

Supplementary material

Dynamics of ionic species in Svalbard annual snow: the effects of rain event and melting

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Table S1. Median concentrations of biogenic ions subdivided by depth (10-20 cm, 30-50 cm, 60-100 cm) and phase (I: from 27th March to 16th April; II: from 17th April to 15th May; III: from 16th May to 31st May).

| depth\period | NO ₃ ⁻ (ng g ⁻¹) | | | MSA (ng g ⁻¹) | | | C2 (ng g ⁻¹) | | | C5 (ng g ⁻¹) | | |
|------------------|--|-----|-----|---------------------------|----|-----|--------------------------|----|-----|--------------------------|----|-----|
| | I | II | III | I | II | III | I | II | III | I | II | III |
| 10-20 cm | 220 | 353 | 570 | 16 | 34 | 136 | 2 | 2 | 5 | 2 | 3 | 7 |
| 30-50 cm | 105 | 255 | 312 | 5 | 14 | 22 | 2 | 2 | 2 | 1 | 2 | 4 |
| 60-100 cm | 118 | 175 | 260 | 1 | 1 | 2 | 2 | 2 | 2 | 0.1 | 1 | 1 |

Table S2. Median concentrations of Br⁻, K⁺, Mg²⁺, Ca²⁺, Cl⁻, Na⁺, I⁻ and SO₄²⁻ by depth (10-40 cm, 50 cm, 60-90 cm and 100 cm) and phase (I: from 27th March to 16th April; II: from 17th April to 15th May; III: from 16th May to 31st May).

| depth\period | Br ⁻ (ng g ⁻¹) | | | K ⁺ (ng g ⁻¹) | | | Mg ²⁺ (ng g ⁻¹) | | | Ca ²⁺ (ng g ⁻¹) | | | Cl ⁻ (ng g ⁻¹) | | | Na ⁺ (ng g ⁻¹) | | | I ⁻ (ng g ⁻¹) | | | SO ₄ ²⁻ (ng g ⁻¹) | | |
|------------------|---------------------------------------|-----|------|--------------------------------------|-----|-----|--|-----|-----|--|-----|-----|---------------------------------------|------|------|---------------------------------------|------|------|--------------------------------------|-----|-----|---|------|------|
| | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III | I | II | III |
| 10- 40 cm | 0.5 | 0.6 | 0.7 | 64 | 66 | 58 | 177 | 120 | 50 | 133 | 104 | 64 | 1662 | 1872 | 1711 | 1830 | 1676 | 871 | 0.3 | 0.2 | 0.1 | 1083 | 1437 | 1713 |
| 50 cm | 0.5 | 0.8 | 1.4 | 481 | 91 | 58 | 1396 | 205 | 65 | 593 | 136 | 69 | 3812 | 2373 | 1773 | 14218 | 2281 | 1034 | 0.7 | 0.3 | 0.1 | 3265 | 1839 | 1767 |
| 60-90 cm | 0.5 | 1.1 | 1.0 | 113 | 122 | 146 | 306 | 319 | 222 | 205 | 171 | 133 | 2348 | 2754 | 2859 | 3234 | 3301 | 3637 | 0.3 | 0.4 | 0.3 | 1129 | 1866 | 2317 |
| 100 cm | 0.5 | 1.0 | 0.94 | 355 | 362 | 277 | 1066 | 600 | 596 | 543 | 347 | 283 | 3497 | 3792 | 3935 | 10429 | 9199 | 6508 | 0.6 | 0.6 | 0.3 | 2690 | 3022 | 3037 |

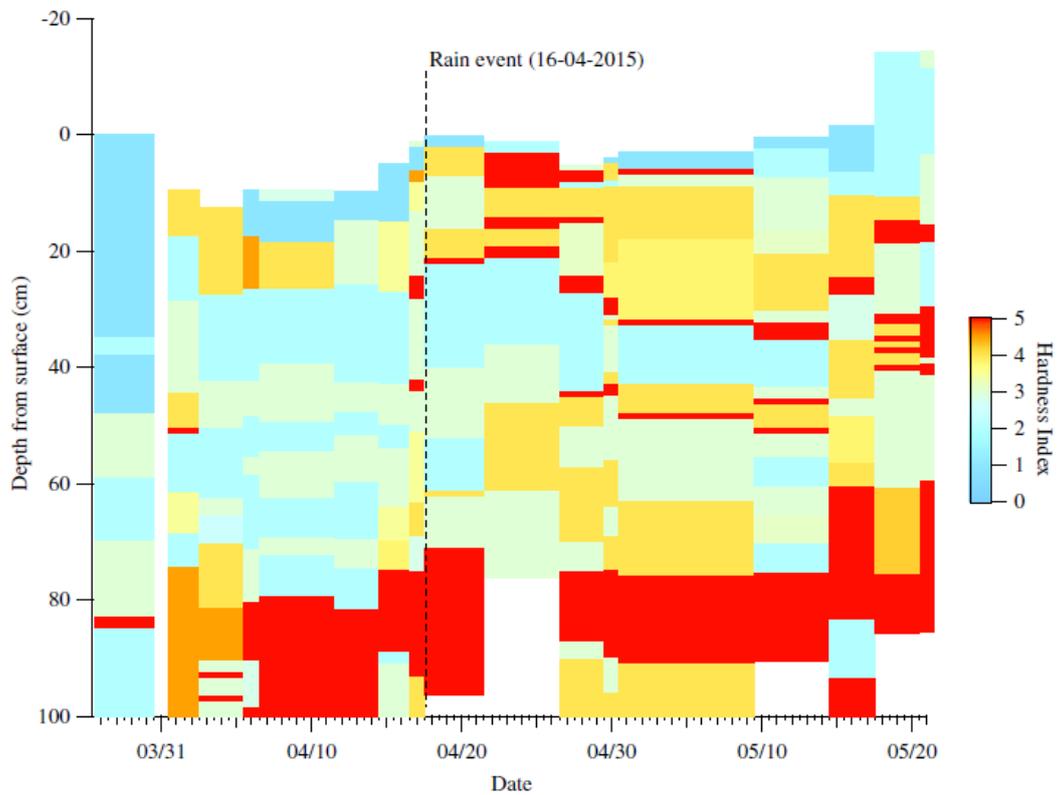


Figure S1. Evolution of the annual snow stratigraphy in the first meter of annual snow. All data are corrected in function of the accumulation. The layers detected are classified by their resistance of penetration (hardness) using the hand test. The color scale represents the hardness of the layers: red (equal to 5) corresponds to the hardest, ice or melted/refrozen layer, and light blue represents very soft strata such as fresh snow depositions (Spolaor et al., 2016).

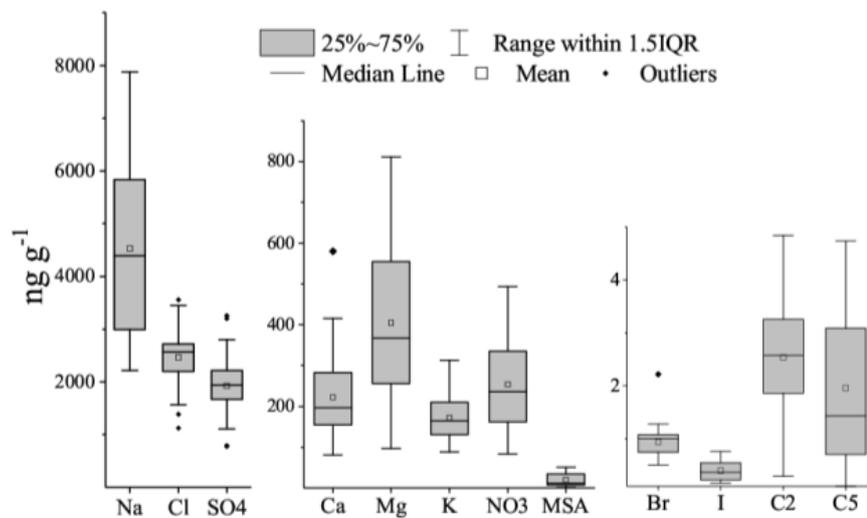


Figure S2. Box plots of average concentration of each ionic species found in the 1-m snow pit collected at Austre Brøggerbreen glacier, monitored daily from the 27th of March until to the 31st of May 2015.

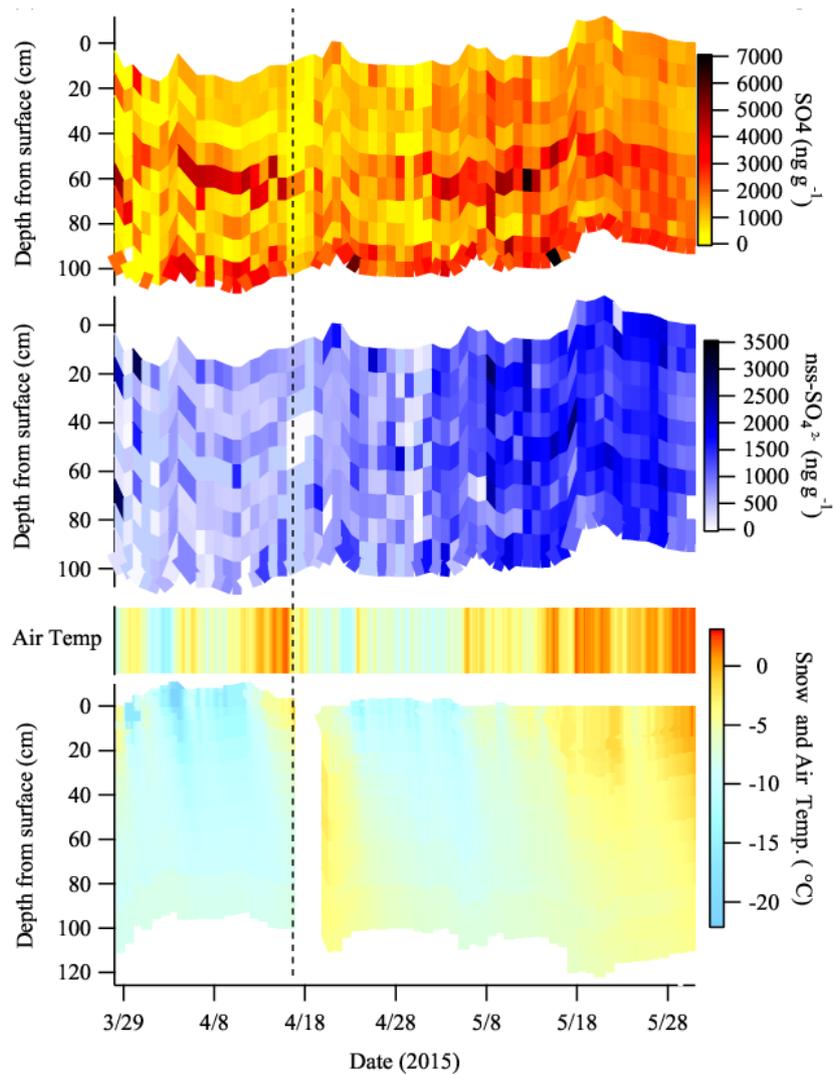


Figure S3. The concentrations of SO_4^{2-} and nss- SO_4^{2-} (ng g^{-1}) were measured in the daily 1-m snow pit with a 10 cm resolution: dark red represents the highest concentration, light colors the lowest concentration. Each value is corrected for the daily accumulation/ablation. Air temperature and snow temperature of the first meter of snow are also reported.

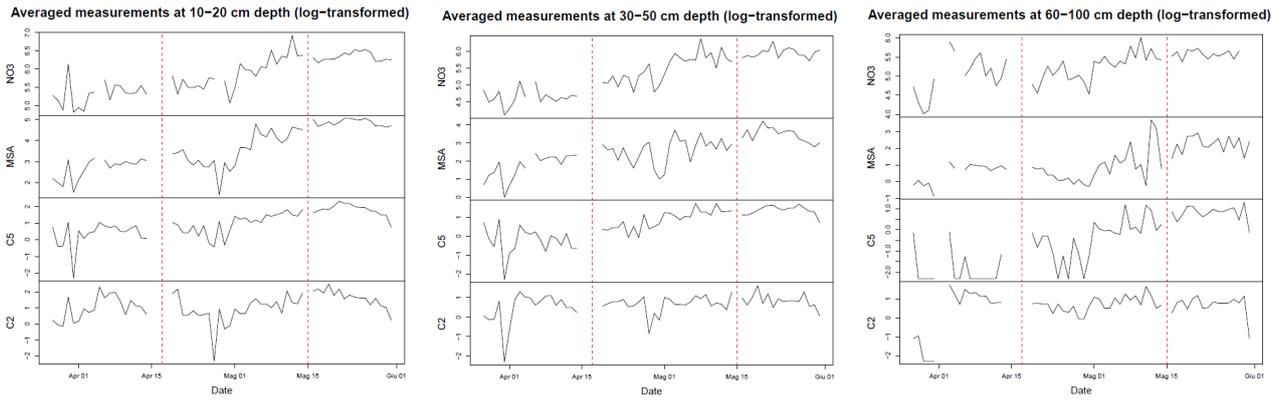


Figure S4. Time series plots of averaged concentrations of biogenic ions (NO_3^- , MSA, C2 and C5) on the logarithm scale for each considered stratum (10-20 cm, 30-50 cm and 60-100 cm). The red vertical lines identify the rain event (16th April) and the melting phase (15th May).

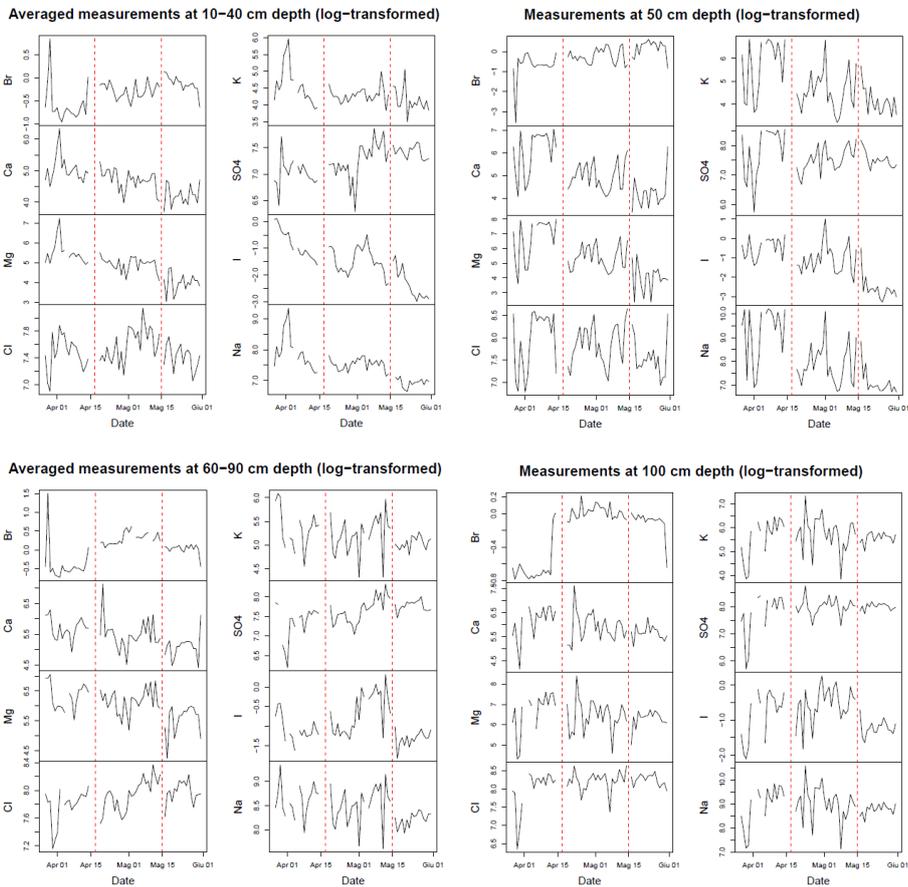


Figure S4. [Time series plots of averaged concentrations of non-biogenic ions (Br^- , Ca^{2+} , Mg^{2+} , Cl^- , K^+ , SO_4^{2-} , I^- , Na^+) on the logarithm scale for each considered stratum (10-40 cm, 50 cm, 60-90 cm and 100 cm). The red vertical lines identify the rain event (16th April) and the melting phase (15th May).

References

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