



# Statistiques des précipitations extrêmes des communes belges

Zuienkerke (INS 31042)

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  | 17.4  | 18.6  | 19.5  | 21.3  | 22.7  | 26.1  |
| 20 min | 10.7                       | 15.3  | 18.8  | 20.9  | 22.4  | 23.7  | 24.7  | 26.4  | 27.7  | 30.2  | 32.1  | 36.9  |
| 30 min | 12.7                       | 18.4  | 22.7  | 25.3  | 27.2  | 28.8  | 30.0  | 32.1  | 33.8  | 36.9  | 39.2  | 45.1  |
| 1 h    | 15.7                       | 21.9  | 26.5  | 29.3  | 31.3  | 33.0  | 34.3  | 36.5  | 38.3  | 41.6  | 44.1  | 50.4  |
| 2 h    | 18.7                       | 25.7  | 30.9  | 34.0  | 36.3  | 38.2  | 39.7  | 42.2  | 44.1  | 47.8  | 50.6  | 57.6  |
| 3 h    | 20.8                       | 28.6  | 34.4  | 37.9  | 40.4  | 42.5  | 44.2  | 46.9  | 49.1  | 53.2  | 56.3  | 64.0  |
| 6 h    | 25.1                       | 33.3  | 39.3  | 43.0  | 45.7  | 47.8  | 49.6  | 52.5  | 54.7  | 59.0  | 62.2  | 70.3  |
| 12 h   | 30.4                       | 40.3  | 47.6  | 51.9  | 55.2  | 57.7  | 59.8  | 63.2  | 66.0  | 71.1  | 74.9  | 84.4  |
| 1 j    | 37.1                       | 48.4  | 56.6  | 61.5  | 65.0  | 67.7  | 70.0  | 73.7  | 76.6  | 82.0  | 86.0  | 95.9  |
| 2 j    | 46.5                       | 59.9  | 69.3  | 74.8  | 78.7  | 81.8  | 84.3  | 88.4  | 91.6  | 97.5  | 101.7 | 112.3 |
| 3 j    | 49.1                       | 63.2  | 73.0  | 78.6  | 82.7  | 85.8  | 88.4  | 92.5  | 95.7  | 101.6 | 105.9 | 116.4 |
| 4 j    | 53.2                       | 68.2  | 78.4  | 84.3  | 88.5  | 91.8  | 94.5  | 98.7  | 102.0 | 108.1 | 112.4 | 123.1 |
| 5 j    | 60.3                       | 76.4  | 87.3  | 93.6  | 98.0  | 101.4 | 104.2 | 108.7 | 112.2 | 118.5 | 123.0 | 134.1 |
| 7 j    | 69.2                       | 86.6  | 98.3  | 104.9 | 109.6 | 113.2 | 116.2 | 120.9 | 124.5 | 131.1 | 135.8 | 147.2 |
| 10 j   | 82.0                       | 101.2 | 113.9 | 121.1 | 126.2 | 130.1 | 133.3 | 138.2 | 142.1 | 149.1 | 154.0 | 166.0 |
| 15 j   | 99.2                       | 121.7 | 136.4 | 144.6 | 150.3 | 154.7 | 158.3 | 163.9 | 168.2 | 176.0 | 181.5 | 194.7 |
| 20 j   | 115.5                      | 141.6 | 158.5 | 167.9 | 174.5 | 179.5 | 183.5 | 189.8 | 194.7 | 203.5 | 209.6 | 224.2 |
| 25 j   | 122.7                      | 150.4 | 168.3 | 178.2 | 185.0 | 190.3 | 194.5 | 201.1 | 206.2 | 215.2 | 221.6 | 236.7 |
| 30 j   | 144.0                      | 174.0 | 193.2 | 203.8 | 211.1 | 216.7 | 221.2 | 228.2 | 233.6 | 243.2 | 249.9 | 265.7 |

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  | 17.4  | 18.6  | 19.5  | 21.3  | 22.7  | 26.1  |
|        | 0.2                        | 0.3   | 0.5   | 0.7   | 0.8   | 0.9   | 1.0   | 1.2   | 1.3   | 1.7   | 1.9   | 2.6   |
| 20 min | 10.7                       | 15.3  | 18.8  | 20.9  | 22.4  | 23.7  | 24.7  | 26.4  | 27.7  | 30.2  | 32.1  | 36.9  |
|        | 0.3                        | 0.5   | 0.8   | 1.0   | 1.1   | 1.3   | 1.4   | 1.6   | 1.8   | 2.2   | 2.5   | 3.4   |
| 30 min | 12.7                       | 18.4  | 22.7  | 25.3  | 27.2  | 28.8  | 30.0  | 32.1  | 33.8  | 36.9  | 39.2  | 45.1  |
|        | 0.4                        | 0.6   | 0.9   | 1.1   | 1.3   | 1.4   | 1.5   | 1.7   | 1.9   | 2.3   | 2.6   | 3.4   |
| 1 h    | 15.7                       | 21.9  | 26.5  | 29.3  | 31.3  | 33.0  | 34.3  | 36.5  | 38.3  | 41.6  | 44.1  | 50.4  |
|        | 0.5                        | 0.8   | 1.1   | 1.4   | 1.6   | 1.8   | 2.0   | 2.3   | 2.5   | 3.0   | 3.5   | 4.6   |
| 2 h    | 18.7                       | 25.7  | 30.9  | 34.0  | 36.3  | 38.2  | 39.7  | 42.2  | 44.1  | 47.8  | 50.6  | 57.6  |
|        | 0.6                        | 0.9   | 1.3   | 1.6   | 1.9   | 2.1   | 2.3   | 2.6   | 2.9   | 3.4   | 3.9   | 5.2   |
| 3 h    | 20.8                       | 28.6  | 34.4  | 37.9  | 40.4  | 42.5  | 44.2  | 46.9  | 49.1  | 53.2  | 56.3  | 64.0  |
|        | 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    | 25.1                       | 33.3  | 39.3  | 43.0  | 45.7  | 47.8  | 49.6  | 52.5  | 54.7  | 59.0  | 62.2  | 70.3  |
|        | 0.8                        | 1.1   | 1.5   | 1.8   | 2.1   | 2.4   | 2.6   | 3.0   | 3.4   | 4.1   | 4.7   | 6.4   |
| 12 h   | 30.4                       | 40.3  | 47.6  | 51.9  | 55.2  | 57.7  | 59.8  | 63.2  | 66.0  | 71.1  | 74.9  | 84.4  |
|        | 1.1                        | 1.5   | 2.0   | 2.4   | 2.8   | 3.1   | 3.4   | 3.9   | 4.4   | 5.3   | 6.1   | 8.3   |
| 1 j    | 37.1                       | 48.4  | 56.6  | 61.5  | 65.0  | 67.7  | 70.0  | 73.7  | 76.6  | 82.0  | 86.0  | 95.9  |
|        | 1.3                        | 1.5   | 1.9   | 2.1   | 2.4   | 2.5   | 2.7   | 3.0   | 3.3   | 3.8   | 4.2   | 5.3   |
| 2 j    | 46.5                       | 59.9  | 69.3  | 74.8  | 78.7  | 81.8  | 84.3  | 88.4  | 91.6  | 97.5  | 101.7 | 112.3 |
|        | 1.9                        | 2.5   | 3.2   | 3.7   | 4.1   | 4.5   | 4.8   | 5.3   | 5.8   | 6.6   | 7.3   | 9.2   |
| 3 j    | 49.1                       | 63.2  | 73.0  | 78.6  | 82.7  | 85.8  | 88.4  | 92.5  | 95.7  | 101.6 | 105.9 | 116.4 |
|        | 2.3                        | 3.1   | 3.8   | 4.3   | 4.7   | 5.1   | 5.4   | 5.9   | 6.3   | 7.2   | 7.8   | 9.6   |
| 4 j    | 53.2                       | 68.2  | 78.4  | 84.3  | 88.5  | 91.8  | 94.5  | 98.7  | 102.0 | 108.1 | 112.4 | 123.1 |
|        | 2.7                        | 3.3   | 4.0   | 4.4   | 4.7   | 5.0   | 5.2   | 5.7   | 6.0   | 6.7   | 7.2   | 8.7   |
| 5 j    | 60.3                       | 76.4  | 87.3  | 93.6  | 98.0  | 101.4 | 104.2 | 108.7 | 112.2 | 118.5 | 123.0 | 134.1 |
|        | 3.1                        | 3.8   | 4.4   | 4.8   | 5.1   | 5.4   | 5.6   | 6.0   | 6.3   | 6.9   | 7.4   | 8.8   |
| 7 j    | 69.2                       | 86.6  | 98.3  | 104.9 | 109.6 | 113.2 | 116.2 | 120.9 | 124.5 | 131.1 | 135.8 | 147.2 |
|        | 3.7                        | 4.4   | 5.0   | 5.4   | 5.7   | 5.9   | 6.2   | 6.5   | 6.8   | 7.4   | 7.8   | 8.9   |
| 10 j   | 82.0                       | 101.2 | 113.9 | 121.1 | 126.2 | 130.1 | 133.3 | 138.2 | 142.1 | 149.1 | 154.0 | 166.0 |
|        | 4.6                        | 5.7   | 6.5   | 7.0   | 7.3   | 7.6   | 7.9   | 8.3   | 8.6   | 9.2   | 9.7   | 11.0  |
| 15 j   | 99.2                       | 121.7 | 136.4 | 144.6 | 150.3 | 154.7 | 158.3 | 163.9 | 168.2 | 176.0 | 181.5 | 194.7 |
|        | 5.6                        | 6.9   | 7.7   | 8.1   | 8.4   | 8.7   | 8.9   | 9.2   | 9.5   | 9.9   | 10.3  | 11.2  |
| 20 j   | 115.5                      | 141.6 | 158.5 | 167.9 | 174.5 | 179.5 | 183.5 | 189.8 | 194.7 | 203.5 | 209.6 | 224.2 |
|        | 6.7                        | 8.2   | 9.2   | 9.7   | 10.1  | 10.5  | 10.7  | 11.1  | 11.5  | 12.1  | 12.6  | 13.7  |
| 25 j   | 122.7                      | 150.4 | 168.3 | 178.2 | 185.0 | 190.3 | 194.5 | 201.1 | 206.2 | 215.2 | 221.6 | 236.7 |
|        | 7.4                        | 9.1   | 10.3  | 11.1  | 11.6  | 12.1  | 12.4  | 13.0  | 13.5  | 14.5  | 15.2  | 17.0  |
| 30 j   | 144.0                      | 174.0 | 193.2 | 203.8 | 211.1 | 216.7 | 221.2 | 228.2 | 233.6 | 243.2 | 249.9 | 265.7 |
|        | 8.2                        | 10.0  | 11.4  | 12.3  | 13.0  | 13.6  | 14.0  | 14.8  | 15.5  | 16.7  | 17.6  | 20.0  |

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  | 14.2  | 14.9  | 15.4  | 16.3  | 16.9  | 18.1  | 18.9  | 20.9  |
|        | 7.9                        | 11.4  | 14.2  | 16.0  | 17.4  | 18.5  | 19.4  | 20.9  | 22.2  | 24.6  | 26.4  | 31.3  |
| 20 min | 10.0                       | 14.3  | 17.3  | 19.0  | 20.2  | 21.2  | 22.0  | 23.2  | 24.2  | 25.9  | 27.2  | 30.2  |
|        | 11.4                       | 16.4  | 20.3  | 22.8  | 24.6  | 26.1  | 27.4  | 29.5  | 31.2  | 34.5  | 37.0  | 43.6  |
| 30 min | 11.8                       | 17.1  | 20.9  | 23.1  | 24.7  | 26.0  | 27.0  | 28.7  | 30.0  | 32.4  | 34.1  | 38.4  |
|        | 13.5                       | 19.7  | 24.5  | 27.5  | 29.7  | 31.5  | 33.0  | 35.5  | 37.5  | 41.4  | 44.3  | 51.8  |
| 1 h    | 14.8                       | 20.3  | 24.3  | 26.5  | 28.2  | 29.4  | 30.4  | 32.1  | 33.3  | 35.7  | 37.3  | 41.3  |
|        | 16.6                       | 23.4  | 28.7  | 32.0  | 34.5  | 36.5  | 38.2  | 41.0  | 43.2  | 47.6  | 50.8  | 59.4  |
| 2 h    | 17.6                       | 23.9  | 28.3  | 30.9  | 32.7  | 34.1  | 35.3  | 37.1  | 38.5  | 41.1  | 43.0  | 47.4  |
|        | 19.9                       | 27.6  | 33.5  | 37.2  | 40.0  | 42.2  | 44.1  | 47.2  | 49.7  | 54.6  | 58.2  | 67.8  |
| 3 h    | 19.4                       | 26.6  | 31.6  | 34.6  | 36.7  | 38.4  | 39.7  | 41.9  | 43.5  | 46.6  | 48.8  | 54.3  |
|        | 22.1                       | 30.6  | 37.1  | 41.1  | 44.1  | 46.5  | 48.6  | 51.9  | 54.6  | 59.8  | 63.7  | 73.8  |
| 6 h    | 23.4                       | 31.1  | 36.4  | 39.4  | 41.5  | 43.1  | 44.5  | 46.5  | 48.1  | 51.0  | 53.0  | 57.7  |
|        | 26.7                       | 35.5  | 42.3  | 46.6  | 49.9  | 52.5  | 54.7  | 58.4  | 61.4  | 67.1  | 71.5  | 82.9  |
| 12 h   | 28.1                       | 37.3  | 43.6  | 47.2  | 49.7  | 51.6  | 53.1  | 55.5  | 57.3  | 60.6  | 62.9  | 68.2  |
|        | 32.6                       | 43.2  | 51.5  | 56.7  | 60.6  | 63.8  | 66.5  | 71.0  | 74.6  | 81.5  | 86.8  | 100.7 |
| 1 j    | 34.6                       | 45.4  | 52.9  | 57.3  | 60.3  | 62.7  | 64.7  | 67.8  | 70.2  | 74.7  | 77.8  | 85.6  |
|        | 39.6                       | 51.5  | 60.3  | 65.7  | 69.6  | 72.7  | 75.4  | 79.6  | 83.0  | 89.4  | 94.2  | 106.3 |
| 2 j    | 42.8                       | 54.9  | 63.0  | 67.5  | 70.6  | 73.0  | 74.9  | 78.0  | 80.3  | 84.5  | 87.4  | 94.3  |
|        | 50.3                       | 64.8  | 75.6  | 82.0  | 86.8  | 90.6  | 93.7  | 98.8  | 102.8 | 110.4 | 116.0 | 130.3 |
| 3 j    | 44.5                       | 57.2  | 65.5  | 70.2  | 73.4  | 75.9  | 77.8  | 80.9  | 83.3  | 87.6  | 90.6  | 97.6  |
|        | 53.7                       | 69.2  | 80.4  | 87.1  | 91.9  | 95.8  | 98.9  | 104.1 | 108.1 | 115.7 | 121.2 | 135.1 |
| 4 j    | 47.9                       | 61.6  | 70.7  | 75.7  | 79.3  | 82.0  | 84.2  | 87.6  | 90.2  | 95.0  | 98.3  | 106.1 |
|        | 58.5                       | 74.7  | 86.2  | 92.9  | 97.8  | 101.6 | 104.7 | 109.8 | 113.8 | 121.2 | 126.6 | 140.1 |
| 5 j    | 54.3                       | 68.9  | 78.6  | 84.1  | 87.9  | 90.9  | 93.2  | 96.9  | 99.8  | 104.9 | 108.5 | 116.9 |
|        | 66.4                       | 83.8  | 95.9  | 103.0 | 108.0 | 112.0 | 115.2 | 120.5 | 124.5 | 132.1 | 137.6 | 151.3 |
| 7 j    | 61.9                       | 77.9  | 88.4  | 94.3  | 98.4  | 101.6 | 104.1 | 108.1 | 111.2 | 116.7 | 120.6 | 129.7 |
|        | 76.4                       | 95.3  | 108.1 | 115.5 | 120.8 | 124.9 | 128.3 | 133.6 | 137.8 | 145.5 | 151.1 | 164.8 |
| 10 j   | 73.0                       | 90.1  | 101.3 | 107.5 | 111.9 | 115.2 | 117.9 | 122.1 | 125.3 | 131.0 | 135.0 | 144.5 |
|        | 91.0                       | 112.3 | 126.6 | 134.8 | 140.5 | 145.0 | 148.6 | 154.4 | 158.9 | 167.2 | 173.1 | 187.5 |
| 15 j   | 88.1                       | 108.2 | 121.4 | 128.7 | 133.8 | 137.7 | 140.9 | 145.9 | 149.7 | 156.6 | 161.4 | 172.8 |
|        | 110.3                      | 135.1 | 151.4 | 160.5 | 166.9 | 171.8 | 175.7 | 182.0 | 186.8 | 195.5 | 201.7 | 216.6 |
| 20 j   | 102.5                      | 125.6 | 140.5 | 148.8 | 154.6 | 159.0 | 162.5 | 168.0 | 172.2 | 179.7 | 185.0 | 197.3 |
|        | 128.6                      | 157.6 | 176.5 | 187.0 | 194.3 | 200.0 | 204.5 | 211.7 | 217.2 | 227.2 | 234.2 | 251.2 |
| 25 j   | 108.1                      | 132.5 | 148.0 | 156.4 | 162.2 | 166.6 | 170.1 | 175.5 | 179.6 | 186.9 | 191.9 | 203.4 |
|        | 137.2                      | 168.3 | 188.6 | 199.9 | 207.8 | 213.9 | 218.9 | 226.7 | 232.7 | 243.6 | 251.3 | 269.9 |
| 30 j   | 127.9                      | 154.4 | 170.8 | 179.6 | 185.6 | 190.1 | 193.7 | 199.2 | 203.3 | 210.5 | 215.4 | 226.6 |
|        | 160.2                      | 193.7 | 215.6 | 228.0 | 236.6 | 243.3 | 248.7 | 257.3 | 263.9 | 275.9 | 284.4 | 304.9 |

#### 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                          | 132.7 | 0.4709 | 301.1  | 0.7256 | 53.9  | 0.5277 |
| 5                          | 191.6 | 0.4737 | 462.7  | 0.7477 | 83.4  | 0.5507 |
| 10                         | 234.4 | 0.4724 | 592.1  | 0.7602 | 110.1 | 0.5668 |
| 15                         | 259.9 | 0.4708 | 674.1  | 0.7669 | 128.2 | 0.5761 |
| 20                         | 278.4 | 0.4695 | 735.8  | 0.7714 | 142.5 | 0.5827 |
| 25                         | 293.1 | 0.4684 | 785.9  | 0.7749 | 154.4 | 0.5878 |
| 30                         | 305.2 | 0.4674 | 828.3  | 0.7776 | 164.7 | 0.5920 |
| 40                         | 324.7 | 0.4658 | 898.3  | 0.7819 | 182.2 | 0.5985 |
| 50                         | 340.2 | 0.4644 | 955.2  | 0.7851 | 196.9 | 0.6036 |
| 75                         | 369.1 | 0.4617 | 1065.0 | 0.7910 | 226.3 | 0.6129 |
| 100                        | 390.2 | 0.4597 | 1148.3 | 0.7950 | 249.5 | 0.6195 |
| 200                        | 443.5 | 0.4545 | 1369.0 | 0.8047 | 314.4 | 0.6355 |

## 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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