



# Statistiques des précipitations extrêmes des communes belges

Mechelen (INS 12025)

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 | 7.5                        | 10.8  | 13.2  | 14.7  | 15.8  | 16.7  | 17.5  | 18.7  | 19.6  | 21.4  | 22.8  | 26.2  |
| 20 min | 10.8                       | 15.4  | 18.9  | 21.0  | 22.6  | 23.8  | 24.9  | 26.6  | 27.9  | 30.5  | 32.3  | 37.2  |
| 30 min | 12.7                       | 18.5  | 22.8  | 25.4  | 27.4  | 28.9  | 30.2  | 32.3  | 33.9  | 37.1  | 39.4  | 45.3  |
| 1 h    | 15.8                       | 22.0  | 26.7  | 29.5  | 31.6  | 33.2  | 34.6  | 36.8  | 38.6  | 42.0  | 44.4  | 50.8  |
| 2 h    | 18.9                       | 25.9  | 31.1  | 34.3  | 36.6  | 38.5  | 40.0  | 42.5  | 44.5  | 48.2  | 51.0  | 58.1  |
| 3 h    | 20.9                       | 28.8  | 34.6  | 38.1  | 40.7  | 42.7  | 44.4  | 47.2  | 49.4  | 53.6  | 56.6  | 64.5  |
| 6 h    | 25.2                       | 33.5  | 39.5  | 43.2  | 45.9  | 48.0  | 49.8  | 52.7  | 55.0  | 59.3  | 62.5  | 70.5  |
| 12 h   | 30.6                       | 40.5  | 47.8  | 52.2  | 55.4  | 58.0  | 60.1  | 63.5  | 66.2  | 71.4  | 75.1  | 84.7  |
| 1 j    | 37.0                       | 48.3  | 56.5  | 61.3  | 64.9  | 67.6  | 69.9  | 73.6  | 76.5  | 81.9  | 85.9  | 95.8  |
| 2 j    | 46.3                       | 59.7  | 69.1  | 74.6  | 78.5  | 81.6  | 84.1  | 88.2  | 91.3  | 97.2  | 101.5 | 112.0 |
| 3 j    | 48.9                       | 63.0  | 72.7  | 78.4  | 82.4  | 85.5  | 88.1  | 92.2  | 95.4  | 101.3 | 105.6 | 116.0 |
| 4 j    | 53.0                       | 67.9  | 78.1  | 84.0  | 88.2  | 91.5  | 94.1  | 98.4  | 101.7 | 107.7 | 112.1 | 122.7 |
| 5 j    | 60.1                       | 76.1  | 86.9  | 93.2  | 97.6  | 101.0 | 103.8 | 108.3 | 111.7 | 118.1 | 122.6 | 133.6 |
| 7 j    | 68.9                       | 86.2  | 97.9  | 104.5 | 109.2 | 112.8 | 115.7 | 120.4 | 124.0 | 130.6 | 135.3 | 146.7 |
| 10 j   | 81.6                       | 100.7 | 113.4 | 120.6 | 125.6 | 129.5 | 132.6 | 137.6 | 141.4 | 148.4 | 153.3 | 165.2 |
| 15 j   | 98.7                       | 121.1 | 135.7 | 143.9 | 149.6 | 154.0 | 157.6 | 163.2 | 167.5 | 175.2 | 180.7 | 193.8 |
| 20 j   | 115.0                      | 140.9 | 157.7 | 167.1 | 173.6 | 178.6 | 182.6 | 188.9 | 193.8 | 202.5 | 208.6 | 223.2 |
| 25 j   | 122.0                      | 149.7 | 167.4 | 177.3 | 184.1 | 189.3 | 193.5 | 200.1 | 205.1 | 214.2 | 220.5 | 235.5 |
| 30 j   | 143.3                      | 173.2 | 192.3 | 202.9 | 210.1 | 215.7 | 220.2 | 227.2 | 232.5 | 242.1 | 248.8 | 264.5 |

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 | 7.5                        | 10.8  | 13.2  | 14.7  | 15.8  | 16.7  | 17.5  | 18.7  | 19.6  | 21.4  | 22.8  | 26.2  |
|        | 0.2                        | 0.3   | 0.5   | 0.7   | 0.8   | 0.9   | 1.0   | 1.2   | 1.4   | 1.7   | 1.9   | 2.6   |
| 20 min | 10.8                       | 15.4  | 18.9  | 21.0  | 22.6  | 23.8  | 24.9  | 26.6  | 27.9  | 30.5  | 32.3  | 37.2  |
|        | 0.4                        | 0.6   | 0.8   | 1.0   | 1.1   | 1.3   | 1.4   | 1.6   | 1.8   | 2.2   | 2.6   | 3.5   |
| 30 min | 12.7                       | 18.5  | 22.8  | 25.4  | 27.4  | 28.9  | 30.2  | 32.3  | 33.9  | 37.1  | 39.4  | 45.3  |
|        | 0.4                        | 0.7   | 0.9   | 1.1   | 1.3   | 1.4   | 1.5   | 1.7   | 1.9   | 2.3   | 2.6   | 3.4   |
| 1 h    | 15.8                       | 22.0  | 26.7  | 29.5  | 31.6  | 33.2  | 34.6  | 36.8  | 38.6  | 42.0  | 44.4  | 50.8  |
|        | 0.5                        | 0.8   | 1.2   | 1.4   | 1.6   | 1.8   | 2.0   | 2.3   | 2.5   | 3.1   | 3.5   | 4.7   |
| 2 h    | 18.9                       | 25.9  | 31.1  | 34.3  | 36.6  | 38.5  | 40.0  | 42.5  | 44.5  | 48.2  | 51.0  | 58.1  |
|        | 0.6                        | 1.0   | 1.3   | 1.6   | 1.9   | 2.1   | 2.3   | 2.6   | 2.9   | 3.5   | 3.9   | 5.2   |
| 3 h    | 20.9                       | 28.8  | 34.6  | 38.1  | 40.7  | 42.7  | 44.4  | 47.2  | 49.4  | 53.6  | 56.6  | 64.5  |
|        | 0.7                        | 1.0   | 1.4   | 1.7   | 1.9   | 2.1   | 2.3   | 2.6   | 2.8   | 3.4   | 3.8   | 5.0   |
| 6 h    | 25.2                       | 33.5  | 39.5  | 43.2  | 45.9  | 48.0  | 49.8  | 52.7  | 55.0  | 59.3  | 62.5  | 70.5  |
|        | 0.9                        | 1.1   | 1.5   | 1.8   | 2.1   | 2.4   | 2.6   | 3.0   | 3.4   | 4.1   | 4.7   | 6.4   |
| 12 h   | 30.6                       | 40.5  | 47.8  | 52.2  | 55.4  | 58.0  | 60.1  | 63.5  | 66.2  | 71.4  | 75.1  | 84.7  |
|        | 1.2                        | 1.5   | 2.0   | 2.4   | 2.8   | 3.1   | 3.4   | 3.9   | 4.4   | 5.3   | 6.1   | 8.3   |
| 1 j    | 37.0                       | 48.3  | 56.5  | 61.3  | 64.9  | 67.6  | 69.9  | 73.6  | 76.5  | 81.9  | 85.9  | 95.8  |
|        | 1.4                        | 1.7   | 2.0   | 2.3   | 2.5   | 2.7   | 2.8   | 3.1   | 3.4   | 3.9   | 4.3   | 5.4   |
| 2 j    | 46.3                       | 59.7  | 69.1  | 74.6  | 78.5  | 81.6  | 84.1  | 88.2  | 91.3  | 97.2  | 101.5 | 112.0 |
|        | 2.2                        | 2.8   | 3.5   | 4.0   | 4.4   | 4.7   | 5.0   | 5.5   | 6.0   | 6.8   | 7.5   | 9.4   |
| 3 j    | 48.9                       | 63.0  | 72.7  | 78.4  | 82.4  | 85.5  | 88.1  | 92.2  | 95.4  | 101.3 | 105.6 | 116.0 |
|        | 2.7                        | 3.4   | 4.2   | 4.7   | 5.1   | 5.4   | 5.7   | 6.2   | 6.7   | 7.5   | 8.1   | 9.9   |
| 4 j    | 53.0                       | 67.9  | 78.1  | 84.0  | 88.2  | 91.5  | 94.1  | 98.4  | 101.7 | 107.7 | 112.1 | 122.7 |
|        | 3.1                        | 3.8   | 4.4   | 4.8   | 5.2   | 5.5   | 5.7   | 6.1   | 6.5   | 7.1   | 7.7   | 9.1   |
| 5 j    | 60.1                       | 76.1  | 86.9  | 93.2  | 97.6  | 101.0 | 103.8 | 108.3 | 111.7 | 118.1 | 122.6 | 133.6 |
|        | 3.5                        | 4.3   | 5.0   | 5.4   | 5.7   | 6.0   | 6.2   | 6.6   | 6.9   | 7.6   | 8.0   | 9.4   |
| 7 j    | 68.9                       | 86.2  | 97.9  | 104.5 | 109.2 | 112.8 | 115.7 | 120.4 | 124.0 | 130.6 | 135.3 | 146.7 |
|        | 4.3                        | 5.1   | 5.7   | 6.1   | 6.5   | 6.7   | 6.9   | 7.3   | 7.6   | 8.1   | 8.6   | 9.7   |
| 10 j   | 81.6                       | 100.7 | 113.4 | 120.6 | 125.6 | 129.5 | 132.6 | 137.6 | 141.4 | 148.4 | 153.3 | 165.2 |
|        | 5.3                        | 6.6   | 7.5   | 8.0   | 8.4   | 8.7   | 9.0   | 9.4   | 9.7   | 10.4  | 10.9  | 12.2  |
| 15 j   | 98.7                       | 121.1 | 135.7 | 143.9 | 149.6 | 154.0 | 157.6 | 163.2 | 167.5 | 175.2 | 180.7 | 193.8 |
|        | 6.6                        | 7.9   | 8.9   | 9.4   | 9.7   | 10.0  | 10.2  | 10.6  | 10.9  | 11.4  | 11.8  | 12.8  |
| 20 j   | 115.0                      | 140.9 | 157.7 | 167.1 | 173.6 | 178.6 | 182.6 | 188.9 | 193.8 | 202.5 | 208.6 | 223.2 |
|        | 7.7                        | 9.4   | 10.6  | 11.2  | 11.7  | 12.0  | 12.3  | 12.8  | 13.1  | 13.8  | 14.3  | 15.6  |
| 25 j   | 122.0                      | 149.7 | 167.4 | 177.3 | 184.1 | 189.3 | 193.5 | 200.1 | 205.1 | 214.2 | 220.5 | 235.5 |
|        | 8.6                        | 10.5  | 11.9  | 12.7  | 13.2  | 13.7  | 14.1  | 14.7  | 15.2  | 16.2  | 16.9  | 18.7  |
| 30 j   | 143.3                      | 173.2 | 192.3 | 202.9 | 210.1 | 215.7 | 220.2 | 227.2 | 232.5 | 242.1 | 248.8 | 264.5 |
|        | 9.6                        | 11.5  | 13.0  | 13.9  | 14.6  | 15.2  | 15.7  | 16.5  | 17.1  | 18.3  | 19.2  | 21.6  |

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 | 7.1                        | 10.1  | 12.2  | 13.4  | 14.3  | 14.9  | 15.5  | 16.3  | 17.0  | 18.2  | 19.0  | 21.0  |
|        | 7.9                        | 11.5  | 14.3  | 16.1  | 17.4  | 18.5  | 19.5  | 21.0  | 22.3  | 24.7  | 26.5  | 31.4  |
| 20 min | 10.1                       | 14.3  | 17.3  | 19.1  | 20.3  | 21.3  | 22.1  | 23.3  | 24.3  | 26.1  | 27.3  | 30.3  |
|        | 11.4                       | 16.5  | 20.5  | 23.0  | 24.8  | 26.4  | 27.6  | 29.8  | 31.5  | 34.8  | 37.4  | 44.0  |
| 30 min | 11.9                       | 17.2  | 21.0  | 23.3  | 24.9  | 26.2  | 27.2  | 28.9  | 30.2  | 32.6  | 34.4  | 38.7  |
|        | 13.6                       | 19.8  | 24.6  | 27.6  | 29.8  | 31.7  | 33.2  | 35.7  | 37.7  | 41.5  | 44.4  | 52.0  |
| 1 h    | 14.9                       | 20.5  | 24.4  | 26.7  | 28.4  | 29.6  | 30.7  | 32.3  | 33.6  | 35.9  | 37.6  | 41.7  |
|        | 16.7                       | 23.6  | 28.9  | 32.3  | 34.8  | 36.8  | 38.5  | 41.3  | 43.6  | 48.0  | 51.2  | 59.9  |
| 2 h    | 17.7                       | 24.0  | 28.5  | 31.1  | 32.9  | 34.4  | 35.5  | 37.4  | 38.8  | 41.5  | 43.3  | 47.8  |
|        | 20.0                       | 27.8  | 33.8  | 37.5  | 40.3  | 42.6  | 44.5  | 47.6  | 50.2  | 55.0  | 58.7  | 68.4  |
| 3 h    | 19.5                       | 26.7  | 31.8  | 34.8  | 37.0  | 38.6  | 40.0  | 42.2  | 43.9  | 47.0  | 49.2  | 54.7  |
|        | 22.3                       | 30.8  | 37.3  | 41.4  | 44.4  | 46.8  | 48.9  | 52.3  | 55.0  | 60.2  | 64.1  | 74.2  |
| 6 h    | 23.6                       | 31.2  | 36.6  | 39.6  | 41.7  | 43.4  | 44.7  | 46.8  | 48.4  | 51.2  | 53.2  | 58.0  |
|        | 26.9                       | 35.7  | 42.5  | 46.8  | 50.1  | 52.7  | 54.9  | 58.6  | 61.6  | 67.3  | 71.7  | 83.1  |
| 12 h   | 28.3                       | 37.5  | 43.9  | 47.5  | 49.9  | 51.9  | 53.4  | 55.8  | 57.6  | 60.9  | 63.2  | 68.5  |
|        | 32.9                       | 43.5  | 51.8  | 57.0  | 60.9  | 64.1  | 66.8  | 71.2  | 74.9  | 81.8  | 87.1  | 101.0 |
| 1 j    | 34.2                       | 45.0  | 52.5  | 56.9  | 60.0  | 62.4  | 64.3  | 67.5  | 69.9  | 74.3  | 77.5  | 85.3  |
|        | 39.8                       | 51.7  | 60.5  | 65.8  | 69.7  | 72.9  | 75.5  | 79.7  | 83.1  | 89.5  | 94.2  | 106.3 |
| 2 j    | 42.1                       | 54.2  | 62.3  | 66.8  | 69.9  | 72.3  | 74.3  | 77.3  | 79.6  | 83.8  | 86.7  | 93.6  |
|        | 50.6                       | 65.2  | 75.9  | 82.3  | 87.1  | 90.8  | 93.9  | 99.0  | 103.0 | 110.6 | 116.2 | 130.4 |
| 3 j    | 43.7                       | 56.3  | 64.6  | 69.2  | 72.4  | 74.9  | 76.9  | 80.0  | 82.4  | 86.6  | 89.6  | 96.6  |
|        | 54.2                       | 69.7  | 80.9  | 87.5  | 92.4  | 96.2  | 99.3  | 104.4 | 108.5 | 116.0 | 121.5 | 135.4 |
| 4 j    | 46.9                       | 60.4  | 69.5  | 74.5  | 78.0  | 80.8  | 82.9  | 86.4  | 89.0  | 93.7  | 97.0  | 104.9 |
|        | 59.0                       | 75.3  | 86.8  | 93.5  | 98.4  | 102.2 | 105.3 | 110.4 | 114.4 | 121.7 | 127.1 | 140.6 |
| 5 j    | 53.1                       | 67.5  | 77.2  | 82.6  | 86.4  | 89.3  | 91.6  | 95.3  | 98.2  | 103.3 | 106.8 | 115.3 |
|        | 67.0                       | 84.6  | 96.7  | 103.8 | 108.8 | 112.8 | 116.0 | 121.2 | 125.3 | 132.9 | 138.4 | 152.0 |
| 7 j    | 60.5                       | 76.2  | 86.6  | 92.4  | 96.5  | 99.6  | 102.2 | 106.1 | 109.2 | 114.7 | 118.5 | 127.6 |
|        | 77.2                       | 96.2  | 109.1 | 116.5 | 121.8 | 125.9 | 129.3 | 134.7 | 138.9 | 146.6 | 152.1 | 165.8 |
| 10 j   | 71.1                       | 87.8  | 98.8  | 104.9 | 109.2 | 112.4 | 115.1 | 119.2 | 122.3 | 128.0 | 132.0 | 141.3 |
|        | 92.0                       | 113.6 | 128.0 | 136.2 | 142.0 | 146.5 | 150.2 | 156.0 | 160.5 | 168.8 | 174.7 | 189.1 |
| 15 j   | 85.9                       | 105.5 | 118.4 | 125.6 | 130.6 | 134.4 | 137.5 | 142.4 | 146.1 | 152.8 | 157.5 | 168.7 |
|        | 111.6                      | 136.6 | 153.1 | 162.3 | 168.7 | 173.6 | 177.6 | 183.9 | 188.8 | 197.6 | 203.8 | 218.8 |
| 20 j   | 99.8                       | 122.4 | 137.0 | 145.1 | 150.7 | 155.0 | 158.5 | 163.9 | 168.0 | 175.4 | 180.5 | 192.6 |
|        | 130.1                      | 159.4 | 178.5 | 189.1 | 196.5 | 202.2 | 206.8 | 214.0 | 219.5 | 229.6 | 236.7 | 253.7 |
| 25 j   | 105.1                      | 129.0 | 144.2 | 152.5 | 158.2 | 162.5 | 165.9 | 171.3 | 175.3 | 182.5 | 187.4 | 198.8 |
|        | 138.9                      | 170.3 | 190.7 | 202.1 | 210.1 | 216.2 | 221.1 | 228.9 | 235.0 | 245.9 | 253.6 | 272.2 |
| 30 j   | 124.5                      | 150.6 | 166.8 | 175.5 | 181.5 | 185.9 | 189.4 | 194.9 | 199.0 | 206.2 | 211.1 | 222.2 |
|        | 162.1                      | 195.8 | 217.8 | 230.2 | 238.8 | 245.5 | 250.9 | 259.4 | 266.0 | 278.0 | 286.5 | 306.9 |

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                          | 131.3 | 0.4648 | 306.0  | 0.7278 | 54.1  | 0.5287 |
| 5                          | 189.4 | 0.4673 | 470.4  | 0.7499 | 83.8  | 0.5517 |
| 10                         | 231.6 | 0.4658 | 602.0  | 0.7625 | 110.6 | 0.5678 |
| 15                         | 256.8 | 0.4643 | 685.4  | 0.7692 | 128.8 | 0.5771 |
| 20                         | 275.1 | 0.4629 | 748.2  | 0.7738 | 143.1 | 0.5836 |
| 25                         | 289.5 | 0.4618 | 799.2  | 0.7772 | 155.1 | 0.5887 |
| 30                         | 301.5 | 0.4608 | 842.3  | 0.7799 | 165.5 | 0.5929 |
| 40                         | 320.8 | 0.4591 | 913.5  | 0.7842 | 183.1 | 0.5994 |
| 50                         | 336.1 | 0.4577 | 971.4  | 0.7875 | 197.8 | 0.6045 |
| 75                         | 364.6 | 0.4550 | 1083.1 | 0.7933 | 227.4 | 0.6138 |
| 100                        | 385.4 | 0.4530 | 1167.8 | 0.7973 | 250.6 | 0.6204 |
| 200                        | 438.0 | 0.4477 | 1392.4 | 0.8070 | 315.8 | 0.6364 |

## 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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