

| OPC Channel | Instrument size | | Ambient size (μm) | |
|-------------|-----------------------|--|--------------------------------|--------|
| | PSL (μm) | | Spring | Summer |
| 1 | 0.25 | | 0.26 | 0.26 |
| 2 | 0.28 | | 0.29 | 0.29 |
| 3 | 0.30 | | 0.31 | 0.31 |
| 4 | 0.35 | | 0.37 | 0.37 |
| 5 | 0.40 | | 0.43 | 0.43 |
| 6 | 0.45 | | 0.49 | 0.50 |
| 7 | 0.50 | | 0.53 | 0.54 |
| 8 | 0.58 | | 0.69 | 0.71 |
| 9 | 0.65 | | 0.73 | 0.75 |
| 10 | 0.70 | | 0.77 | 0.79 |
| 11 | 0.80 | | 0.93 | 0.94 |
| 12 | 1.00 | | 1.20 | 1.24 |
| 13 | 1.30 | | 2.24 | 2.37 |
| 14 | 1.60 | | 2.48 | 2.54 |
| 15 | 2.00 | | 2.66 | 2.72 |
| 16 | 2.50 | | 3.89 | 4.17 |
| 17 | 3.00 | | 4.79 | 5.25 |
| 18 | 3.50 | | 6.61 | 7.16 |
| 19 | 4.00 | | 7.67 | 8.41 |
| 20 | 5.00 | | 9.77 | 10.47 |
| 21 | 6.50 | | 16.03 | 16.60 |
| 22 | 7.50 | | 17.58 | 18.20 |
| 23 | 8.50 | | 19.72 | 20.18 |
| 24 | 10.00 | | 23.99 | 24.55 |
| 25 | 12.50 | | 30.20 | 30.55 |
| 26 | 15.00 | | 35.89 | 36.31 |
| 27 | 17.50 | | 41.69 | 42.17 |
| 28 | >20.00 | | >47.32 | >47.86 |

Table S1. Original size channels of OPC Grimm 1.107 calibrated with PSL spheres (left side) and corrected (right side, columnar average) for the ambient refractive index for spring and summer.

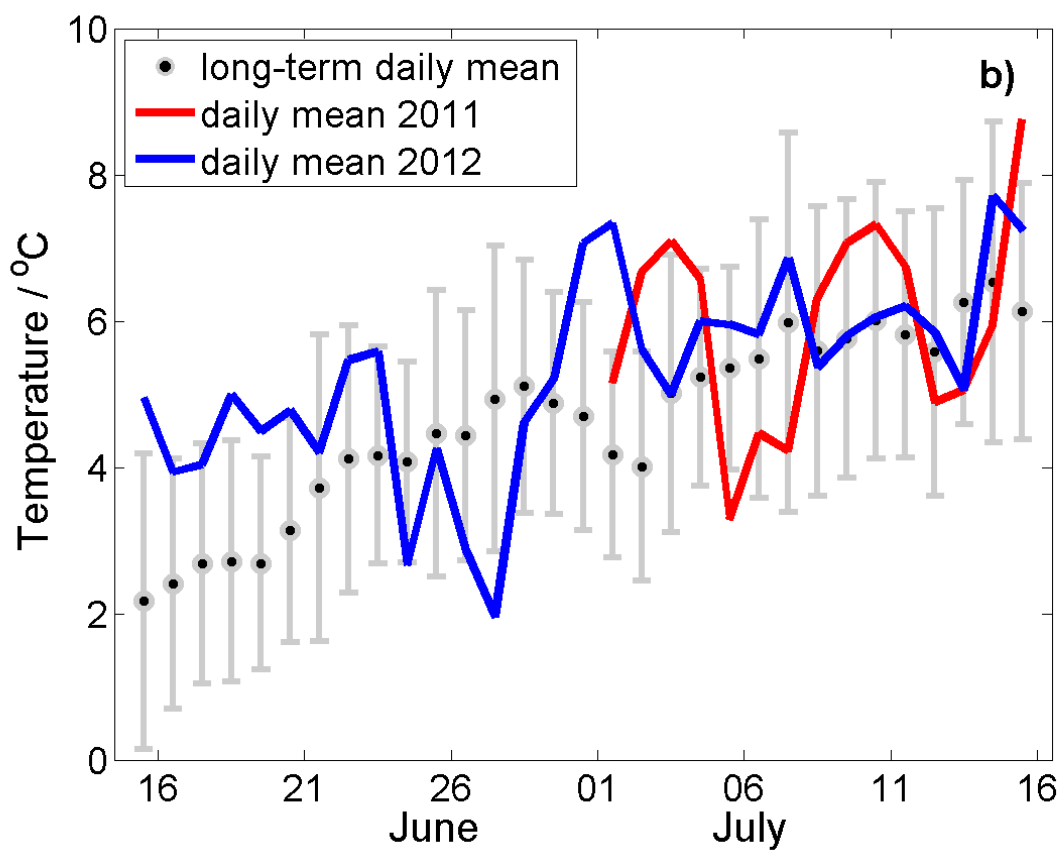
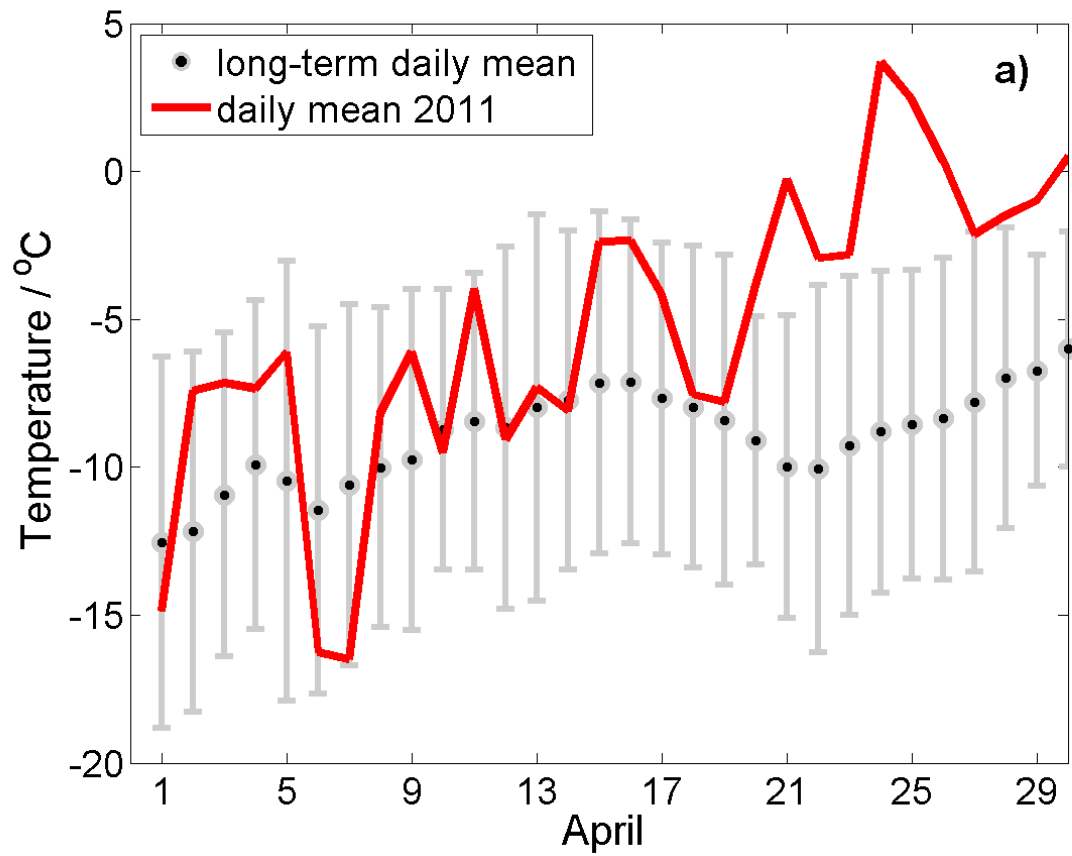


Figure S1. Daily mean temperature during the campaign periods (a) spring 2011, (b) summer 2011 and summer 2012, in comparison to the 20-year longterm daily mean (1993-2015, excluding 2011 and 2012).

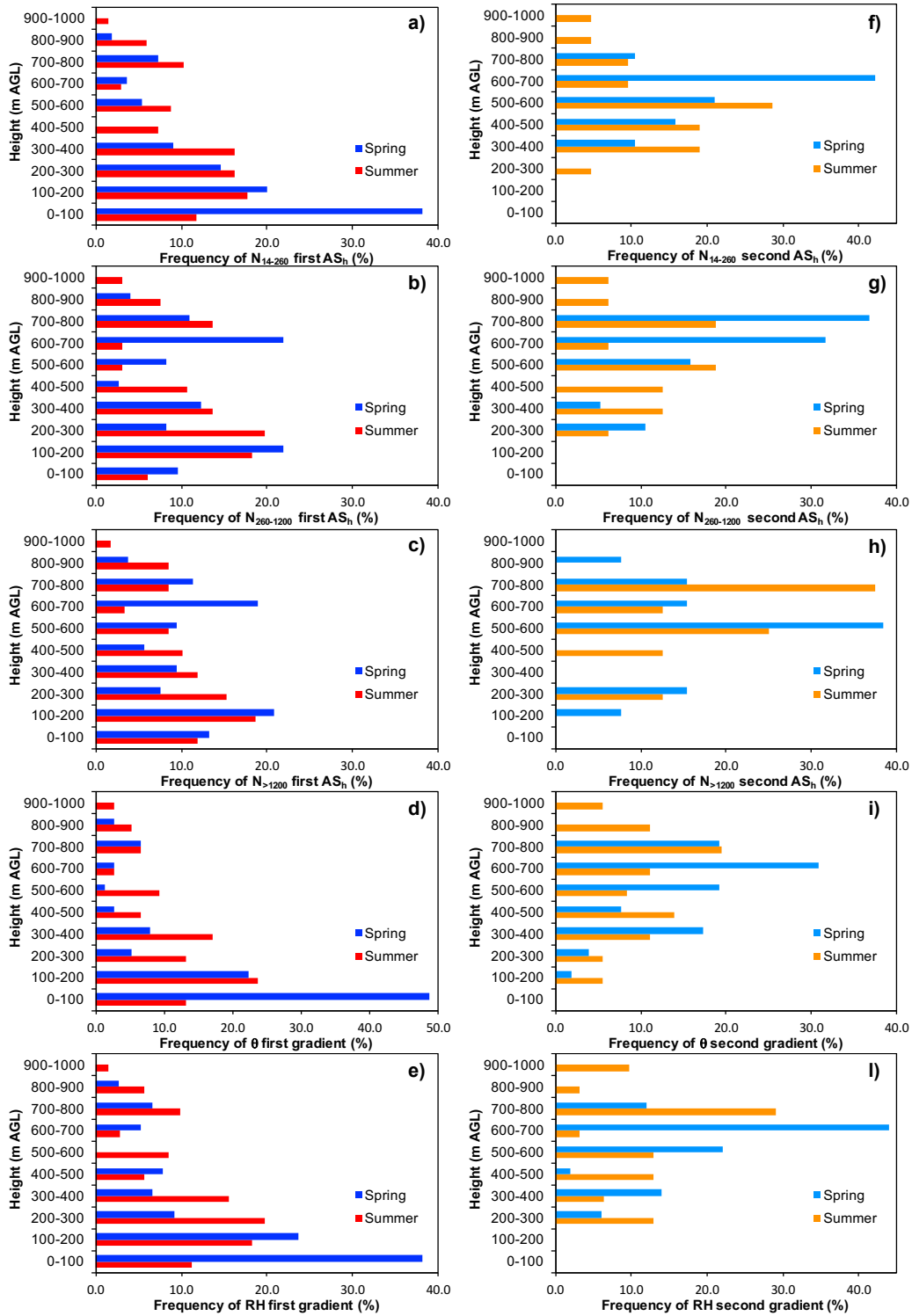


Figure S2. Vertical frequency distribution of the first and second AS_h for N_{14-260} , $N_{260-1200}$, $N_{>1200}$, θ and RH during spring and summer.

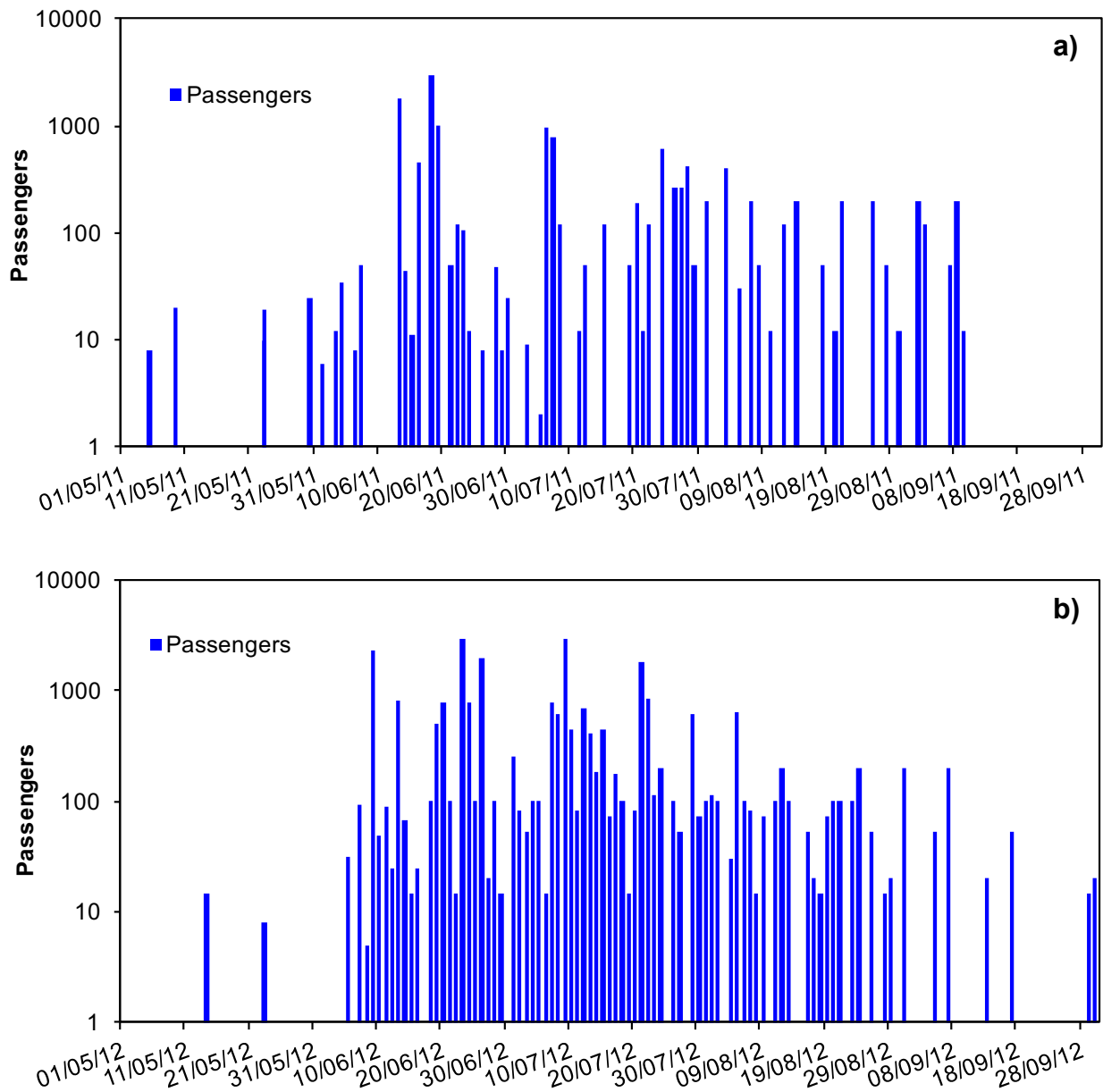


Figure S3. Dates and number of passengers registered by the Kings-Bay Kull Company for ships arrivals in Ny-Ålesund for: a) summer 2011 and b) summer 2012, respectively.