

Supplementary Material

1 SUPPLEMENTARY ANALYSIS

1.0.1 Air temperature, humidity, and atmospheric pressure

During the wintertime, the observed air temperature at JI and HG below 0°C, and the day-to-day variability was highest during the cold winter months. From spring to fall, variability in the observed temperature was much smaller (**Figure 2A, 2E**), in part, because of the air temperature is governed mainly by advection. The coldest monthly mean temperature occurred in March for the JI and in February for the HG, with values of −13 and −7°C, respectively (**Figures 2A, 2E, and 3A**). The maximum temperature was found in July, with monthly mean values ranging between 7 and 9°C during the 2009–2014 period. From winter to mid-spring, the monthly mean air temperature at JI was 2 to 5°C cooler compared to monthly values at HG (**Figure 3A**), but from July to October, monthly mean temperature at both locations showed only a difference of about 0.5°C.

The monthly mean temperature at JI was 3 to 6°C higher than at Swiss Camp (**Figure 4A**), located at about 40 km north of the JI and 1,119 m a.s.l. higher than JI. The monthly mean standard deviation at JI was 4.2°C. A strong coefficient of correlation ($R = 0.97$, the t-test statistic was 12.7, which gives a two-tailed p-value < 0.01) between the observed air temperature at two locations was obtained. The Swiss Camp station is located at 1,149 m a.s.l., while the AWS at JI is positioned at 30 m a.s.l. (lapse rate $\sim 5.3^\circ\text{C}/\text{km}$), which explained the differences in the mean monthly air temperature between the two stations.

The HG and MIT stations are located at a relatively similar altitude, and the monthly mean temperature for the 2009–2014 period showed some similarities. The MIT station, located in the outer Sermilik Fjord area, is about 72 km south of HG (**Figure 1C**) and 4 m altitude lower than HG station. Thus, MIT is more likely to be influenced by maritime conditions than HG (Mernild et al., 2008). The monthly mean temperature at HG was lower than values at MIT by 0.5 to 3°C during winter to early spring and from mid-fall to winter (**Figure 4E** for the year 2013). During summertime, the daily mean temperature at HG was, on average, 0.5°C to 4.0°C higher than values at MIT station (**Figure 4E**). This difference could be partially due to the frequent sea breeze in summer at MIT (Cappelen et al., 2001; Mernild and Liston, 2010).

The air over the two stations was dry. The mean relative humidity was about 63% and 65% at HG and JI, respectively. In general, from January to June, the mean RH at HG was higher than values at JI, and the reverse occurred from June to December (**Figure 3C**). **Figures 4C and 4G** compare RH at JI and Swiss Camp, and at HG and MIT for 2013. The seasonal mean RH at Swiss Camp was 35% larger than at JI.

The mean annual and seasonal atmospheric pressure at JI was about 1,000 hPa, and this was 50 hPa larger than values obtained at HG (**Figure 3D**). HG is 429 m higher than JI, so most of this difference in pressure is due to the altitude difference, as is the difference between JI and Swiss Camp. Both the seasonal and annual atmospheric pressure at JI in 2013 were about 110 hPa larger than values at Swiss Camp (**Figure 4D**). A good agreement between atmospheric pressure records at HG and MIT ($R = 0.95$, t-test statistic = 988.3, p-value = 0) was observed for 2013 (**Figure 4H**).

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