Supplementary Material

**Assessing Snow Accumulation Patterns and Changes on the Patagonian Icefields**

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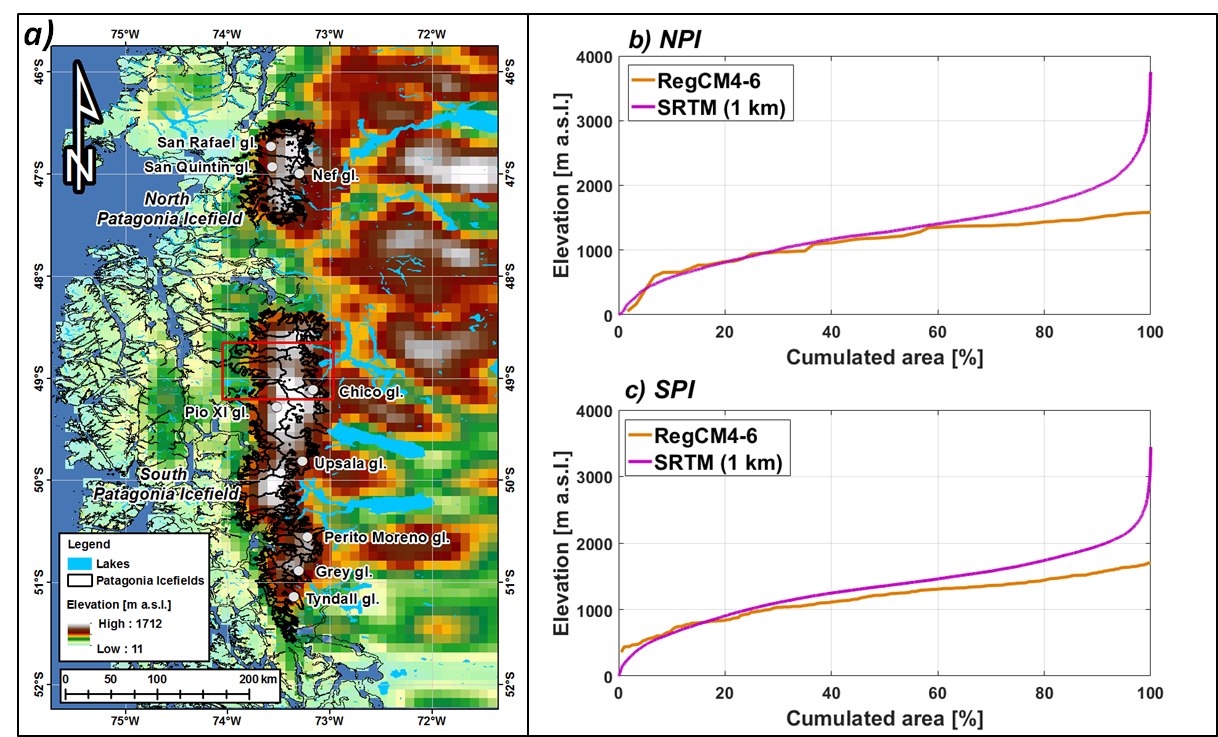
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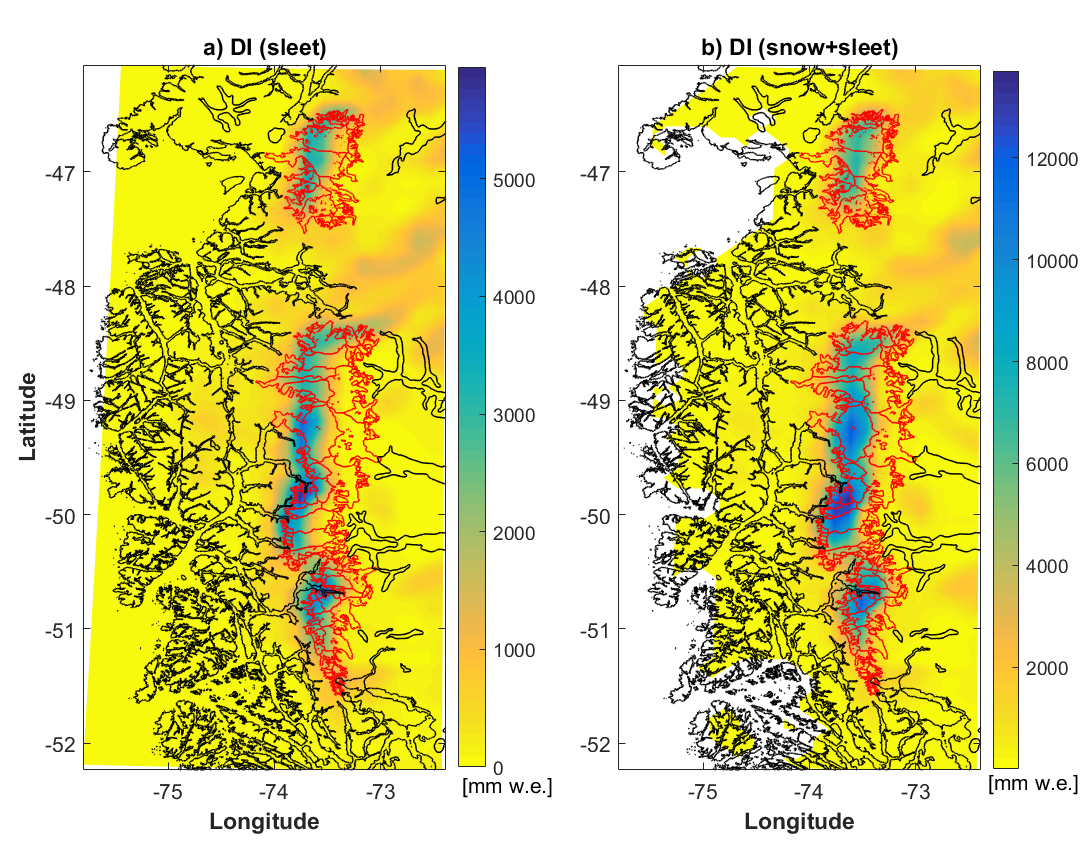
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# Supplementary Figures and Tables

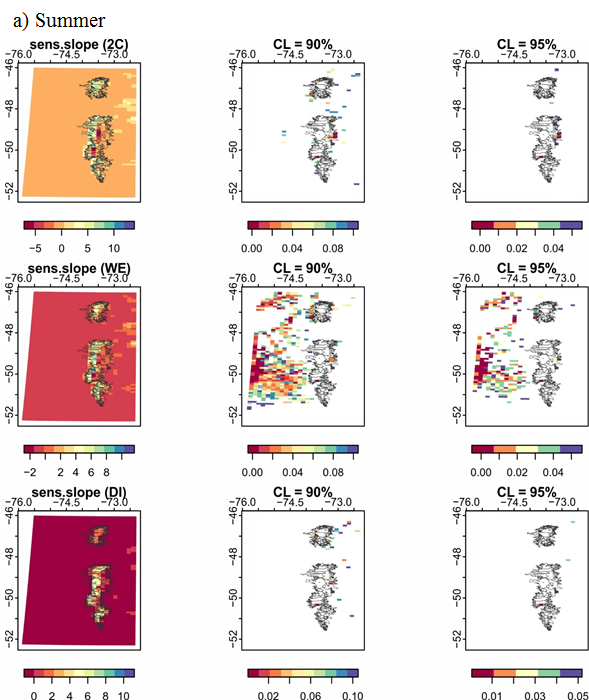
## Supplementary Figures

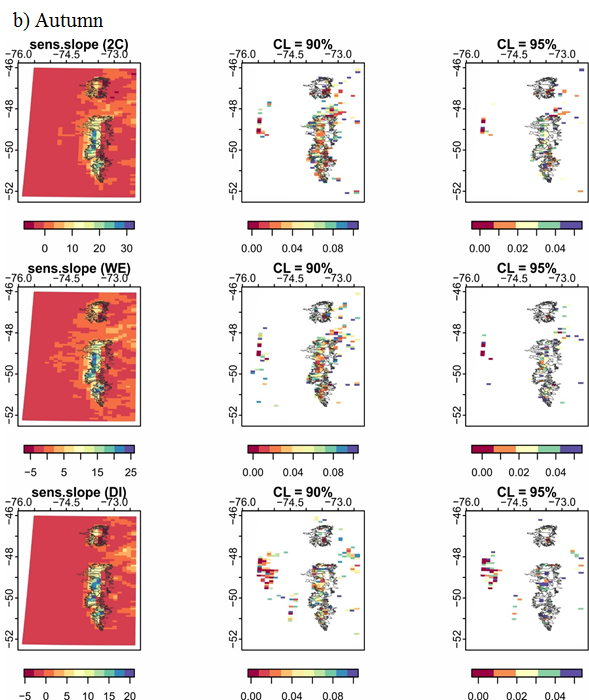


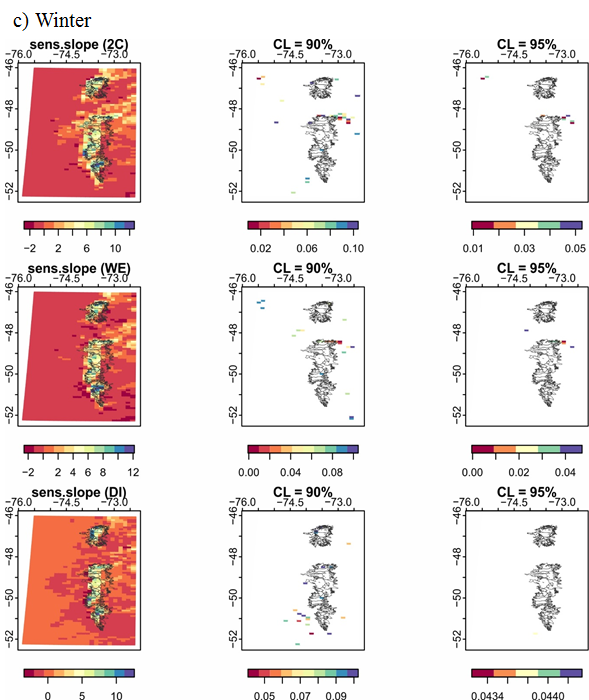
**Figure S1**. a) RegCM4.6 topography at 10 km resolution, b) and c) comparative hypsometric curves of the icefields using 1 km SRTM topographic data (Figure 1) and data from a).

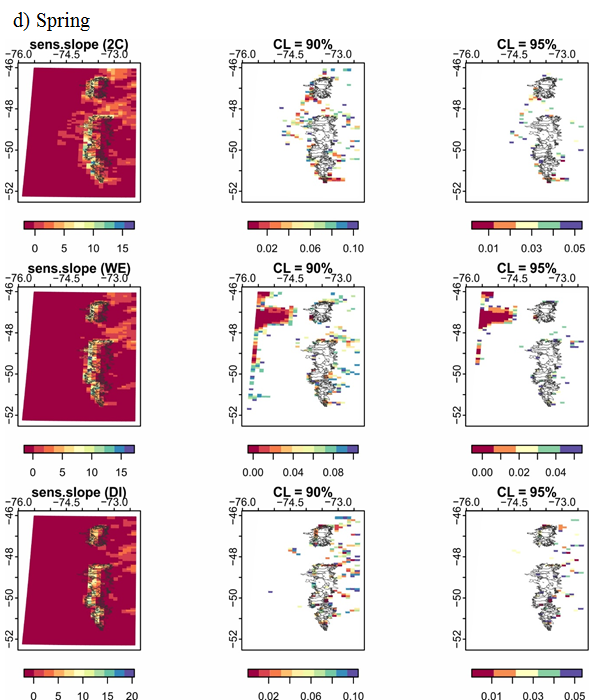


**Figure S2.** 1980-2015 annual mean value of accumulation type for DI PPM. a) sleet and b) snow plus sleet. Red line corresponds to the Icefields limits and glaciers.

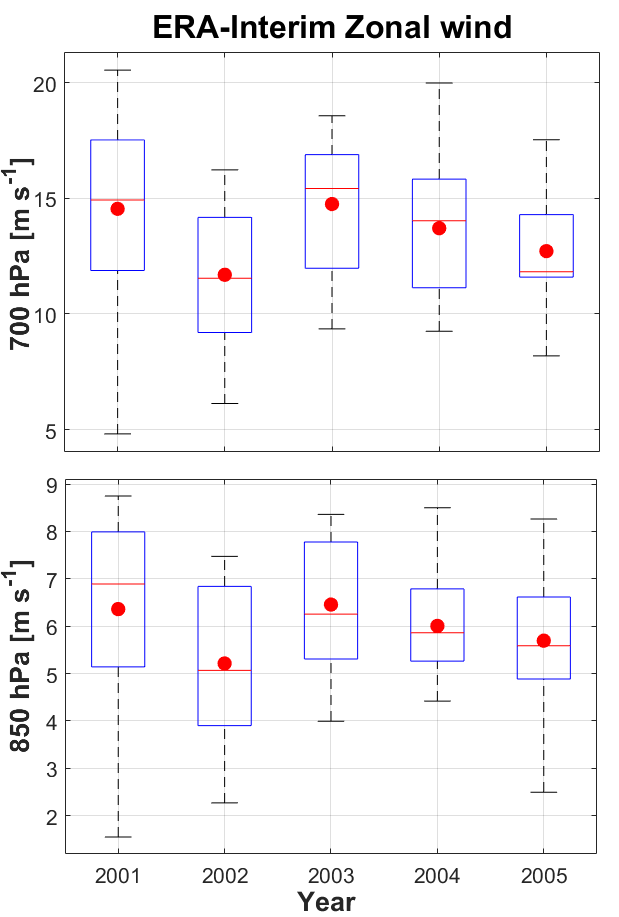




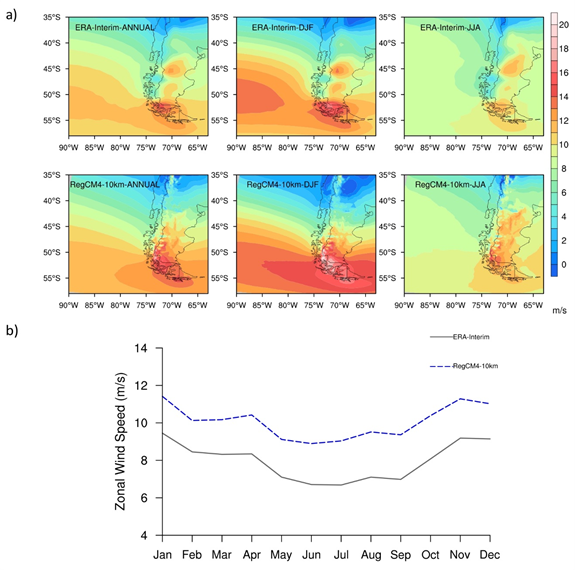




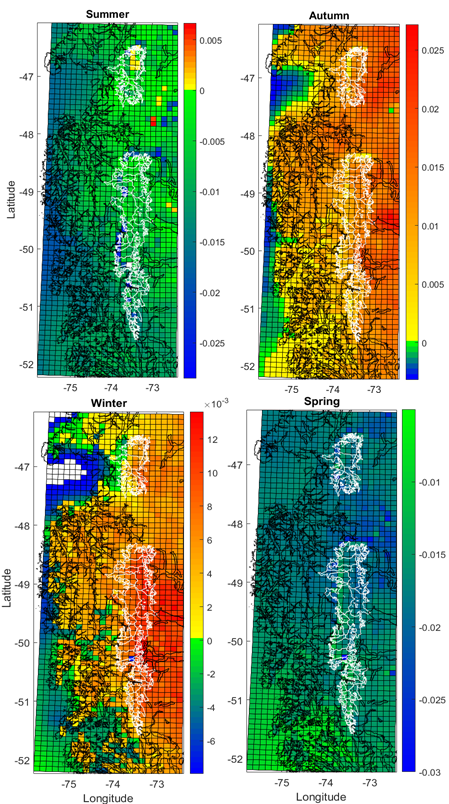
**Figure S3**. Seasonal trends 1980-2015 in mm w.e. yr-1 for three PPMs using Sen’s slope method. (a) Summer, (b) Autumn, (c) Winter and (d) Spring. Statistically significant trend (p<0.1 and p<0.05) are also shown. Icefields contours in black.



**Figure S4**. Boxplot of the ERA-Interim zonal wind for a region covering the Icefields for calendar years 2001 to 2005 at two pressure levels of 700 hPa and 850 hPa.



**Figure S5**. (a) Spatial distribution of 36-year (1980-2015) mean annual, DJF and JJA average of 850hPa zonal wind speed (m/s) from ERA-Interim and RegCM4. (b) 36-year (1980-2015) mean annual cycle of 850hPa zonal wind speed (m/s) from ERA-Interim and RegCM4 for a region covering the Icefields.



**Figure S6.** Seasonal trends 1980-2015 for the near surface air temperature obtained from RegCM4.6. Colorbar in in °C yr-1. Note that each season show a different scale in the trends. Icefields limits in white and coastlines in black.

## Supplementary Tables

**Table S1.** Mean and standard deviation (inter-annual variability) of the snow accumulation values by season, zone and PPM in the period 1980-2015.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Zone** | **Season** | **PPM / RegCM4.6 [mm w.e.]** | | | | | | | | | |
| **2C** | | **WE** | | **SC** | | **DI** | | **DI (snow+sleet)** | |
| **Mean** | **Std Dev** | **Mean** | **Std Dev** | **Mean** | **Std Dev** | **Mean** | **Std Dev** | **Mean** | **Std Dev** |
| **NPI W** | Summer | 711 | 235 | 492 | 203 | 491 | 203 | 250 | 144 | 694 | 234 |
| Autumn | 1,396 | 245 | 1,198 | 227 | 1,199 | 227 | 896 | 206 | 1,378 | 244 |
| Winter | 1,601 | 327 | 1,525 | 302 | 1,526 | 302 | 1,331 | 250 | 1,597 | 325 |
| Spring | 1,232 | 256 | 1,098 | 248 | 1,099 | 248 | 838 | 225 | 1,223 | 254 |
| **Annual** | 4,941 | 463 | 4,313 | 416 | 4,314 | 416 | 3,315 | 381 | 4,892 | 459 |
| **NPI E** | Summer | 90 | 38 | 55 | 28 | 56 | 28 | 31 | 18 | 90 | 38 |
| Autumn | 332 | 71 | 274 | 69 | 274 | 69 | 204 | 65 | 330 | 71 |
| Winter | 429 | 53 | 396 | 50 | 396 | 50 | 337 | 50 | 429 | 53 |
| Spring | 233 | 62 | 188 | 57 | 189 | 57 | 138 | 47 | 234 | 62 |
| **Annual** | 1,084 | 107 | 913 | 98 | 914 | 99 | 710 | 92 | 1,084 | 107 |
| **SPI NW** | Summer | 1,274 | 344 | 820 | 279 | 819 | 279 | 378 | 175 | 1,229 | 339 |
| Autumn | 2,051 | 456 | 1,640 | 373 | 1,640 | 373 | 1,103 | 274 | 2,015 | 446 |
| Winter | 2,452 | 612 | 2,227 | 548 | 2,227 | 548 | 1,782 | 443 | 2,440 | 606 |
| Spring | 2,233 | 413 | 1,813 | 367 | 1,813 | 368 | 1,204 | 292 | 2,199 | 408 |
| **Annual** | 8,010 | 908 | 6,500 | 796 | 6,500 | 796 | 4,467 | 641 | 7,883 | 891 |
| **SPI NE** | Summer | 852 | 160 | 715 | 155 | 715 | 156 | 513 | 149 | 841 | 159 |
| Autumn | 1,104 | 200 | 1,027 | 195 | 1,027 | 195 | 894 | 176 | 1,099 | 200 |
| Winter | 1,172 | 264 | 1,133 | 255 | 1,133 | 255 | 1,066 | 239 | 1,170 | 263 |
| Spring | 1,058 | 175 | 999 | 169 | 999 | 169 | 890 | 159 | 1,055 | 175 |
| **Annual** | 4,186 | 381 | 3,873 | 358 | 3,874 | 358 | 3,363 | 326 | 4,166 | 380 |
| **SPI SW** | Summer | 1,031 | 213 | 698 | 200 | 697 | 200 | 330 | 143 | 999 | 210 |
| Autumn | 1,387 | 292 | 1,182 | 248 | 1,182 | 248 | 867 | 187 | 1,374 | 289 |
| Winter | 1,532 | 345 | 1,469 | 320 | 1,470 | 321 | 1,291 | 281 | 1,529 | 343 |
| Spring | 1,520 | 242 | 1,332 | 233 | 1,332 | 232 | 967 | 206 | 1,507 | 240 |
| **Annual** | 5,471 | 532 | 4,680 | 492 | 4,680 | 491 | 3,455 | 436 | 5,408 | 527 |
| **SPI SE** | Summer | 636 | 94 | 519 | 93 | 519 | 93 | 340 | 99 | 630 | 94 |
| Autumn | 780 | 129 | 723 | 126 | 723 | 126 | 616 | 109 | 780 | 129 |
| Winter | 833 | 149 | 815 | 146 | 815 | 146 | 775 | 136 | 833 | 148 |
| Spring | 785 | 97 | 743 | 97 | 744 | 97 | 656 | 96 | 784 | 98 |
| **Annual** | 3,033 | 226 | 2,801 | 215 | 2,801 | 216 | 2,388 | 201 | 3,027 | 224 |
|  |  |  |  |  |  |  |  |  |  |  |  |

**Table S2.** Maximum and minimum values of the mean snow accumulation values (1980-2015) by season, zone and PPMs.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Zone** | **Season** | **PPM / RegCM4.6 [mm w.e.]** | | | | | | | | | |
| **2C** | | **WE** | | **SC** | | **DI** | | **DI (snow+sleet)** | |
| **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** | **Max** | **Min** |
| **NPI W** | Summer | 1,187 | 93 | 876 | 65 | 875 | 65 | 506 | 15 | 1,156 | 94 |
| Autumn | 2,132 | 229 | 1,755 | 209 | 1,756 | 209 | 1,449 | 175 | 2,104 | 229 |
| Winter | 2,558 | 269 | 2,334 | 266 | 2,335 | 266 | 1,936 | 251 | 2,545 | 269 |
| Spring | 1,921 | 175 | 1,685 | 160 | 1,684 | 160 | 1,369 | 130 | 1,906 | 175 |
| **Annual** | 7,556 | 767 | 6,389 | 701 | 6,391 | 701 | 5,170 | 594 | 7,458 | 767 |
| **NPI E** | Summer | 354 | 8 | 243 | 2 | 243 | 2 | 166 | 1 | 339 | 10 |
| Autumn | 1,127 | 121 | 830 | 95 | 831 | 95 | 526 | 72 | 1,099 | 124 |
| Winter | 1,472 | 167 | 1,343 | 150 | 1,343 | 150 | 1,012 | 139 | 1,469 | 170 |
| Spring | 986 | 58 | 756 | 40 | 757 | 40 | 423 | 36 | 974 | 63 |
| **Annual** | 3,942 | 358 | 3,094 | 290 | 3,096 | 290 | 1,959 | 257 | 3,884 | 368 |
| **SPI NW** | Summer | 3,430 | 30 | 2,889 | 7 | 2,889 | 7 | 1,977 | 0 | 3,397 | 29 |
| Autumn | 3,454 | 480 | 3,305 | 260 | 3,304 | 260 | 2,912 | 83 | 3,445 | 470 |
| Winter | 3,552 | 1,149 | 3,391 | 752 | 3,391 | 751 | 3,252 | 314 | 3,547 | 1,122 |
| Spring | 3,653 | 574 | 3,593 | 261 | 3,593 | 261 | 3,350 | 56 | 3,648 | 550 |
| **Annual** | 13,821 | 2,235 | 13,069 | 1,281 | 13,069 | 1,278 | 11,503 | 454 | 13,774 | 2,171 |
| **SPI NE** | Summer | 2,210 | 4 | 1,993 | 0 | 1,993 | 0 | 1,620 | 0 | 2,196 | 4 |
| Autumn | 2,375 | 181 | 2,329 | 142 | 2,330 | 141 | 2,193 | 46 | 2,375 | 181 |
| Winter | 2,262 | 214 | 2,262 | 210 | 2,262 | 210 | 2,261 | 163 | 2,262 | 214 |
| Spring | 2,315 | 133 | 2,305 | 97 | 2,306 | 97 | 2,239 | 14 | 2,315 | 133 |
| **Annual** | 9,170 | 620 | 8,898 | 559 | 8,899 | 558 | 8,321 | 222 | 9,156 | 626 |
| **SPI SW** | Summer | 2,740 | 16 | 2,107 | 2 | 2,105 | 2 | 1,325 | 0 | 2,646 | 17 |
| Autumn | 3,105 | 274 | 2,735 | 188 | 2,732 | 188 | 2,255 | 69 | 3,070 | 275 |
| Winter | 3,020 | 313 | 2,999 | 312 | 3,000 | 312 | 2,873 | 225 | 3,020 | 313 |
| Spring | 3,365 | 235 | 3,158 | 144 | 3,159 | 143 | 2,556 | 24 | 3,352 | 237 |
| **Annual** | 12,240 | 988 | 10,814 | 870 | 10,812 | 870 | 8,839 | 319 | 12,099 | 993 |
| **SPI SE** | Summer | 2,482 | 32 | 2,103 | 17 | 2,103 | 17 | 1,534 | 0 | 2,430 | 35 |
| Autumn | 2,351 | 123 | 2,196 | 102 | 2,197 | 102 | 1,960 | 93 | 2,347 | 126 |
| Winter | 2,239 | 154 | 2,235 | 147 | 2,235 | 147 | 2,185 | 144 | 2,239 | 155 |
| Spring | 2,678 | 80 | 2,603 | 60 | 2,605 | 60 | 2,324 | 54 | 2,676 | 83 |
| **Annual** | 9,751 | 388 | 9,010 | 326 | 9,013 | 326 | 7,934 | 305 | 9,693 | 399 |
|  |  |  |  |  |  |  |  |  |  |  |  |