 | 204.5 |
|        | 135.1                      | 165.5 | 185.2 | 196.2 | 203.9 | 209.7 | 214.5 | 221.9 | 227.7 | 238.1 | 245.4 | 263.0 |
| 25 j   | 112.1                      | 137.4 | 153.5 | 162.3 | 168.3 | 172.8 | 176.5 | 182.1 | 186.4 | 194.0 | 199.2 | 211.3 |
|        | 144.6                      | 177.1 | 198.2 | 210.0 | 218.2 | 224.6 | 229.7 | 237.8 | 244.1 | 255.4 | 263.4 | 282.7 |
| 30 j   | 132.4                      | 159.8 | 176.8 | 186.0 | 192.2 | 196.9 | 200.6 | 206.3 | 210.7 | 218.2 | 223.4 | 235.1 |
|        | 168.3                      | 203.1 | 225.8 | 238.6 | 247.5 | 254.4 | 259.9 | 268.7 | 275.5 | 287.9 | 296.6 | 317.7 |

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                          | 133.5 | 0.4673 | 303.4  | 0.7224 | 53.1  | 0.5220 |
| 5                          | 191.6 | 0.4677 | 468.8  | 0.7456 | 80.5  | 0.5430 |
| 10                         | 233.8 | 0.4653 | 601.3  | 0.7587 | 105.1 | 0.5582 |
| 15                         | 259.0 | 0.4633 | 685.4  | 0.7656 | 121.8 | 0.5671 |
| 20                         | 277.3 | 0.4617 | 748.7  | 0.7703 | 135.0 | 0.5734 |
| 25                         | 291.7 | 0.4604 | 800.0  | 0.7738 | 145.9 | 0.5783 |
| 30                         | 303.6 | 0.4592 | 843.6  | 0.7767 | 155.5 | 0.5823 |
| 40                         | 322.9 | 0.4573 | 915.4  | 0.7811 | 171.6 | 0.5886 |
| 50                         | 338.1 | 0.4558 | 973.8  | 0.7844 | 185.1 | 0.5936 |
| 75                         | 366.6 | 0.4528 | 1086.5 | 0.7904 | 212.1 | 0.6026 |
| 100                        | 387.4 | 0.4506 | 1171.9 | 0.7945 | 233.4 | 0.6090 |
| 200                        | 439.9 | 0.4450 | 1398.5 | 0.8044 | 292.9 | 0.6247 |

## 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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