**Supplementary material**

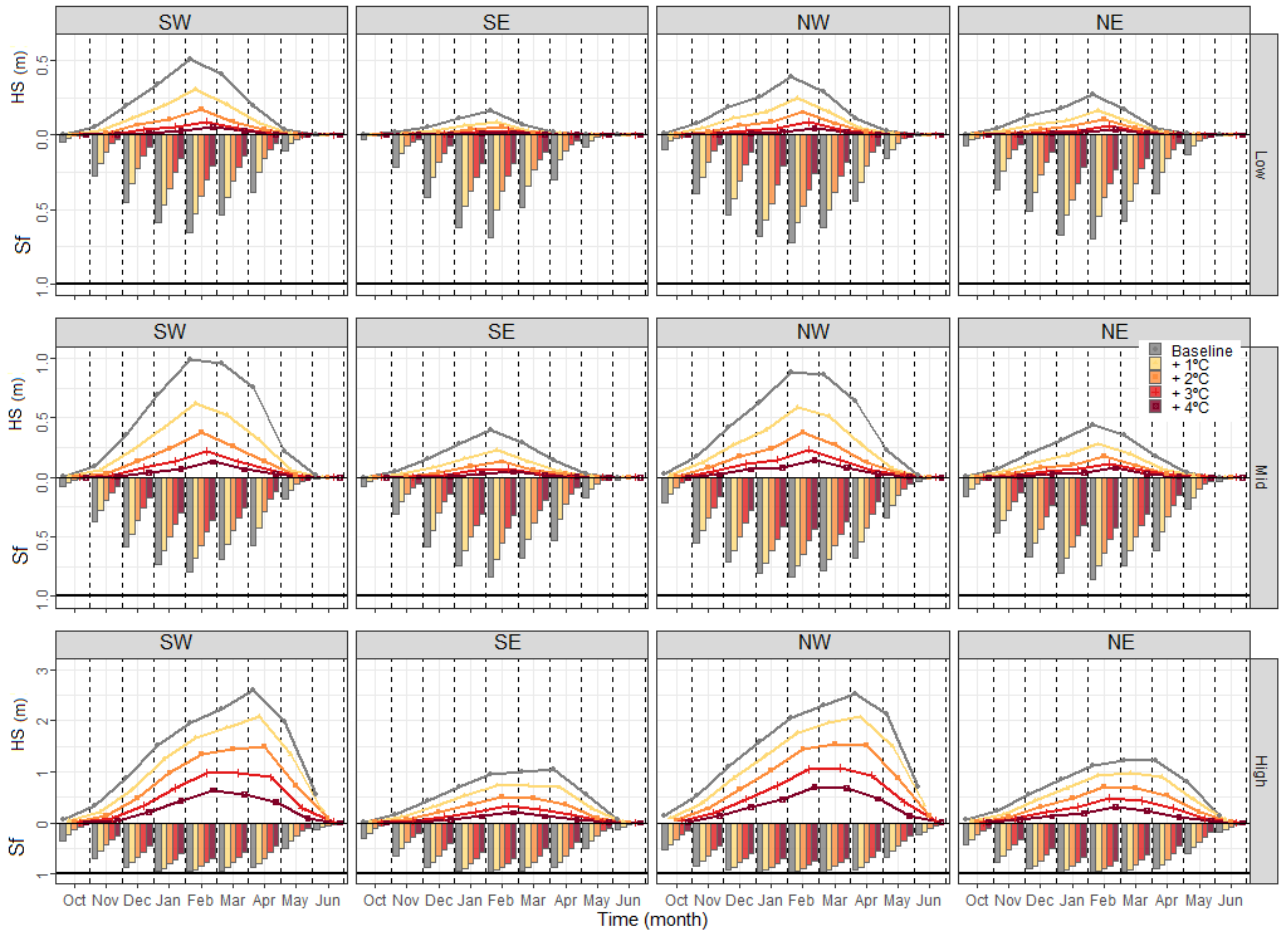


**Figure S1.** Height of snow (HS) (lines) and Snowfall fraction (Sf) (bars) monthly variation for baseline climate scenario and different increments of temperature (colors) grouped by elevation (rows) and sectors (columns).

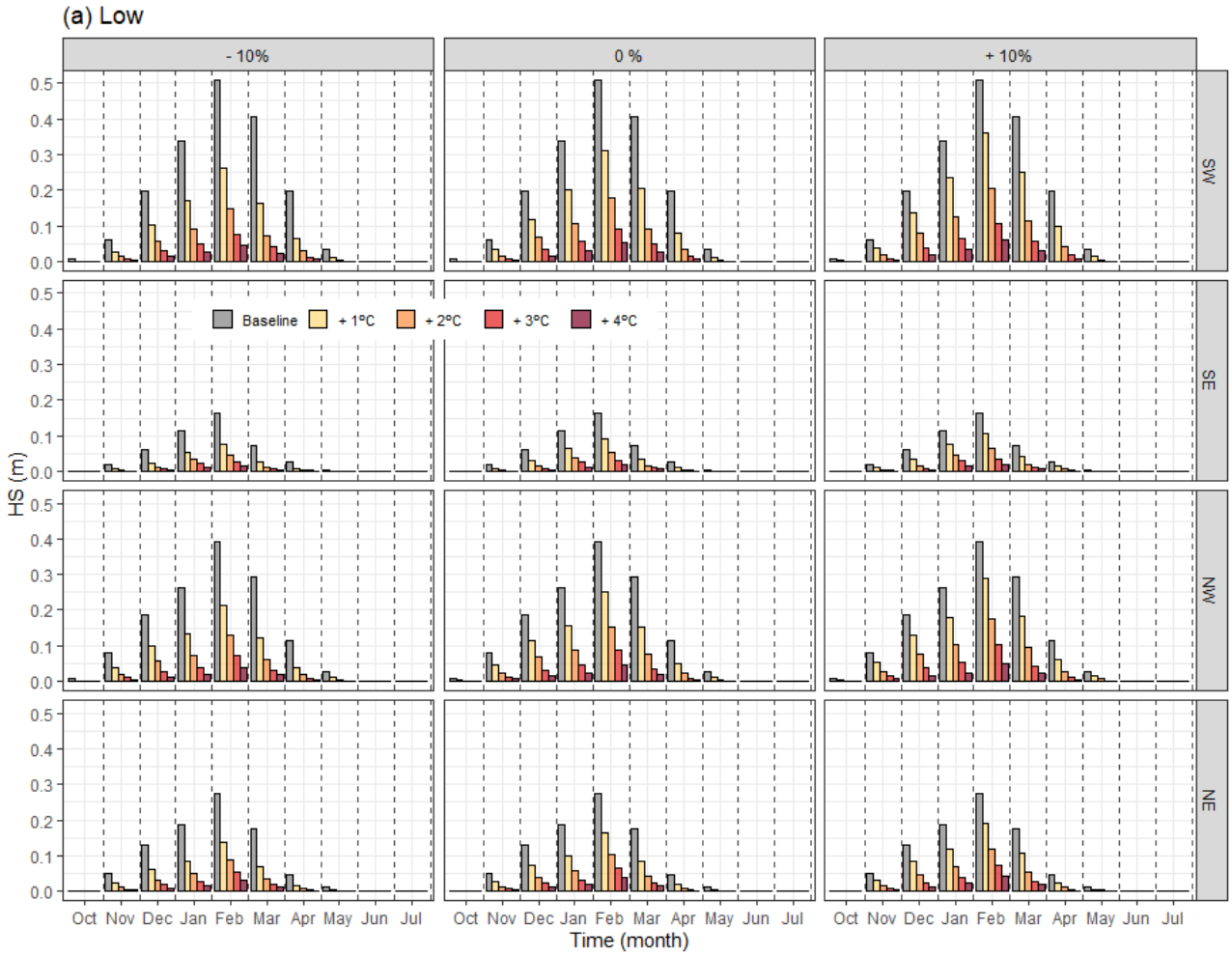


**Figure S2.** Low elevation height of snow (HS) (bars) monthly variation, for baseline climate and different increments of temperature (colors), grouped by elevation (rows) and sectors (columns).

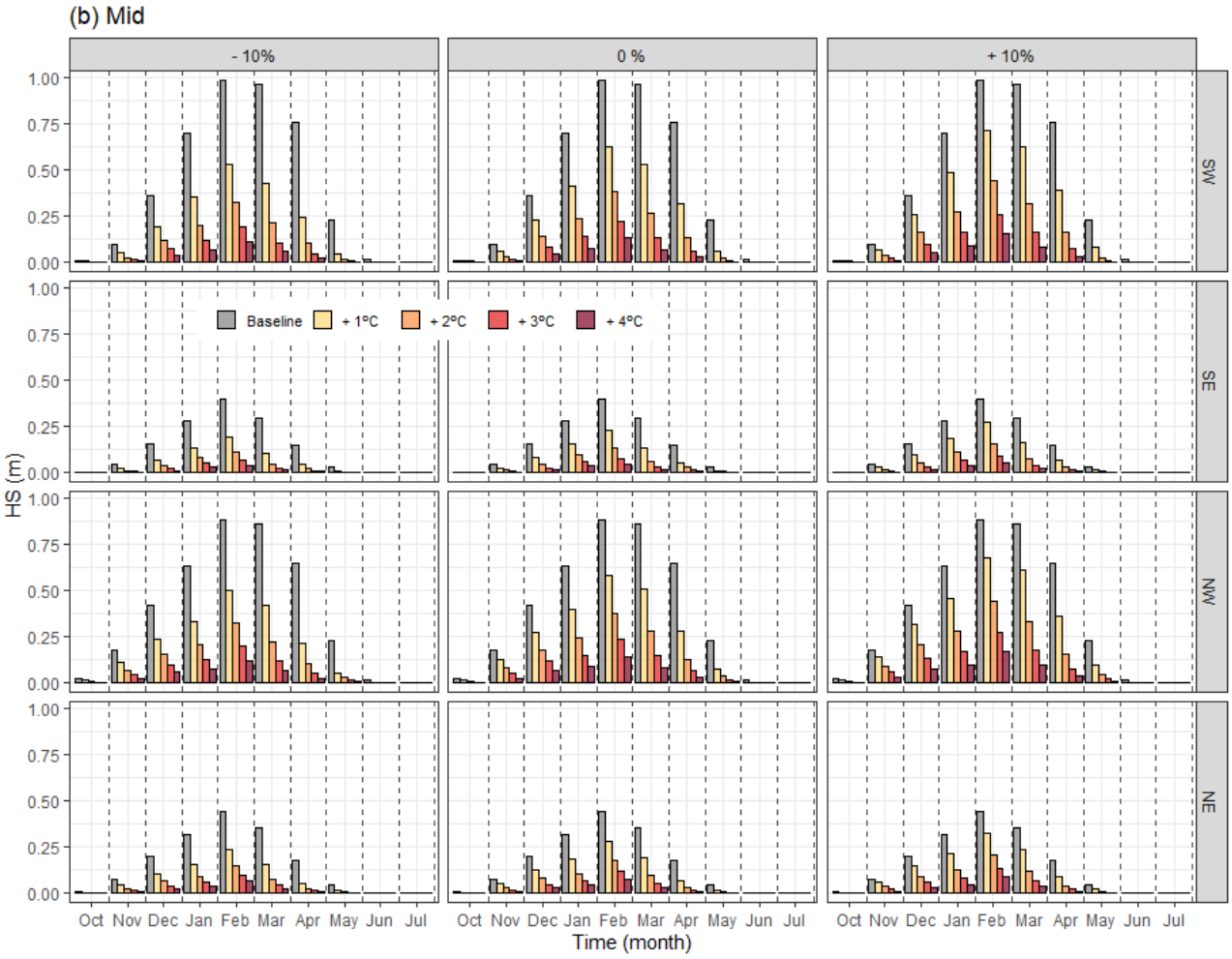


**Figure S3.** Mid elevation height of snow (HS) (bars) monthly variation, for baseline climate and different increments of temperature (colors), grouped by elevation (rows) and sectors (columns).

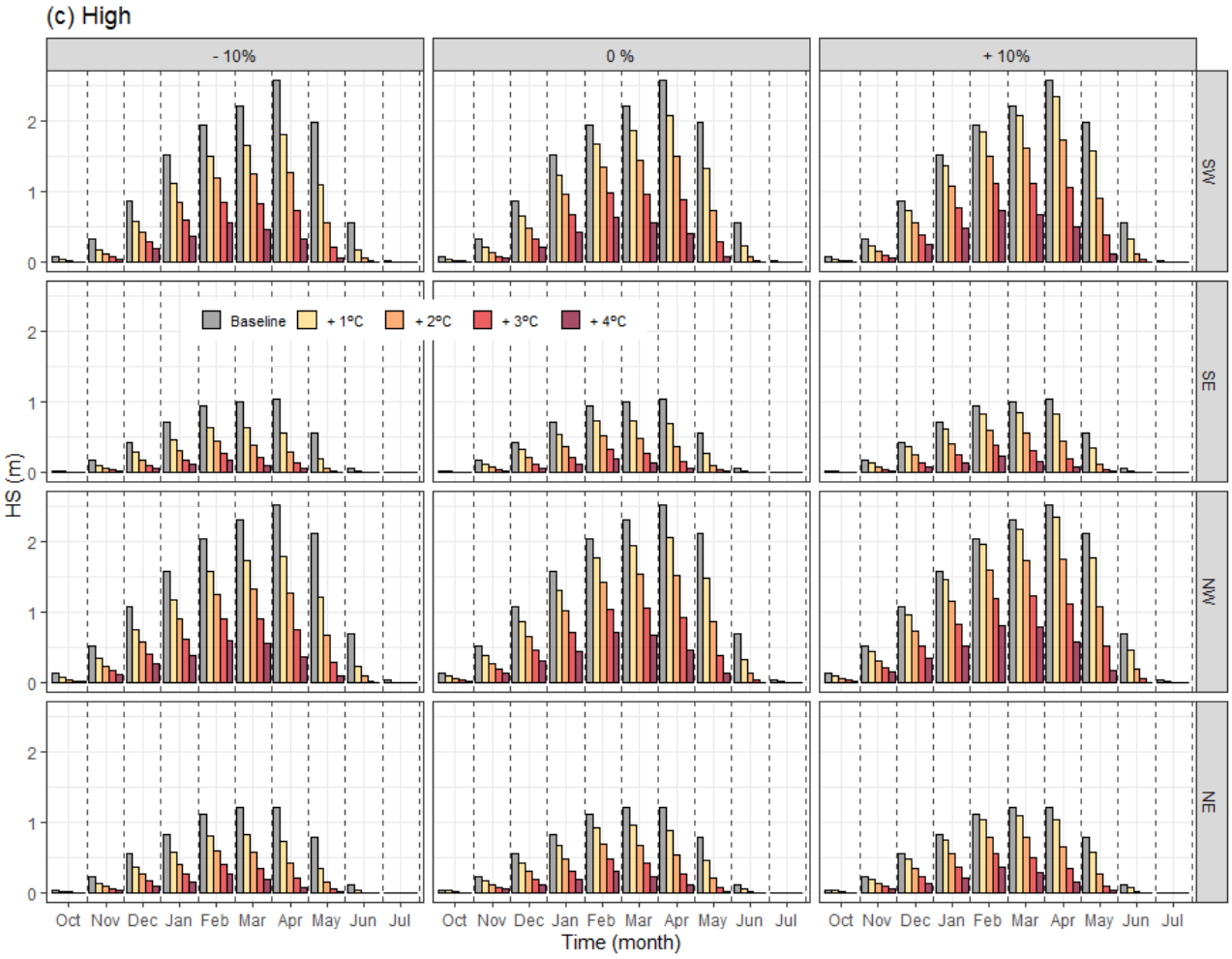


**Figure S4.** High elevation height of snow (HS) (bars) monthly variation, for baseline climate and different increments of temperature (colors), grouped by elevation (rows) and sectors (columns).

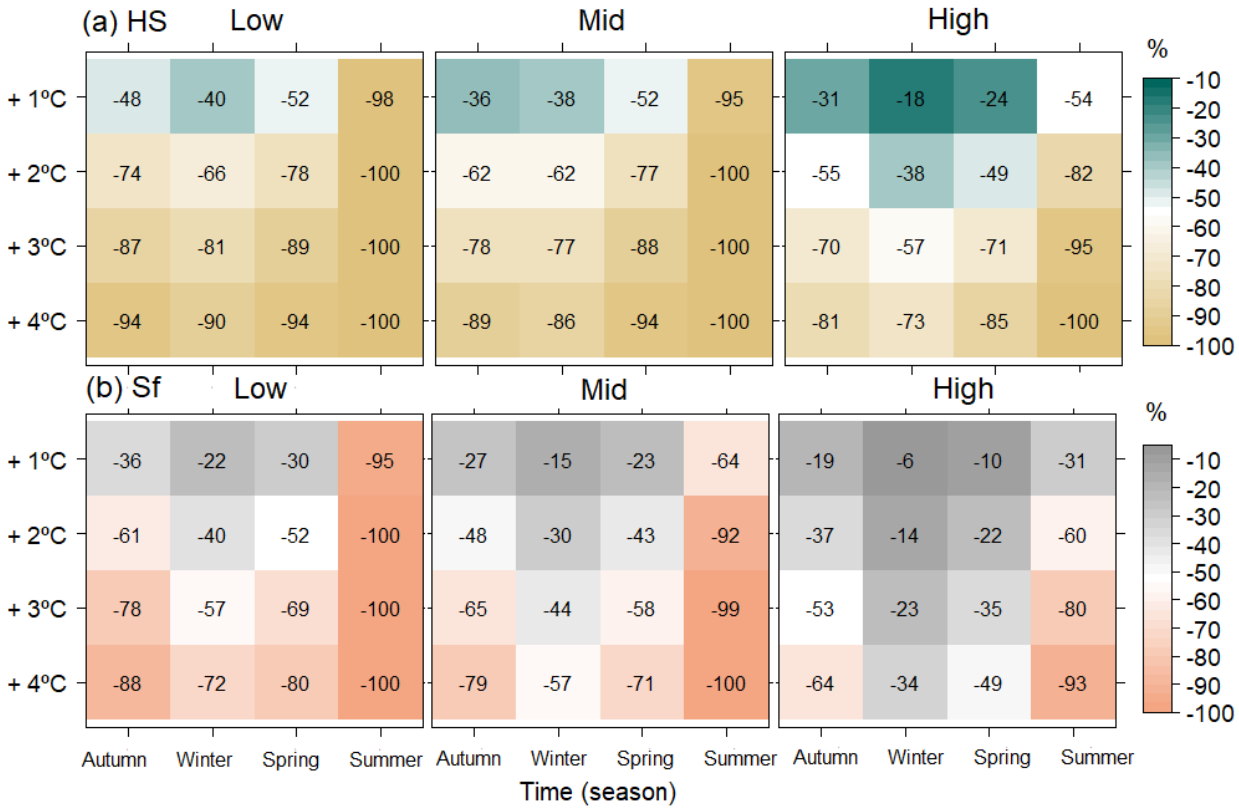


**Figure S5.** Seasonal height of snow (HS) and (b) snowfall fraction (Sf) relative changes (expressed in %) with respect of the baseline climate scenario.

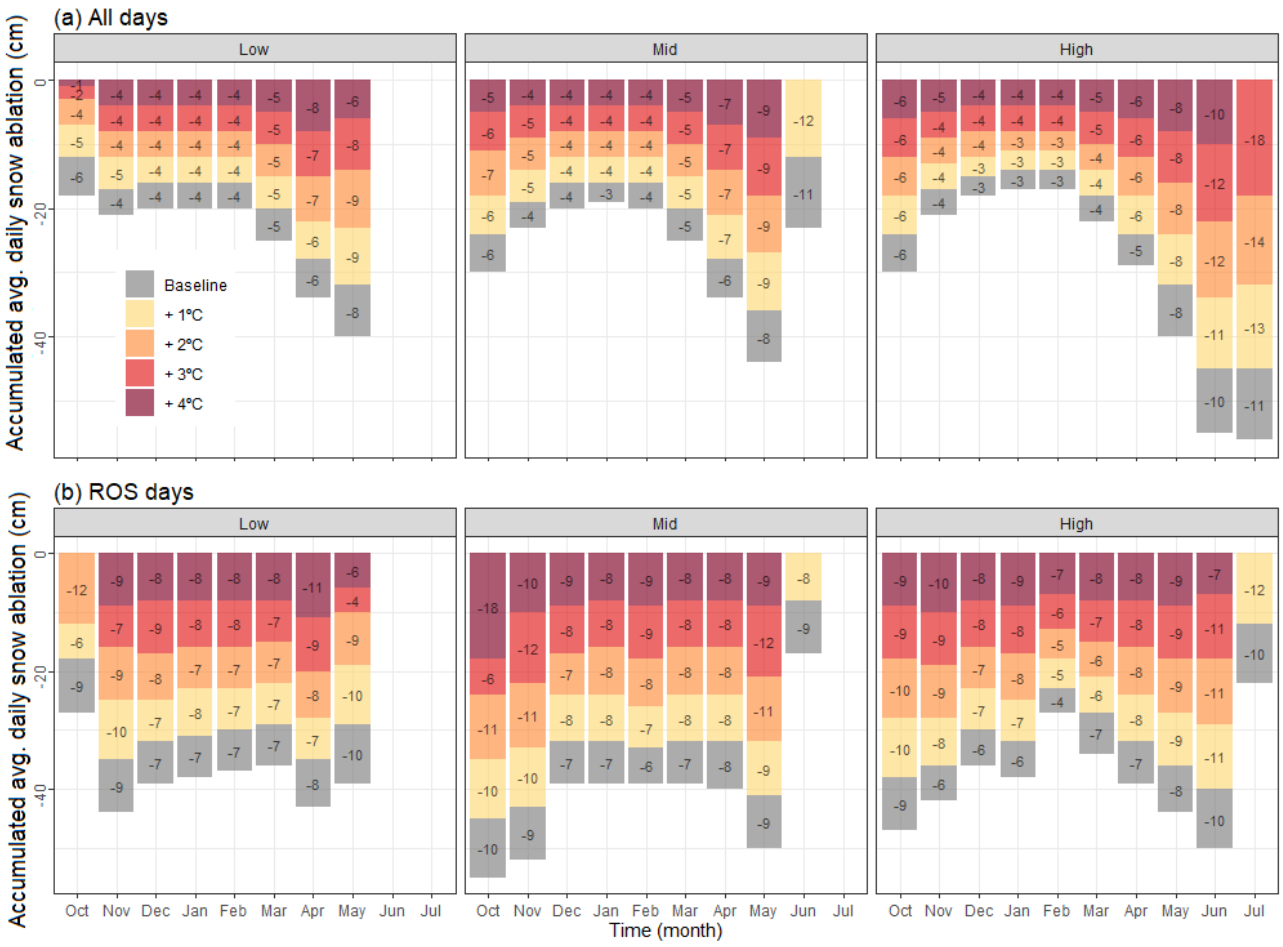


**Figure S6.** (a) All days and (b) ROS days accumulated average daily snow ablation (cm).

**Table 1**. FSM2 configuration implemented in this work.

| **FSM2 Physics and driving data options** | **Configuration name** | **Fortran compilation number** |
|---|---|---|
| Albedo | Prognostic age function | 2 |
| Snow conductivity | Function of density | 1 |
| Snow density | Function of overburden | 2 |
| Turbulent exchange | Richardson number atmospheric stability adjustment | 1 |
| Snow hydrology | Gravitational drainage | 2 |
| Snow cover fraction | Linear function of snow depth | 1 |

**Table S2.** ROS frequency, rainfall intensity and snow ablation average anomalies per ºC over the baseline climate.

| Elevation | Zone | ROS rain (mm) | ROSfr (days) | ROS albation (cm) |
|---|---|---|---|---|
| Low | SW | +2.5 | 0 | +0.5 |
| | SE | +4.7 | 0 | -0.2 |
| | NW | +3.8 | 0 | -0.2 |
| | NE | +4.7 | 0 | -0.3 |
| Mid | SW | +2.5 | 0 | +0.8 |
| | SE | +5.2 | 0 | +0.1 |
| | NW | +3.7 | 0 | +0.4 |
| | NE | +5.0 | 0 | +0.4 |
| High | SW | +5.2 | 1 | +0.4 |
| | SE | +6.4 | 1 | +0.1 |
| | NW | +5.3 | 1 | +0.5 |
| | NE | +6 | 0 | +0.7 |