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**Metata data for runway temperature data acquired at Pegasus Airfield, McMurdo, Antarctica**

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**Period:** Hourly

**Duration of data:** 19 Dec 2012 – 9 Feb 2013

 7 Dec 2013 – present

**Name and location change:** NZPG (Pegasus) 19 Dec 2012 – 30 Nov 2015

 NZFX (Phoenix) 30 Nov 2015 - present

**Description:**

The data set is observed subsurface runway temperature measured in the snow and ice that the runway is composed of. At each observation node 7 temperature measurements are made at elevations initially from 4” to 16” below the top surface of the runway (i.e., that is the depth that the temperature sensors are installed at, the depth of the sensors vary over the course of the season due to snow ablation and accumulation). Each sensor is spaced 2” apart vertically so that the sensor depths are 4”, 6”, 8”, 12”, 14”, 16” at installation. The order of the sensors in the sensor string is sensor number 1 is set at the 16” depth and sensor 7 is at the 4” depth. Up to 4 sensor strings are installed seasonally. The location of the sensors along the length of the runway varies from year to year. Two sensors strings are paired at a single location along the length of the runway, but offset from each other by 50’ across the width of the runway, with one string located at the runway centerline, and the other sensor located 50’ east of the centerline of the runway. Each sensor in the string has a unique digital serial number (S/N) stored on it that is queried by the data logger along with the temperature measurement to determine the paring of the temperature to it’s location (vertically and horizontally).

Each logger transmits 2 sensor strings worth of data (total of 14 temperature readings) from the two strings installed at that location along the length of the runway. The logger sorts the data by sensor S/N for transmission. Therefore, the Iridium SBD message contains the data sorted by S/N, not by depth or string. Once the SBD message is decoded the fields need to be rearranged to separate out the data by string and put the strings in the proper order. The IMEI number of the logger modem and the S/N of the sensor determine unique location of each sensor. Tables for each season and logger are provided below to identify the proper location of each decoded temperature received from the transmitted SBD message.

Furthermore, each temperature is transmitted as raw data. A unique calibration offset needs to be applied to each data point to correct the data to the temperature in Celsius. The offset that needs to be subtracted from each reading is also provided in the tables below.

**Notes for the 2012-13 data:**

Four sensor strings were installed in the runway: two nodes at 2500 ft. from the approach end of the runway and two nodes at 8500 ft. from the approach end. The information for each logger and sensor is provided in Tables 1- 3 below.

**Table 1.** Installation location of sensor strings for the 2012-13 operational season and Pegasus Airfield.

|  |  |  |  |
| --- | --- | --- | --- |
| Logger IMEI # | Runway Station (ft.) | Location | Coordinates |
| 300234010543620 | 25+00 (2500) | Centerline | -77 57’ 31.20007’’166 29’ 50.38658” |
|  | 25+00 (2500) | 50’ East | -77 57’ 31.01642”166 29’ 52.82353 |
| 300234010623960 | 85+00 (8500) | Centerline | -77 58’ 26.76116”166 31’ 25.62806 |
|  | 85+00 (8500) | 50’ East | -77 58’ 26.57592”166 31’ 28.06521” |

**Table 2.** Sort order for sensors tied to the logger located at station 25+00
(IMEI # 300234010543620).

|  |  |  |  |
| --- | --- | --- | --- |
| Order in SDB File | Lateral Location | Depth (in) | Offset, C |
| 1 | CL | 16 | 0.37 |
| 2 | 50’ E | 16 | 0.45 |
| 3 | CL | 14 | 0.37 |
| 4 | 50’ E | 14 | 0.5 |
| 5 | CL | 12 | 0.37 |
| 6 | CL | 10 | 0.43 |
| 7 | CL | 8 | 0.465 |
| 8 | 50’ E | 12 | 0.43 |
| 9 | 50’ E | 10 | 0.4 |
| 10 | 50’ E | 8 | 0.4 |
| 11 | 50’ E | 6 | 0.31 |
| 12 | 50’ E | 4 | 0.43 |
| 13 | CL | 6 | 0.43 |
| 14 | CL | 4 | 0.5 |

**Table 3.** Sort order for sensors tied to the logger located at station 85+00
(IMEI # 300234010623960).

|  |  |  |  |
| --- | --- | --- | --- |
| Order in SDB File | Lateral Location | Initial Depth (in) | Offset, C |
| 1 | CL | 16 | 0.43 |
| 2 | 50’ E | 16 | 0.5 |
| 3 | CL | 14 | 0.5 |
| 4 | CL | 12 | 0.43 |
| 5 | CL | 10 | 0.4 |
| 6 | 50’ E | 14 | 0.37 |
| 7 | 50’ E | 12 | 0.37 |
| 8 | 50’ E | 10 | 0.18 |
| 9 | 50’ E | 8 | 0.43 |
| 10 | CL | 8 | 0.4 |
| 11 | CL | 6 | 0.31 |
| 12 | 50’ E | 6 | 0.12 |
| 13 | CL | 4 | 0.43 |
| 14 | 50’ E | 4 | 0.28 |

**Notes for the 2013-14 data:**

Only two nodes were installed during the 2013-14 season, both at the 3000ft. mark on the runway. Both were tied to a single logger. The information for the sensors and logger are provided below. Note that in Table 4 the initial depth of the sensors is indicated. We note that due to melt out of the runway the top sensor (initial 4” depth) was observed at the surface of the runway on 8 Jan 2014, indicating about 4” of snow / ice lost over the sensors since installation. We have no additional observations indicating depth between installation and 8 Jan so we do not know the time dependent change in depth of the sensors over the intervening period. However, due to extreme warm temperatures between 31 Dec and 8 Jan we expect there was a rapid loss in surface snow during that time. Before that we expect the loss was more gradual.

**Notes for AMRC data processing:**

This files are coming in raw from the SBD message. The data is NOT corrected for anything as denoted in the document and there is currently not a QC process.

**Table 4.** Sort order for sensors tied to the logger located at station 30+00 (3000 ft.)
(IMEI # 300234010543620).

|  |  |  |  |
| --- | --- | --- | --- |
| Order in SDB File | Lateral Location | Initial Depth (in) | Offset, C |
| 1 | CL | 16 | 0.37 |
| 2 | 50’ E | 16 | 0.43 |
| 3 | 50’ E | 14 | 0.25 |
| 4 | CL | 14 | 0.31 |
| 5 | CL | 12 | 0.31 |
| 6 | 50’ E | 12 | 0.31 |
| 7 | 50’ E | 10 | 0.31 |
| 8 | CL | 10 | 0.37 |
| 9 | 50’ E | 8 | 0.18 |
| 10 | CL | 8 | 0.31 |
| 11 | 50’ E | 6 | 0.43 |
| 12 | 50’ E | 4 | 0.25 |
| 13 | CL | 6 | 0.37 |
| 14 | CL | 4 | 0.31 |