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Daily Weather Data From Central and Eastern King George Island (West Antarctica) for 2018–2023

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ABSTRACT

The dataset presented in the paper contains meteorological data from four automatic weather stations (AWS) located in the central and western parts of King George Island (near Arctowski Station and Cape Lions Rump). The dataset includes daily mean, maximum and minimum values of air temperature, relative air humidity, air pressure, wind speed and daily sum of solar radiation. The measurement period ran from 2018.01.01 to 2023.12.31, but it is shorter for two of the stations. Mean values were calculated from measurements taken every 10 min. Direct measurements were used to identify extreme values. The described dataset consists offour files, each for one AWS. It is available in the PANGEA online repository under a non-restrictive CC BY 4.0 licence for anyone after registration. Despite a strong correlation between the daily mean values of the parameters measured at certain stations, some differences between them were also noticeable. These were due to their location at different altitudes, in a place open to the sea or in a shaded place. Generally, values of wind speed, air humidity, solar radiation and pressure are similar to Arctowski during 2013–2017. The only notable distinction is that the mean annual air temperature and the mean air temperature in the winter months were higher than during 1977–1999 and 2013–2017. The data presented can be used as background

Dataset Details

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Titles:

Daily meteorological data from automatic weather station Arctowski, King George Island, during 2018–2023

Daily meteorological data from automatic weather station Puchalski, King George Island, during 2018–2023

Daily meteorological data from automatic weather station Lions Rump, King George Island, during 2018–2023

Daily meteorological data from automatic weather station Hennequin, King George Island, during 2021–2023

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for other research projects on King George Island, as well as for analysis of the meteorological conditions themselves. They may also be useful for the evaluation of the management plans of the eight Antarctic Specially Protected Areas or Antarctic Specially Managed Area no. 1 that are located on King George Island.

1 | Introduction

1.1 | Purpose of the Research

The climate and meteorological conditions at King George Island (KGI) have been extensively researched and documented. Meteorological measurements on KGI started in 1948 (Kejna, Araźny, and Sobota 2013a) and now there are at least nine operating meteorological stations (Figure 1) and plenty of published papers presenting as well long-term data analyses (Kejna 1999; Marsz and Styszyńska 2000; Ferron et al. 2004; Kejna, Araźny, and Sobota 2013a; Plenzler et al. 2019; Bello, Suarez, and Lavado-Casimiro 2022) as short-term or microscale investigations (e.g., Nowosielski 1980; Kejna 1993, 2008; Gonera and Rachlewicz 1997; Rachlewicz 1997; Kejna and Laska 1999; Angiel, Potocki, and Biszczuk-Jakubowska 2010; Kejna et al. 2013b).

However, all of the aforementioned research pertains to the southwest portion of the island, while the data regarding the meteorological conditions of the north, northeast and east parts are lacking. No published data exists for the area east of Ferraz Station, with the exception of irregular meteorological observations carried out each summer since 2007 at Lions Rump (King George Bay), as a background for ecological monitoring or research at Antarctic Special Protected Area No. 151 (Grebieniow et al. 2020). In November 2018, an automatic weather station (AWS) was installed in this location with the objective of investigating meteorological conditions in King George Bay. It is the most eastward-located AWS in the South Shetland Archipelago. In January 2021, an AWS was installed at Hennequin Point on the eastern coast of Admiralty Bay (Figure 1). Both mentioned AWSs are managed by the Henryk Arctowski Polish Antarctic Station, which also oversees two more AWSs: the Puchalski AWS, which was launched in January 2017, and the Arctowski AWS, which was launched in December 2012 in the same location where manual meteorological observations had been conducted from 1977 to 1999 (Marsz and Styszyńska 2000).

The objective of this study was to provide access to meteorological data from the recently established AWSs, along with data from the Arctowski AWS since 2018. These data offer up-to-date insights into meteorological conditions in the region over the past years, providing a foundation for ongoing research projects conducted on King George Island. Furthermore, in light of the current climate warming observed in this region of Antarctica (Turner et al. 2005; Stastna 2010; Bromwich et al. 2013; Kejna, Araźny, and Sobota 2013a; Jones et al. 2019; Bello, Suarez, and Lavado-Casimiro 2022; Dalaiden et al. 2022; Casado et al. 2023), it is imperative to investigate microscale climate and meteorological variabilities, as this warming may have a significant impact on the ecosystem (Carlini et al. 2009; Korczak-Abshire 2010; Bers et al. 2013; Turner et al. 2014; Lee et al. 2017; Znój et al. 2017).

1.2 | Study Area

King George Island, the largest island in South Shetlands Archipelago, is separated from northern end of Antarctic Peninsula by 120 km wide Bransfield Strait (Figure 1). The island is almost entirely covered by an ice cap, which reaches elevations of up to 700 m a.s.l. (Dziembowski and Bialik 2022). The ice-free areas in close proximity to the coastline are home to a diverse range of wildlife and vegetation. A total of 13 bird species are known to breed in the area, including three

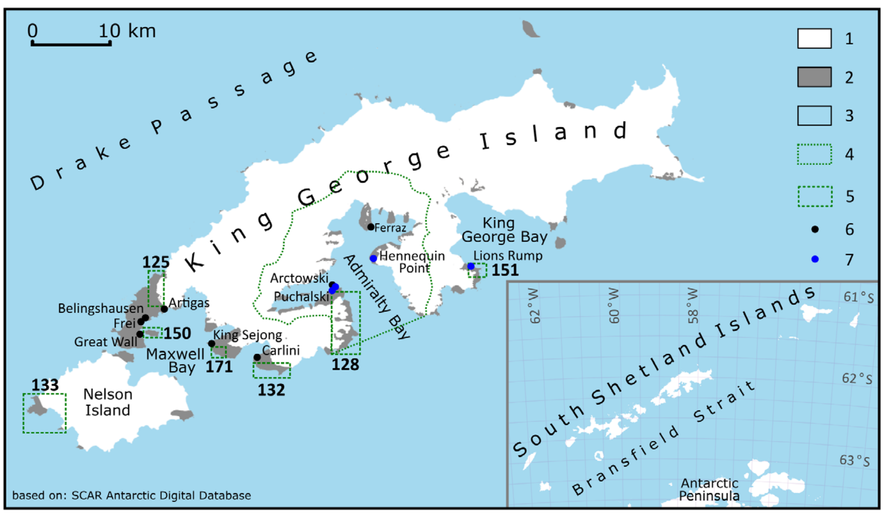

FIGURE 1 | Study area. 1—Ice cap; 2—Land; 3—Sea; 4—Antarctic Special Managed Area no. 1 (ASMA no. 1); 5—Antarctic Special Protected Area (ASPA) with its number; 6—Year-round scientific stations; 7—Automatic weather stations from which data were included in the presented dataset.

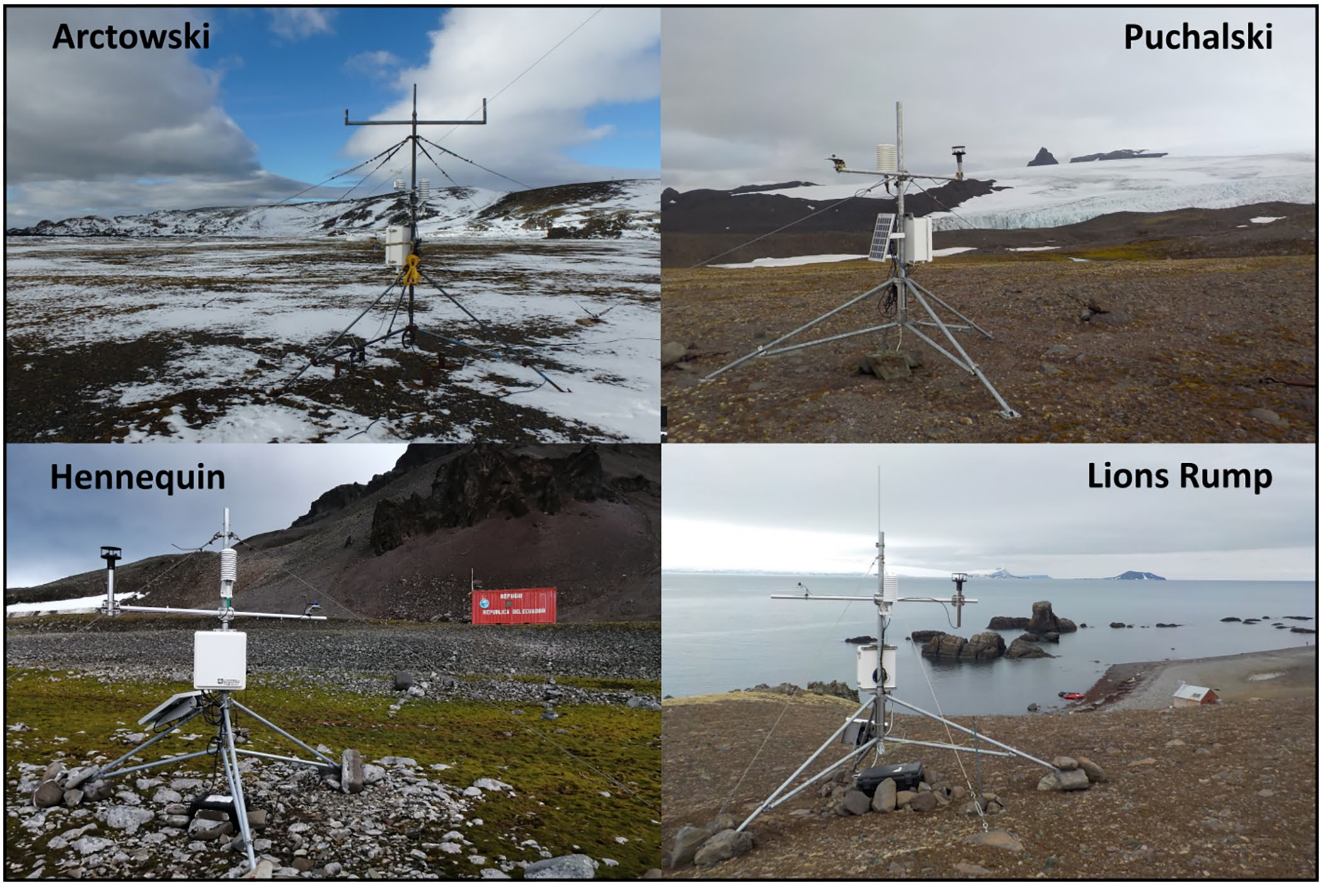

FIGURE 2 | Automatic weather stations from which the data used in the study were taken.

TABLE 1 | Location and time of measurements for each AWS included in the dataset.

Name of automatic weather station (AWS)	Coordinates	High (m a.s.l.)	Time of measurements
Arctowski	62.1594° S; 58.4683° W	2	1 January 2018–31 December 2023
Puchalski	62.1641° S; 58.4701° W	55	1 January 2018–31 December 2023
Hennequin	62.1211° S; 58.3956° W	10	10 January 2021–31 December 2023
Lions Rump	62.1291° S; 58.1576° W	23	2 November 2018–31 December 2023

penguin species: Adelie (*Pygoscelis adeliae*), Gentoo (*Pygoscelis papua*), Chinstrap (*Pygoscelis antarcticus*) (Jabłoński 1986; Sierakowski, Korczak-Abshire, and Jadwiszczak 2017) and southern giant petrel (*Macronectes giganteus*; Jabłoński 1986; Sierakowski, Korczak-Abshire, and Jadwiszczak 2017; Fudala and Bialik 2022a). Furthermore, southern elephant seals (*Mirounga leonina*) utilise the shores of King George Island as breeding, moulting and haul-out areas (Fudala and Bialik 2022b). A considerable number of Antarctic fur seals (*Arctocephalus gazella*) can be observed during the summer months on their foraging journey southwards. Additionally, Weddell seals (*Leptonychotes weddellii*), sea leopards (*Hydrurga leptonyx*) and crabeater seals (*Lobodon carcinophaga*) are observed with regularity in the area (Salwicka and Rakusa-Suszczewski 2002; Grebieniow et al. 2020). A total of 300+ species of lichens and 60+ species of mosses were identified on ice-free areas of the island, in addition to two species of vascular plants: *Deschampsia antarctica* and *Colobanthus quitensis* (Ochyra 1998; Olech 2004). Moreover, although they are not visible, marine and benthic ecosystems represent the most abundant part of the biosphere in the area (Siciński et al. 2011; Management Plan for ASMA No. 1 2023).

The principal factors that have shaped the climate of King George Island are its location in a high latitudinal zone (62° S) which determines insolation, sea surface temperature, concentration and placement of sea ice (Marsz and Styszyńska 2000; Turner et al. 2013; Kejna, Araźny, and Sobota 2013a; Oliva et al. 2017). Other significant factors include the frequent passage of low-pressure systems through the region (Simmonds, Keay, and Lim 2003). As a result of these and other factors, meteorological conditions vary considerably from year to year. Furthermore, the meteorological conditions may change rapidly, and different weather patterns may occur in areas that are only a few kilometres apart (Kejna 2008; Marsz and Styszyńska 2000; Turner et al. 2013).

TABLE 2 | Technical characteristics of the Arctowski, Puchalski, Hennequin and Lions Rump AWS. Measurements time span was 10 min, expect for Arctowski were the maximum wind speed was additionally derived from 3 s measurements.

Meteorological element/device	AWS	Unit	Manufactured	Type	High (m a.g.l.)	Accuracy
Data logger	Arctowski Lions Rump	—	Campbell	CR3000	1.0	—
	Puchalski Hennequin			CR1000X		—
Air temperature	All stations	°C	Vaisala	HMP155	2.0	±0.2°C (−40 to −20°C)
Relative air humidity		%	Vaisala	HMP155	2.0	±1.3% RH (−40 to 20°C)
Wind speed	Arctowski	m/s	Vector Instruments	A100R	2.0	±0.1 m/s at 0–10 m/s 1% between 10–55 m/s; 2% above 55 m/s
	Puchalski Hennequin Lions Rump	m/s	Gill Instruments	WindSonic	2.0	±2% at 12 m/s
Solar radiation	Arctowski	W/m^2	Kipp & Zonen	CNR4	1.5	Spectral range: 300–2800 nm ; sensitivity 5–20 μV/W/m^2
	Puchalski Hennequin		Apogee	CS320	2.0	Spectral range: 385–2105 nm; uncertainty of daily sums < 5%
	Lions Rump		Apogee	SP–110	2.0	Spectral range: 360–1120 nm; uncertainty at 1000 W/m^2 < 3%
Air pressure	Arctowski	hPa	Setra	278	1.5	±1.5 hPa (−40°C to 60°C)

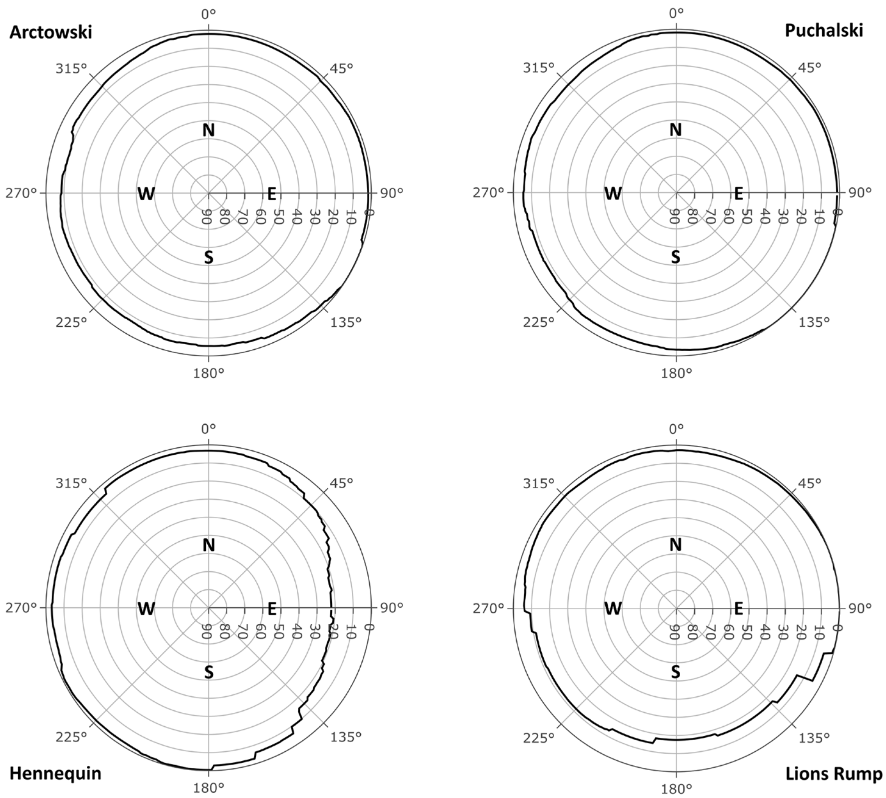

FIGURE 3 | Horizon seen from each AWS included in the dataset. Black solid line indicates horizon angle high (in degrees). Calculated from The Reference Elevation Model of Antarctica (32 and 60 m resolution; Howat et al. 2022) using GRASS GIS software algorithm r.horizon.height in QGIS.

TABLE 3 | Number of days with 108–143 measurements per day for each AWS.

	Air pressure	Air temperature and humidity				Wind speed				Solar radiation			
Year	A	A	P	H	LR	A	P	H	LR	A	P	H	LR
2018	0	0	1	—	2	1	13	—	4	0	2	—	2
2019	0	0	0	—	0	0	10	—	5	1	0	—	0
2020	0	0	1	—	0	0	19	—	21	0	1	—	0
2021	2	1	1	0	0	4	11	0	4	2	3	0	0
2022	3	2	0	0	0	8	6	16	1	1	0	0	0
2023	1	2	0	0	0	3	14	12	9	7	0	0	0
Sum	6	5	3	0	2	16	73	28	44	11	6	0	2

Abbreviations: A, Arctowski; H, Hennequin; LR, Lions Rump; P, Puchalski.

TABLE 4 | The longest periods without data, which prevented the calculation of monthly and annual values.

		Period without data		
AWS	Missing data	Start	End	Number of days in row
Arctowski	Air temperature and humidity, wind speed, solar radiation	1.02.2021	7.02.2021	8
	Solar radiation	23.02.2022	3.03.2022	9
Puchalski	Air temperature and humidity, solar radiation	17.06.2018	14.08.2018	59
	Wind speed	17.06.2018	3.02.2019	232
	Air temperature and humidity, wind speed, solar radiation	4.02.2021	10.02.2021	7
	Solar radiation	3.08.2021	13.01.2022	164
	Solar radiation	9.09.2022	24.09.2022	16
Hennequin	Air temperature and humidity, wind speed	1.01.2021	10.01.2021	10
	Solar radiation	1.01.2021	12.01.2021	12

TABLE 5 | Number of days without data for each AWS.

	Air pressure	Air temperature and humidity				Wind speed				Solar radiation			
Year	A	A	P	H	LR	A	P	H	LR	A	P	H	LR
2018	0	0	59	—	305[a]	1	205	—	305[a]	0	59	—	305[a]
2019	3	0	0	—	0	3	50	—	14	5	0	—	0
2020	0	0	0	—	0	0	4	—	10	0	0	—	0
2021	10	10	7	10[b]	0	10	7	10[b]	2	13	159	12[c]	0
2022	0	0	0	0	0	1	2	1	5	10	29	0	0
2023	3	3	0	0	0	1	3	1	0	4	0	0	0
Sum	16	13	66	10	1	16	271	12	32	32	247	12	1

Abbreviations: A, Arctowski; H, Hennequin; LR, Lions Rump; P, Puchalski.
[a]Measurements started 2 November 2018.
[b]Measurements started 10 January.
[c]Measurements started 12 January.

TABLE 6 | Spearman correlation coefficients between mean daily values of meteorological parameters at four AWSs included in the dataset.

Meteorological element	Arctowski—Puchalski	Arctowski—Lions Rump	Arctowski—Hennequin	Puchalski—Hennequin	Puchalski—Lions Rump	Lions Rump—Hennequin
Air temperature	0.996	0.996	0.996	0.980	0.992	0.976
Air humidity	0.916	0.906	0.778	0.754	0.874	0.747
Wind speed	0.964	0.839	0.843	0.834	0.795	0.681
Sum of solar radiation	0.996	0.981	0.967	0.976	0.981	0.957

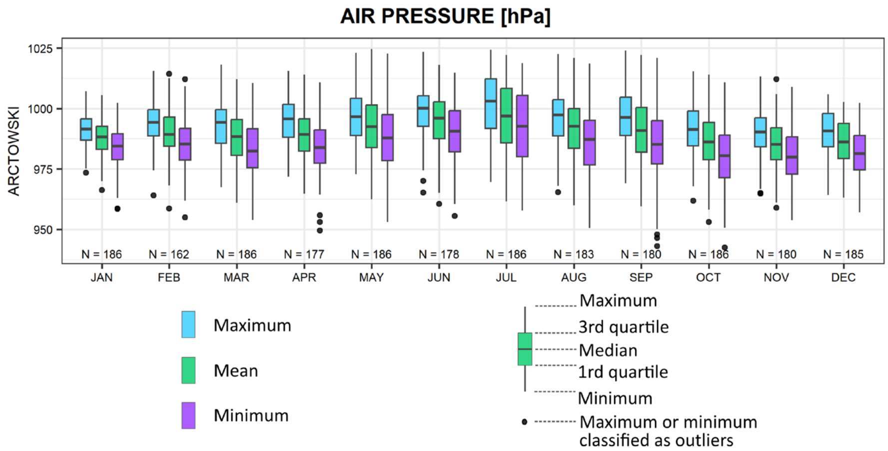

FIGURE 4 | Variability of daily minimum, mean and maximum values of air pressure [hPa] for each month at Arctowski AWS. *N*—amount of data. Outliers are values that exceed the third or first quartile by more than 1.5 times the difference between the third and first quartiles.

1.3 | State of Research

In the past, meteorological conditions in Maxwell Bay and Admiralty Bay (Figure 1) have been compared on a number of occasions (Kejna 1999; Kejna, Araźny, and Sobota 2013a; Kejna et al. 2013b; Oliva et al. 2017; Plenzler et al. 2019), utilising mean daily and monthly values. As indicated by Kejna and Lagun (2004) and Kejna, Araźny, and Sobota (2013a), there is a strong correlation between air temperature at Arctowski and Bellingshausen. In 2012, the mean monthly air temperature and air pressure at the stations Arctowski, Bellingshausen, Artigas, Carlini, Great Wall and Frei exhibited a convergent trend. However, the mean monthly air temperature values at Arctowski Station were typically higher than those in Maxwell Bay (Kejna et al. 2013b). Furthermore, the findings of Kejna (1999) and Kejna and Lagun (2004) indicate that the air temperature in Admiralty Bay is higher than in Fildes Peninsula. One of the phenomena that is responsible for this is the occurrence of foehn wind at Arctowski (Styszyńska 1990). Bellingshausen and Frei are directly exposed to the prevailing west-to-north-west winds (Figure 1). During summer 2006/2007, Kejna (2008) compared data on air temperature, air humidity, wind speed and wind direction from Arctowski Station with data from seven other stations located temporarily within 1–4 km of the station at various locations (moraine, valley, glacier and icefield). The results demonstrate the influence of ground properties, terrain morphology and local air circulation on meteorological conditions.

The meteorological data from the most eastern location at South Shetlands that have been published hitherto are those from investigations that were performed at Ferraz Station in the years 2011–2015 (Soares et al. 2019a, 2019b). One aspect of that research was the surface radiation balance of a no-glaciated coastal area. Meteorological conditions at the western part of Livingstone Island, the second largest island in the South Shetland Archipelago, were described and compared with data from Bellingshausen Station and Deception Island by Banon et al. (2013).

The mean annual air temperature at Arctowski Station for the period 2013–2017 was −1.7°C. The warmest month was February, with a mean monthly air temperature of 1.6°C. The predominant wind direction at Arctowski Station is southwest (Plenzler et al. 2019), while at Fieldes Peninsula the prevailing wind direction is northwest (Kejna and Lagun 2004). Mean monthly wind speed at Arctowski Station varies from 4.6 m/s in December to 6.7 m/s (Plenzler et al. 2019).

2 | Data Description and Development

2.1 | Location and Description of Automatic Weather Stations

The presented dataset contains meteorological data from four automatic weather stations: Arctowski, Puchalski, Lions Rump and Hennequin (Figures 1 and 2, Tables 1 and 2). The Arctowski Station is situated at Pt. Thomas Oasis at the western shore of Admiralty Bay, 6.5 km north from Bransfield Strait. Westward from the station is Ezcurra Fiord, which is a favourable area for the NW winds. The AWS at Arctowski Station is situated in a

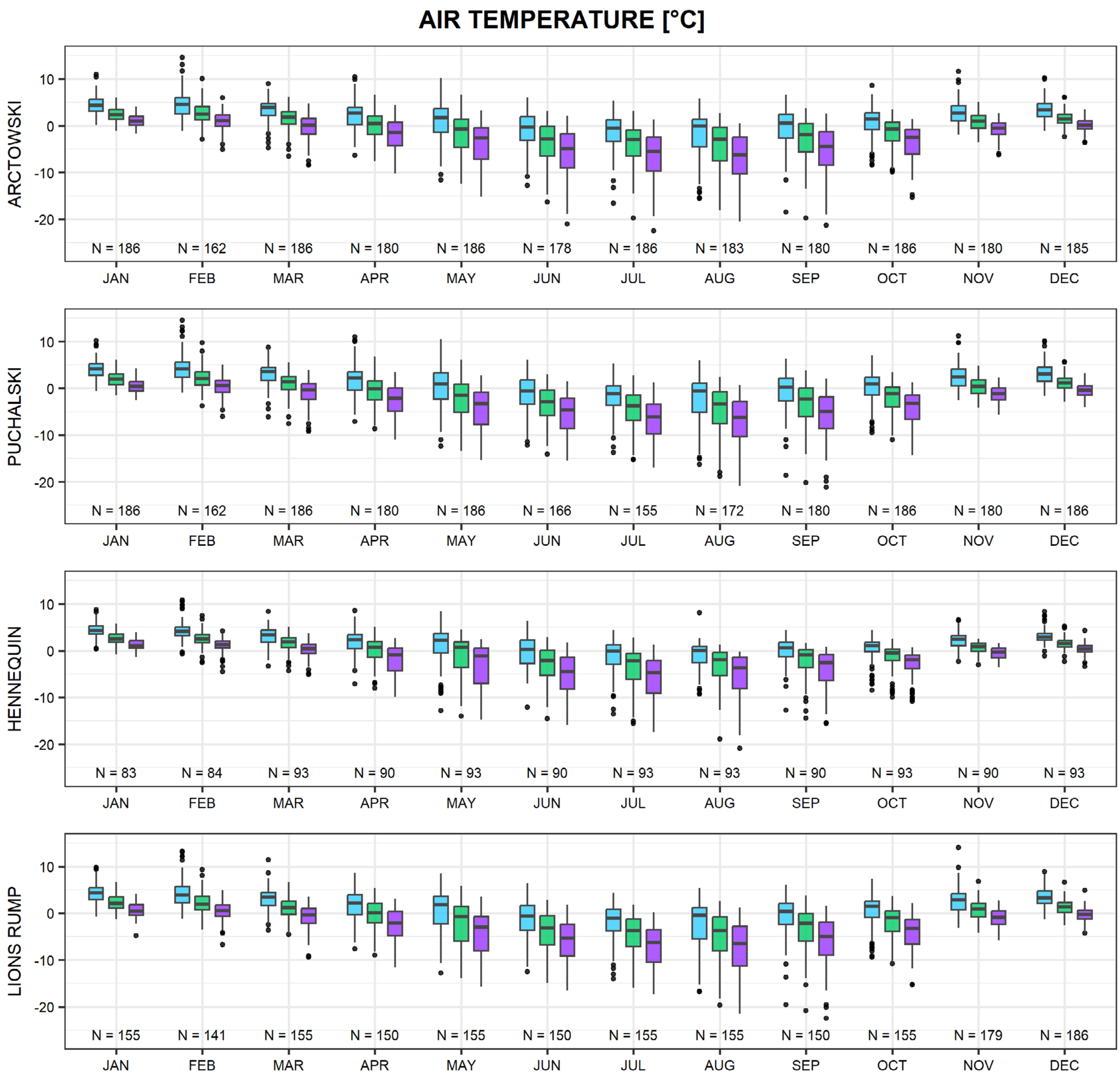

FIGURE 5 | Variability of daily minimum, mean and maximum values of air temperature [°C] for each month at four AWSs included in the dataset. Description as in Figure 4.

flat, open, watery area approximately 60 m from the nearest sea shore and 300 m from rugged slopes approximately 50 m high, which continue up to 220 m above sea level. The ice cap begins 2.5 km from the station. Puchalski Station is situated 500 m to the southwest of Arctowski Station at the summit of a hill covered by moraine deposits at an altitude of approximately 50 m above sea level. To the south of the stations is a penguin rockery and a giant petrel colony, as well as a number of other species of seabird nesting on adjacent hills and rocks (Management Plan for ASPA No. 128 2019). The area south of the station is designated ASPA 128 (Figure 1).

The Lions Rump area is situated at the western shore of King George Bay, while the AWS is located at a slope moraine 20 m a.s.l., exposed to the northeast. It is situated 130 m from the nearest sea shore. West of the AWS, the terrain continues upward to the ice cap edge, which is approximately 700 m from the AWS. To the northwest of the AWS, an uneven slope continues to the ice cap, while to the east, the site is surrounded by sea. The area southeast of the station is designated ASPA 151 to protect its ecological values, including the diverse avian and mammalian Antarctic fauna (Figure 1; Management Plan for ASPA No. 151 2019).

Hennequin Station is situated at the flat area 10 m a.s.l., 80 m from the shoreline. To the east of the station, the terrain continues upward to the ice cap edge at 40 m a.s.l., 600 m from the AWS. The east shore of Admiralty Bay lacks penguin rookeries, but the Hennequin Point neighbourhood is a nesting area for eight bird spices (Costa and Alves 2008). Due to its proximity to the slope of the high mountain, Hennequin is the shadiest weather station, although the line of horizon is unique to each station (Figures 1–3).

2.2 | Data Collection and Calculation

All the automatic weather stations described here were designed to operate in remote locations and harsh environments. They have a frame and a data logger manufactured by Campbell and high-quality sensors for particular parameters (Table 2). The Arctowski and Puchalski AWSs are located close to the Henryk Arctowski Polish Antarctic Station, which is a year-round research station. Their technical condition is checked by station staff at least once a month, and always after very strong wind events. If necessary, essential repairs can be carried out quickly using spare parts stored at Arctowski Station. The Lions Rump and Hennequin AWSs, which are located further out from Arctowski Station, are checked approximately four times a year. All AWS are located in open areas where the snow cover rarely exceeds 25 cm due to strong winds. Therefore, the sensors were not raised during the winter. Data from the Arctowski AWS are transmitted directly to the Arctowski Station, providing an opportunity to systematically monitor its quality. Data from the Puchalski AWS are downloaded once a month, and from the Lions Rump and Hennequin AWS during each service visit. Prior to the preparation of the dataset, all the data were checked in order to eliminate the exceptional values that were sometimes recorded by chance.

The dataset comprises daily mean, maximum and minimum values of air temperature [°C], relative air humidity [%], wind speed [m/s] and daily sum of solar radiation [MJ/m^2] for each AWS, with the additional inclusion of air pressure [hPa] for the Arctowski AWS.

Mean values of air temperature and air humidity, wind speed and air pressure were calculated from measurements taken every 10 min. Non-processed data were used for the identification of extreme values. Furthermore, in the case of wind speed measurements at Arctowski, maximum values were derived from 3-s time span measurements. Daily sums of solar radiation were calculated from solar radiation intensity measurements taken every 10 min. Monthly and annual values were calculated from daily values. The length of the dataset differs for each AWS, as previously mentioned in the introduction, as the installations were not simultaneous (Table 1).

2.3 | Limitation of the Dataset

Despite the regular service of AWS, some technical issues had occurred during the investigation period, resulting in the loss of data. In general, each station has a majority of days with complete datasets comprising 144 measurements per day. In the event that fewer than 108 measurements were recorded on a given day (< 75% of the total), that day was deemed to be a day without data. The threshold of 75% of measurements per day was chosen because in this particular dataset most of the days with incomplete measurements had up to 25% missing measurements or much more (e.g., 40% or more). The number of days with 106–143 measurements per day represents a minority within the dataset (Table 3). These incidents occurred most frequently in the case of wind speed, as the wind speed sensor is occasionally obstructed by snow or ice.

During the period from 2018 to 2023, the Arctowski AWS exhibited two extended periods of data loss, which resulted in the unavailability of mean monthly values for calculation (Table 4). The remainder of days devoid of data were discrete days or no longer than four consecutive days (Table 5). The

TABLE 7 | Annual values of air pressure (hPa) at Arctowski AWS.

Year	Minimum	Mean	Maximum
2018	951.2	989.0	1023.4
2019	953.1	992.1	1026.4
2020	947.9	991.7	1023.9
2021	943.1	988.9	1026.6
2022	942.5	989.6	1022.6
2023	953.1	988.8	1024.4
Mean	947.9	990.0	1026.6

TABLE 8 | Annual values of air temperature (°C) at each AWS included in the dataset.

	Minimum				Mean				Maximum			
Year	A	P	H	LR	A	P	H	LR	A	P	H	LR
2018	−22.5	—[a]	—	—	−0.7	—[a]	—	—	9.9	—[a]	—	—
2019	−17.3	−18.0	—	−17.9	−1.5	−2.2	—	−1.9	11.6	11.2	—	14.0
2020	−21.3	−21.2	—	−22.5	−1.0	−1.7	—	−1.5	14.6	14.5	—	13.2
2021	−20.4	−20.9	−20.9	−21.5	−0.2	−0.5	−0.3	−0.6	10.8	11.1	9.9	12.1
2022	−14.5	−14.3	−14.7	−15.1	−0.2	−0.6	−0.4	−0.7	11.7	12.4	10.8	12.1
2023	−15.2	−16.3	−16.5	−16.9	−0.6	−1.0	−0.8	−1.2	11.0	11.0	9.2	9.8
Multiannual	−22.5	−21.2	−20.9	−22.5	−0.7	−1.2	−0.5	−1.2	14.6	14.5	10.8	14.0

Abbreviations: A, Arctowski; H, Hennequin; LR, Lions Rump; P, Puchalski.
[a]The annual values are not displayed due to the lack of sufficient data, see Table 5.

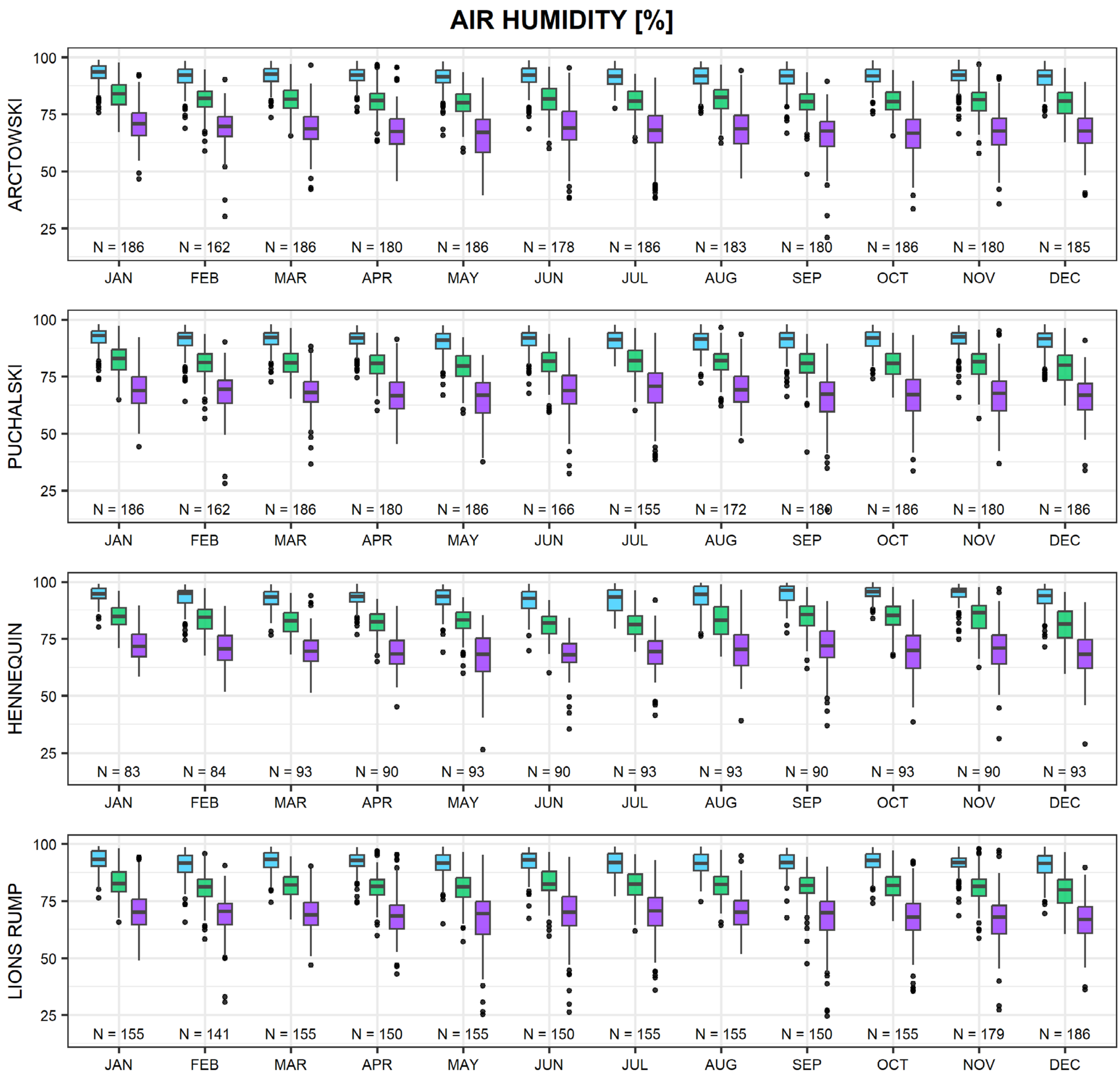

FIGURE 6 | Variability of daily minimum, mean and maximum values of relative air humidity [%] for each month at four AWSs included in the dataset. Description as in Figure 4.

Puchalski AWS exhibited the greatest number of days without data. In particular, this was the case in 2018 and 2019 for wind speed and in 2018 and 2021 for solar radiation. The Hennequin AWS is missing only the first 10 calendar days (12 in the case of solar radiation) in 2021, as the station was launched on 10 January that year. Lions Rump only lacks data for individual days (Table 3).

3 | Dataset Access and Results

The described dataset consists of four files in Excel format. Each file contains data for a single AWS. It is accessible at the PANGEA online repository under a non-restrictive CC BY 4.0 licence, which permits any individual to access the data upon registration. There are no plans to update the dataset in the near future. However, meteorological data from the upcoming years will be published in a separate dataset.

The Spearman correlation coefficient indicates a strong correlation between the mean daily values of specific parameters at distinct stations. As anticipated, the correlation is the most pronounced between the Arctowski and Puchalski stations, which are situated in close proximity. However, the correlation coefficient for air temperature is consistent between the Arctowski and all other stations (Table 6).

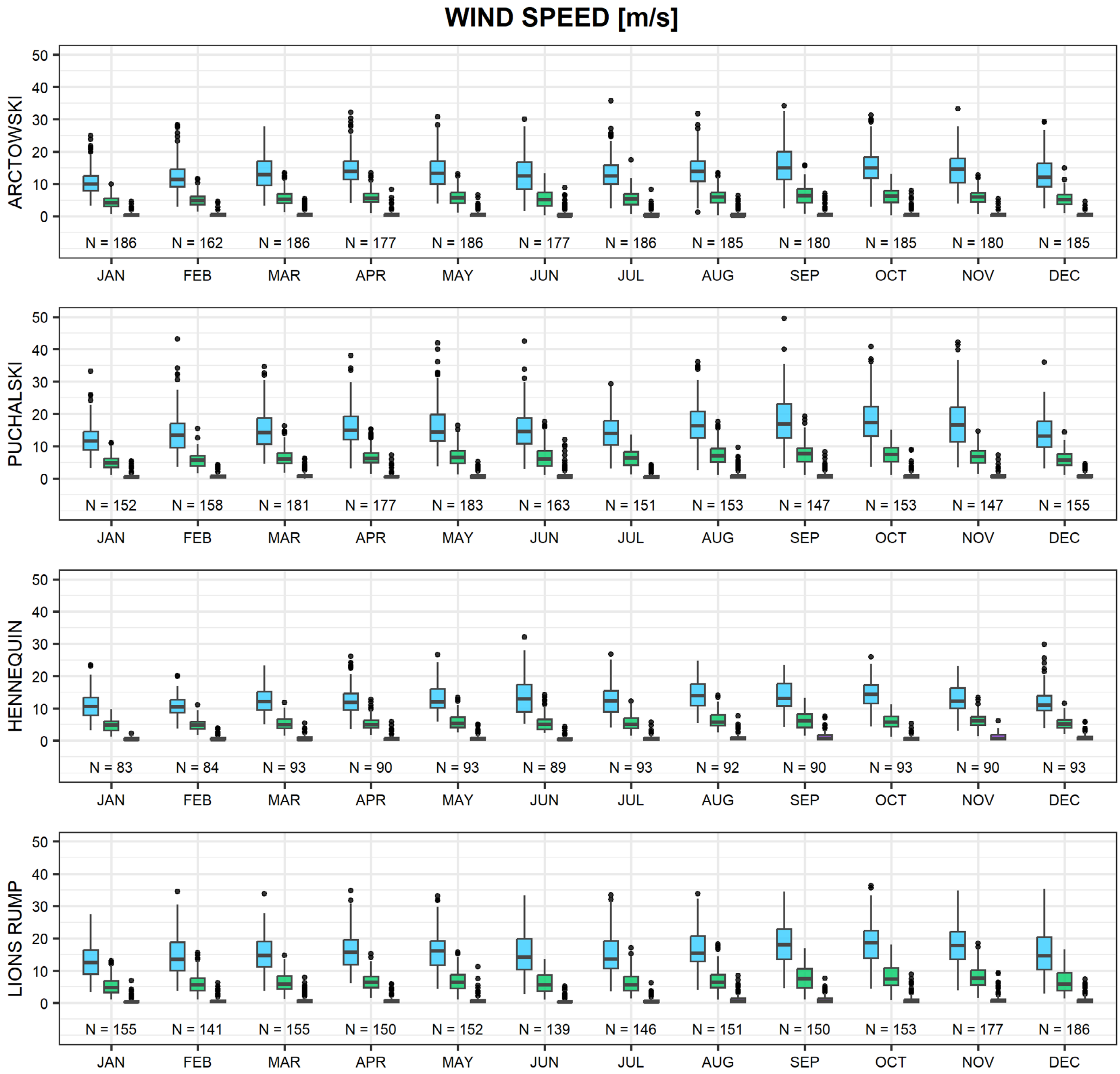

FIGURE 7 | Variability of daily minimum, mean and maximum values of wind speed [m/s] for each month at four AWSs included in the dataset. Description as in Figure 4.

The mean daily air pressure at Arctowski AWS exhibits a range of 953.1–1024.3 hPa, with a first quartile of 982.1 hPa and a third quartile of 997.7 hPa (Figure 4). The mean daily wind speed for the entire dataset (four stations) ranges from 0.2 m/s (Arctowski) to 19.2 m/s (Puchalski), with the first quartile at 4.1 m/s and the third quartile at 7.8 m/s. In the case of air humidity, the mean daily values vary from 41.9% (Puchalski) to 99.0% (Hennequin), with the first quartile at 77.2% and the third quartile at 85.5%. The mean daily air temperature varies from −20.0°C (Puchalski) to 10.1°C (Arctowski), with the first quartile at −2.6°C and the third quartile at 1.8°C. The low temperatures (all maximum, mean and minimum) classified as outliers are consistent with previous observations that the temperature minimum is higher in recent years than it was in 1977–1999. The absolute minimum temperature recorded at the Arctowski station during mentioned period was −32.2°C (Marsz and Styszyńska 2000), while the corresponding figure for the 2013–2023 period was −22.5°C. During the period covered by the dataset, the Antarctic Peninsula and South Shetland region experienced two extremely warm temperature events—in February 2020 and February 2022 (González-Herrero et al. 2022; Gorodetskaya et al. 2023). These events are also present in the dataset. On 10 February 2020, a maximum temperature of 14.6°C was recorded at the Arctowski station for the period 2013–2023. It is worth mentioning that for the period 1977–1999, the temperature record was 16.7°C in January 1977 (Marsz and Styszyńska 2000).

The daily sum of solar radiation exhibits considerable variability, ranging from 0.000 MJ/m^2 (Hennequin) to 35.156 MJ/

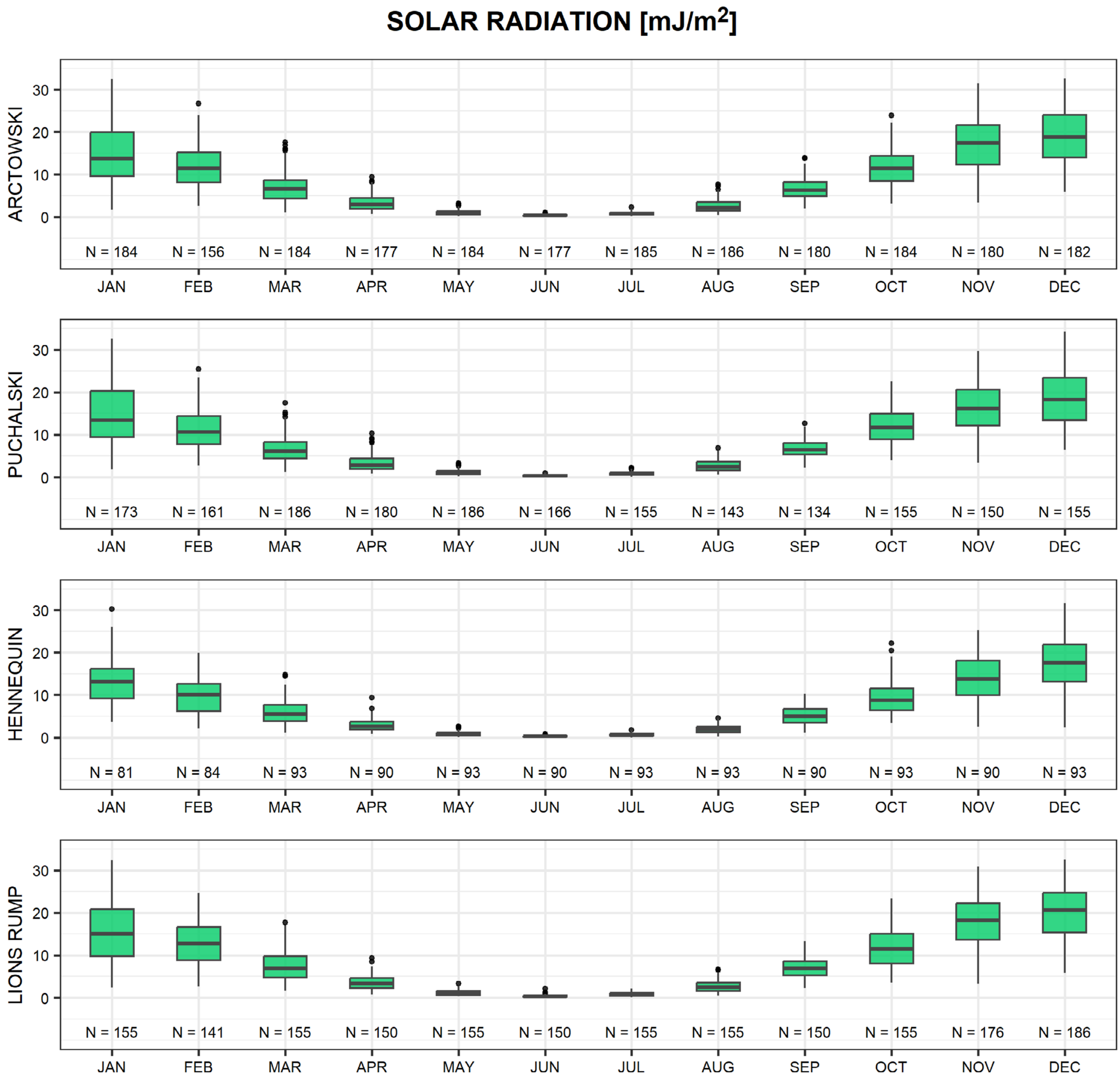

FIGURE 8 | Variability of daily sum of solar radiation [MJ/m^2] for each month at four AWSs included in the dataset. Description as in Figure 4.

m^2 (Lions Rump). The first quartile is 1.420 MJ/m^2, while the third quartile is 12.617 MJ/m^2. The ranges of air temperature, wind speed and air pressure are significantly broader in the winter months than in the summer months (see Figures 4, 5, 7 and 8).

In general, values of wind speed, air humidity, solar radiation and air pressure at Arctowski AWS are similar to those from 2013 to 2017 (Plenzler et al. 2019; Figures 4 and 6, Tables 7, 9–11). The only notable difference is the mean annual air temperature at the Arctowski station (Table 8), which was −0.7°C for the study period. This is much higher than the mean air temperature value from 1977 to 1999 and from 2013 to 2017, which was −1.7°C for both periods (Marsz and Styszyńska 2000; Plenzler et al. 2019). During the first decade of the XXI century, climate cooling was observed in the region of the Antarctic Peninsula (Turner et al. 2016; Oliva et al. 2017), which was also marked in Arctowski during 2013–2017 (Plenzler et al. 2019). The mean annual air temperature calculated for Arctowski for 2013–2023 is −1.2°C, which is significantly higher compared to 1977–1999.

Visible differences between the values of certain parameters at the AWSs (Figures 4–8, Tables 7–11) are probably due to their higher altitude (Puchalski and Lions Rump) or more open (Lions Rump) or shaded (Hennequin; Table 1, Figures 1–3) location. For example, previous research shows that Arctowski station has higher air temperature and lower wind speed than Maxwell Bay stations due to its location in the lee of the ice cap (Kejna 1999; Kejna, Araźny, and Sobota 2013a; Plenzler

TABLE 9 | Annual values of relative air humidity (%) at each AWS included in the dataset.

	Minimum				Mean				Maximum			
Year	**A**	**P**	**H**	**LR**	**A**	**P**	**H**	**LR**	**A**	**P**	**H**	**LR**
2018	33.4	—[a]	—	—	80.4	—[a]	—	—	98.4	—[a]	—	—
2019	21.0	16.6	—	24.5	81.1	79.2	—	81.1	98.8	95.7	—	99.0
2020	30.2	28.2	—	26.3	81.4	79.6	—	81.7	98.6	95.5	—	99.0
2021	39.7	36.0	26.4	25.3	80.9	80.4	82.8	81.3	98.7	97.1	99.3	98.8
2022	39.6	33.8	38.5	26.4	81.2	82.2	83.1	81.6	98.9	97.9	99.5	99.1
2023	39.4	36.6	37.0	36.8	80.5	82.0	82.4	81.3	98.2	98.0	99.7	98.8
Multiannual	21.0	16.6	26.4	24.5	80.9	80.7	82.8	81.4	98.9	98.0	99.7	99.1

Abbreviations: A, Arctowski; H, Hennequin; LR, Lions Rump; P, Puchalski.
[a]The annual values are not displayed due to the lack of sufficient data, see Table 5.

TABLE 10 | Annual values of wind speed (m/s) at each AWS included in the dataset.

	Minimum				Mean				Maximum				
Year	**A**	**P**	**H**	**LR**	**A**	**P**	**H**	**LR**	**A (3s)**	**A**	**P**	**H**	**LR**
2018	0.0	—[a]	—	—	5.7	—[a]	—	—	44.2	35.8	—[a]	—	—
2019	0.0	—[a]	—	0.0	5.1	—[a]	—	6.1	37.1	29.6	—[a]	—	36.3
2020	0.0	0.0	—	0.1	5.4	6.2	—	6.2	41.7	27.9	36.7	—	34.8
2021	0.0	0.0	0.0	0.0	6.1	7.0	5.8	7.7	47.9	30.4	49.5	26.7	34.5
2022	0.0	0.0	0.0	0.0	5.9	7.0	5.6	7.2	41.7	33.3	42.5	27.9	34.8
2023	0.0	0.1	0.0	0.1	5.7	6.8	5.6	6.7	41.7	32.1	40.0	32.1	35.7
Multiannual	0.0	0.0	0.0	0.0	5.6	6.8	5.6	6.8	47.9	35.8	49.5	32.1	36.3

Abbreviations: A, Arctowski; H, Hennequin; LR, Lions Rump; P, Puchalski.
[a]The annual values are not displayed due to the lack of sufficient data, see Table 5.

et al. 2019). According to the data presented, the situation is similar when comparing Arctowski with Lions Rump, which is more open to the Bransfield Strait than Arctowski. Nevertheless, a closer look at the dataset may reveal some other reasons for the differences, but this is not the subject of this paper.

4 | Potential Data Set Use and Reuse

Meteorological data are used as a background for almost all other research projects conducted at King George Island, as well as an analysis of meteorological conditions themselves. However, there are some gaps in the data, they may be filled based on strong correlation between particular parameters at particular stations (Table 6). The dataset may be used to determine if there are significant differences between meteorological conditions at the bays on King George Island. The locations of breeding, moulting and resting areas of animals and vegetation are distributed very irregularly on the island (Jabłoński 1986; Zmarz et al. 2018; Korczak-Abshire et al. 2019; Fudala and Bialik 2022a, 2022b). A number of factors are responsible for this, with the local climate being one of them. By analysing meteorological conditions, it may be determined why animals tend to occupy particular areas.

TABLE 11 | Annual values of solar radiation sum (MJ/m^2) at each AWS included in the dataset.

Year	Arctowski	Puchalski	Hennequin	Lions Rump
2018	2844.11	—[a]	—	—
2019	2816.40	2814.09	—	2996.89
2020	3063.73	2909.68	—	3214.34
2021	2768.73	—[a]	2162.02	3125.33
2022	2802.84	2596.50	2535.37	3030.03
2023	2929.55	2990.07	2611.26	3134.97
Mean	2870.89	2811.85	2436.22	3100.31

[a]The annual values are not displayed due to the lack of sufficient data, see Table 5.

Three of meteorological stations, from with data were used in this paper are located close to Antarctic Special Protected Areas (Figure 1), that were established due to outstanding wildlife values. In total, there are six Antarctic Special Protected Areas (ASPA) on King George Island, with one additional ASPA on Nelson Island. Furthermore, Admiralty Bay basin is designated as Antarctic Special Managed Area no. 1 (Figure 1), indicating the potential applicability of the findings of this study in future evaluations of management plans for these areas.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The described dataset is available in the PANGEA online repository under a non-restrictive CC BY 4.0 licence for anyone after registration. The links are provided in the dataset details section.

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