

# Southern Ocean Clouds, Radiation, Aerosol Transport Experimental Study (SOCRATES) 50m Vertical Resolution Sounding Composite Data Set

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## 2.0 Dataset Overview

This data set contains a composite of interpolated 50m resolution upper air sounding data from all sources for the Southern Ocean Clouds, Radiation, Aerosol Transport Experimental Study (SOCRATES) project in the EOL Sounding Composite (ESC) columnar ASCII format. The data set currently contains 1888 soundings including the dropsonde data (109 soundings) from the NSF/NCAR Gulfstream-V HIAPER aircraft and the radiosonde data from the ships R/V Investigator (234 soundings), RSV Aurora Australis (208 soundings) and from 19 Australia, New Zealand, and Antarctica operational locations (1337 soundings) .

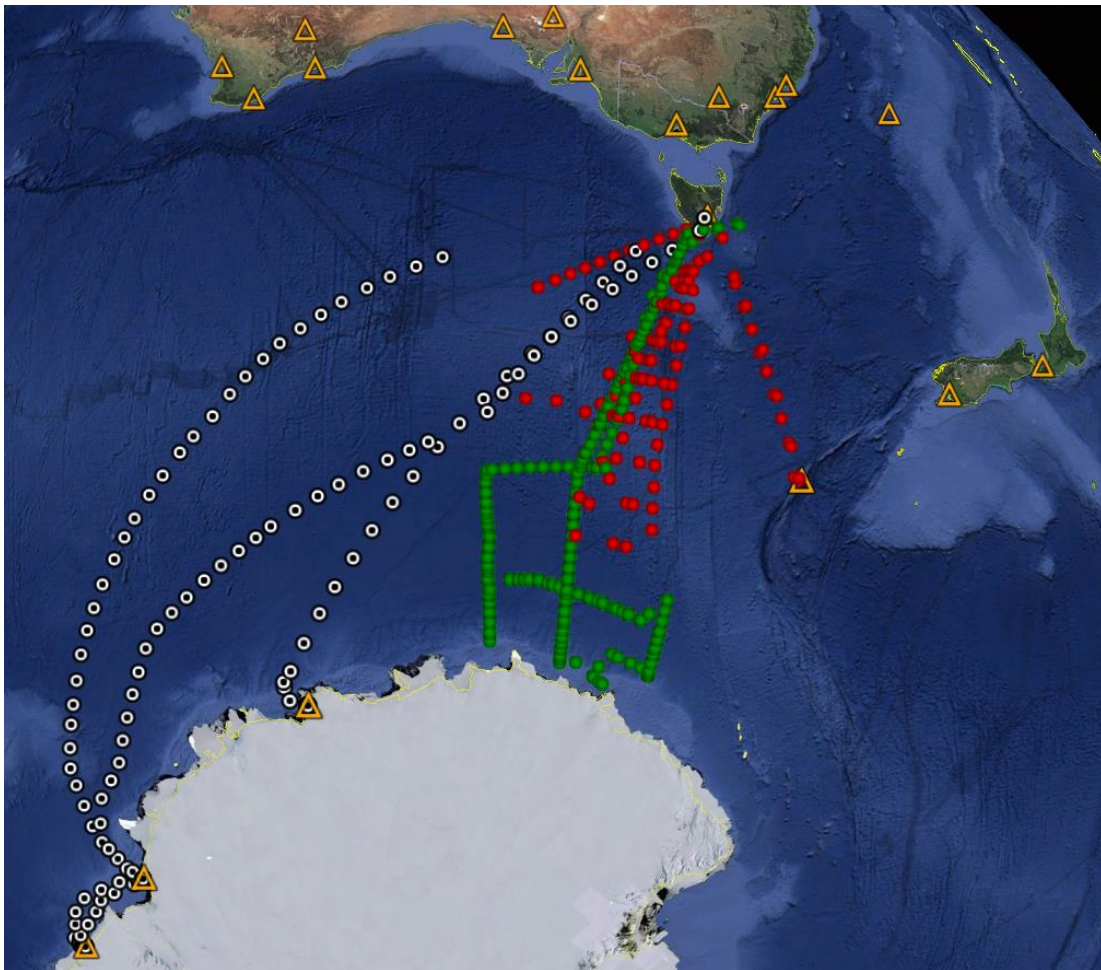


Figure 1. Locations of the soundings included in the SOCRATES high vertical resolution sounding composite data set. The NSF/NCAR GV HIAPER dropsondes are red circles, the RSV Aurora Australis radiosondes are white circles, the R/V Investigator radiosondes are green circles, and the operational radiosonde sites are the orange triangles.

### 3.0 Project Overview

The Southern Ocean Clouds, Radiation, Aerosol Transport Experimental Study (SOCRATES) is a research program to improve our understanding of clouds, aerosols, air-sea exchanges, and their interactions over the Southern Ocean. SOCRATES utilized the NSF/NCAR GV HIAPER aircraft based out of Hobart, Tasmania. There were additional projects occurring at the same time that were cooperating with SOCRATES, these included the DOE/ARM MARCUS (Measurements of Aerosols, Radiation, and Clouds over the Southern Ocean) project which used the RSV Aurora Australis, the DOE/ARM MICRE (Macquarie Island Cloud and Radiation Experiment) and the Australian CAPRICORN (Clouds, Aerosols, Precipitation Radiation and atmospheric Composition Over the southern ocean) project which utilized the RV Investigator. Further information on SOCRATES is available at the SOCRATES web site at NCAR/EOL: [https://www.eol.ucar.edu/field\\_projects/socrates](https://www.eol.ucar.edu/field_projects/socrates) and information on the SOCRATES deployments is available at the SOCRATES Field Catalog: <http://catalog.eol.ucar.edu/socrates>.

### 4.0 EOL Sounding Composite (ESC) File Format Description

The ESC is a columnar ASCII format consisting of 15 header records for each sounding followed by the data records with associated data quality flags.

#### 4.1 Header Records

The header records (15 total records) contain a variety of metadata about the sounding (i.e. location, time, radiosonde type, etc). The first five header lines contain information identifying the sounding, and have a rigidly defined form. The following 7 header lines are used for auxiliary information and comments about the sounding, and may vary from dataset to dataset. The last 3 header records contain header information for the data columns. Line 13 holds the field names, line 14 the field units, and line 15 contains dashes ('-' characters) delineating the extent of the field.

The file standard header lines are as follows:

Line	Label (padded to 35 char)	Contents
1	Data Type:	Description of the type and resolution of data
2	Project ID:	Short name for the field project
3	Release Site Type/Site ID:	Description of the release site.
4	Release Location (lon,lat,alt):	Location of the release site.
5	UTC Release Time (y,m,d,h,m,s):	Time of release.

The release location is given as:

lon (deg min), lat (deg min), lon (dec. deg), lat (dec. deg), alt (m)

Longitude in deg min is in the format: ddd mm.mm'W where ddd is the number of degrees (with leading zeros if necessary), mm.mm is the decimal number of minutes, and W represents W or E for west or east longitude, respectively. Latitude has the same format as longitude, except there are only two digits for degrees and N or S for north/south latitude.

The time of release is given as: yyyy, mm, dd, hh:nn:ss.  
 Where yyyy is the year, mm is the month, dd is the day of month, and hh:nn:ss are the UTC hour, minute, and second respectively.

The seven non-standard header lines may contain any label and contents. The labels are padded to 35 characters to match the standard header lines. For this composite data set these non-standard header lines vary depending on the data source. See the individual data set readmes for details.

## 4.2 Data Records

The data records each contain time from release, pressure, temperature, dew point, relative humidity, U and V wind components, wind speed and direction, ascent rate, balloon position data, altitude, and quality control flags (see the QC code description). Each data line contains 21 fields, separated by spaces, with a total width of 130 characters. The data are right-justified within the fields. All fields have one decimal place of precision, with the exception of latitude and longitude, which have three decimal places of precision. The contents and sizes of the 21 fields that appear in each data record are as follows:

Field	Width	Format	Parameter	Units	Missing Value
1	6	F6.1	Time since release	Seconds	9999.0
2	6	F6.1	Pressure	Millibars	9999.0
3	5	F5.1	Dry-bulb Temperature	Degrees C	999.0
4	5	F5.1	Dew Point Temperature	Degrees C	999.0
5	5	F5.1	Relative Humidity	Percent	999.0
6	6	F6.1	U Wind Comp	m/s	9999.0
7	6	F6.1	V Wind Comp	m/s	9999.0
8	5	F5.1	Wind speed	m/s	999.0
9	5	F5.1	Wind direction	Degrees	999.0
10	5	F5.1	Ascent Rate	m/s	999.0
11	8	F8.3	Longitude	Degrees	9999.0
12	7	F7.3	Latitude	Degrees	999.0
13	5	F5.1	Elevation Angle	Degrees	999.0
14	5	F5.1	Azimuth Angle	Degrees	999.0
15	7	F7.1	Geopotential Altitude	Meters	99999.0
16	4	F4.1	QC for Pressure	Code	99.0
17	4	F4.1	QC for Temperature	Code	99.0
18	4	F4.1	QC for Humidity	Code	99.0
19	4	F4.1	QC for U Wind	Code	99.0
20	4	F4.1	QC for V Wind	Code	99.0
21	4	F4.1	QC for Ascent Rate	Code	99.0

Fields 16 through 21 contain the data quality flags from the NCAR/Earth Observing Laboratory (EOL) sounding quality control procedures. The data quality flags are defined as follows:

Code	Description
------	-------------

1.0	Checked, datum seems physically reasonable. ("GOOD")
2.0	Checked, datum seems questionable on a physical basis. ("MAYBE")
3.0	Checked, datum seems to be in error. ("BAD")
4.0	Checked, datum is interpolated. ("ESTIMATED")
9.0	Checked, datum is missing. ("MISSING")
99.0	Unchecked (QC information is "missing".) ("UNCHECKED")

### 4.3 Data Specifics

Details on the radiosonde systems included in this data set are included in this section. Links are included to the documentation for the individual sounding data sets for details on processing and quality control.

#### **NSF/NCAR Gulfstream-V HIAPER Aircraft Dropsondes**

109 total dropsondes with 0.5 second vertical resolution pressure/temperature/humidity and 0.25 second resolution winds

56 Vaisala RD94 dropsondes

53 Vaisala RD41 dropsondes

[http://data.eol.ucar.edu/datafile/nph-get/552.010/readme\\_SOCRATES\\_GV\\_dropsonde\\_ESC\\_V1.pdf](http://data.eol.ucar.edu/datafile/nph-get/552.010/readme_SOCRATES_GV_dropsonde_ESC_V1.pdf)

#### **RSV Aurora Australis Radiosondes**

208 total radiosondes at 2 second vertical resolution

Vaisala RS92-SGP and Vaisala DigiCORA 3.64 sounding system

[http://data.eol.ucar.edu/datafile/nph-get/552.036/readme\\_SOCRATES\\_Australis\\_ESC.pdf](http://data.eol.ucar.edu/datafile/nph-get/552.036/readme_SOCRATES_Australis_ESC.pdf)

#### **RV Investigator Radiosondes**

234 total radiosondes at 1 second vertical resolution

Vaisala RS41-SGP and Vaisala DigiCORA MW41 2.4.0 sounding system

[http://data.eol.ucar.edu/datafile/nph-get/552.008/readme\\_socrates\\_2018\\_radiosondes\\_20181128.pdf](http://data.eol.ucar.edu/datafile/nph-get/552.008/readme_socrates_2018_radiosondes_20181128.pdf)

#### **Adelaide, Australia Radiosondes**

89 radiosondes at 2 second vertical resolution (typically at 00 and 12 UTC)

Source – GTS real time BUFR data

Radiosonde Type - Vaisala RS92

Humidity Sensor – Vaisala RS90

Pressure Sensor – Capacitance Aneroid

Temperature Sensor – Capacitance Bead

Winds - GPS

Sounding System Software - Digicora III MW31 3.66B

Solar and infrared correction applied by radiosonde system

No humidity corrections applied

Geopotential Height calculated from pressure

No data quality issues of note

#### **Albany, Australia Radiosondes and Pibals**

29 radiosondes at 2 second vertical resolution (typically at 00 UTC)

18 pibals at 2 second vertical resolution (wind only; typically at 06 UTC)

Source – GTS real time BUFR data

Radiosonde Type – Vaisala RS92  
Pibal Type – Vaisala RS90  
Humidity Sensor – Vaisala RS90  
Pressure Sensor – Capacitance Aneroid  
Temperature Sensor – Capacitance Bead  
Winds – GPS for radiosonde, radar for pibal  
Sounding System Software – Digicora III MW31 3.66B  
Solar and infrared correction applied by radiosonde system  
No humidity corrections applied  
Geopotential Height calculated from pressure  
No data quality issues of note

**Casey, Antarctica Radiosondes**

92 radiosondes at 2 second vertical resolution (typically at 00 and 12 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type – Vaisala RS92  
Humidity Sensor – Vaisala RS90  
Pressure Sensor – Capacitance Aneroid  
Temperature Sensor – Capacitance Bead  
Winds – GPS  
Sounding System Software – Digicora III MW31 3.66B  
Solar and infrared correction applied by radiosonde system  
No humidity corrections applied  
Geopotential Height calculated from pressure  
No data quality issues of note

**Ceduna, Australia Radiosondes**

14 radiosondes at 2 second vertical resolution (typically one per week on Tuesdays at 00 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type – Vaisala RS41 AUTOSONDE  
Humidity Sensor – Humicap capacitance sensor with active de-icing method  
Pressure Sensor – Derived from GPS height  
Temperature Sensor – Resistive sensor  
Winds – GPS  
Sounding System Software – Digicora III MW41 2.6.1  
Solar and infrared correction - applied by radiosonde system  
Humidity corrections – Solar radiation and time lag correction provided by manufacturer  
Geopotential Height - calculated from GPS height  
No data quality issues of note

**Davis, Antarctica Radiosondes**

93 radiosondes at 2 second vertical resolution (typically at 00 and 12 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type – Vaisala RS92  
Humidity Sensor – Vaisala RS90  
Pressure Sensor – Capacitance Aneroid  
Temperature Sensor – Capacitance Bead  
Winds – GPS  
Sounding System Software – Digicora III MW31 3.66B

Solar and infrared correction applied by radiosonde system  
No humidity corrections applied  
Geopotential Height calculated from pressure  
No data quality issues of note

### **Esperance, Australia Radiosondes and Pibals**

27 radiosondes at 2 second vertical resolution (typically at 00 UTC)  
27 pibals at 2 second vertical resolution (wind only; typically at 06 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type – Vaisala RS92  
Pibal Type – Vaisala RS90  
Humidity Sensor – Vaisala RS90  
Pressure Sensor – Capacitance Aneroid  
Temperature Sensor – Capacitance Bead  
Winds – GPS for radiosonde, radar for pibal  
Sounding System Software – Digicora III MW31 3.66B  
Solar and infrared correction applied by radiosonde system  
No humidity corrections applied  
Geopotential Height calculated from pressure  
No data quality issues of note

### **Hobart, Tasmania Radiosondes and Pibals**

89 radiosondes at 2 second vertical resolution (typically at 00 and 12 UTC)  
71 pibals at 2 second vertical resolution (wind only; typically at 06 and 18 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type – Vaisala RS92  
Pibal Type – Vaisala RS90  
Humidity Sensor – Vaisala RS90  
Pressure Sensor – Capacitance Aneroid  
Temperature Sensor – Capacitance Bead  
Winds – GPS for radiosonde, radar for pibal  
Sounding System Software – Digicora III MW31 3.66B  
Solar and infrared correction applied by radiosonde system  
No humidity corrections applied  
Geopotential Height calculated from pressure  
No data quality issues of note

### **Invercargill, New Zealand Radiosondes**

90 radiosondes at 2 second vertical resolution (typically at 10 and 22 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type – Vaisala RS41  
Humidity Sensor – Vaisala RS90  
Pressure Sensor – Capacitance Aneroid  
Temperature Sensor – Capacitance Bead  
Winds – GPS  
Sounding System Software – Digicora III MW41 2.3.0  
Solar and infrared correction applied by radiosonde system  
Humidity corrections - Solar radiation and time lag correction provided by manufacturer  
Geopotential Height - calculated from pressure  
No data quality issues of note

### **Kalgoorlie, Australia Radiosondes**

30 radiosondes at 2 second vertical resolution (typically at 00 UTC)

Source – GTS real time BUFR data

Radiosonde Type - Vaisala RS92 Autosonde

Humidity Sensor – Vaisala RS90

Pressure Sensor – Capacitance Aneroid

Temperature Sensor – Capacitance Bead

Winds - GPS

Sounding System Software - Digicora III AS14 3.66.0B

Solar and infrared correction applied by radiosonde system

No humidity corrections applied

Geopotential Height calculated from pressure

No data quality issues of note

### **Lord Howe Island Radiosondes**

24 radiosondes at 2 second vertical resolution (typically at 00 UTC)

Source – GTS real time BUFR data

Radiosonde Type - Vaisala RS92 Autosonde

Humidity Sensor – Vaisala RS90

Pressure Sensor – Capacitance Aneroid

Temperature Sensor – Capacitance Bead

Winds - GPS

Sounding System Software - Digicora III AS14 3.66.0B

Solar and infrared correction applied by radiosonde system

No humidity corrections applied

Geopotential Height calculated from pressure

No data quality issues of note

### **Macquarie Island Radiosondes**

90 radiosondes at 2 second vertical resolution (typically at 00 and 12 UTC)

Source – GTS real time BUFR data

Radiosonde Type - Vaisala RS92

Humidity Sensor – Vaisala RS90

Pressure Sensor – Capacitance Aneroid

Temperature Sensor – Capacitance Bead

Winds - GPS

Sounding System Software - Digicora III MW31 3.66B

Solar and infrared correction applied by radiosonde system

No humidity corrections applied

Geopotential Height calculated from pressure

No data quality issues of note

### **Mawson, Antarctica Radiosondes**

45 radiosondes at 2 second vertical resolution (typically at 12 UTC)

Source – GTS real time BUFR data

Radiosonde Type – Vaisala RS92

Humidity Sensor – Vaisala RS90

Pressure Sensor – Capacitance Aneroid

Temperature Sensor – Capacitance Bead

Winds – GPS

Sounding System Software – Digicora III MW31 3.66B  
Solar and infrared correction applied by radiosonde system  
Humidity corrections – None  
Geopotential Height calculated from pressure  
A few soundings have very low RH values near the surface.

### **Melbourne, Australia Radiosondes**

99 radiosondes at 2 second vertical resolution (typically at 00 and 12 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type - Vaisala RS92 (through 2316 UTC 25 February) and Vaisala RS41 (starting 0355 UTC 26 February)  
Humidity Sensor – Vaisala RS90 (with RS92 sondes) and Humicap capacitance sensor with active de-icing method (with RS41 sondes)  
Pressure Sensor – Capacitance Aneroid (with RS92 sondes) and derived from GPS (with RS41 sondes)  
Temperature Sensor – Capacitance Bead (with RS92 sondes) and resistive sensor (with RS41 sondes)  
Winds - GPS  
Sounding System Software - Digicora III MW31 3.64.1 (with RS92 sondes) and MW41 2.6.1 (with RS41 sondes)  
Solar and infrared correction applied by radiosonde system  
No humidity corrections applied  
Geopotential Height calculated from GPS height  
No data quality issues of note

### **Paraparamu, New Zealand Radiosondes**

91 radiosondes at 2 second vertical resolution (typically at 10 and 22 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type – Vaisala RS41  
Humidity Sensor – Vaisala RS90  
Pressure Sensor – Capacitance Aneroid  
Temperature Sensor – Capacitance Bead  
Winds – GPS  
Sounding System Software – Digicora III MW41 2.2.1  
Solar and infrared correction applied by radiosonde system  
Humidity corrections - Solar radiation and time lag correction provided by manufacturer  
Geopotential Height - calculated from pressure  
No data quality issues of note

### **Perth, Australia Radiosondes and Pibals**

90 radiosondes at 2 second vertical resolution (typically at 00 and 12 UTC)  
77 pibals at 2 second vertical resolution (wind only; typically at 06 and 18 UTC)  
Source – GTS real time BUFR data  
Radiosonde Type – Vaisala RS92  
Pibal Type – Vaisala RS90  
Humidity Sensor – Vaisala RS90  
Pressure Sensor – Capacitance Aneroid  
Temperature Sensor – Capacitance Bead  
Winds – GPS for radiosonde, radar for pibal  
Sounding System Software – Digicora III MW31 3.66B



Solar and infrared correction applied by radiosonde system  
No humidity corrections applied  
Geopotential Height calculated from pressure  
No data quality issues of note

### **Sydney, Australia Radiosondes**

44 radiosondes at 2 second vertical resolution (typically at 19 UTC)

Source – GTS real time BUFR data

Radiosonde Type – Vaisala RS92

Humidity Sensor – Vaisala RS90

Pressure Sensor – Capacitance Aneroid

Temperature Sensor – Capacitance Bead

Winds – GPS

Sounding System Software – Digicora III MW31 3.66B

Solar and infrared correction applied by radiosonde system

Humidity corrections – None

Geopotential Height calculated from pressure

No data quality issues of note

### **Wagga Wagga, Australia Radiosondes and Pibals**

16 radiosondes at 2 second vertical resolution (typically at 00 UTC)

14 pibals at 2 second vertical resolution (wind only; typically at 00 UTC)

Source – GTS real time BUFR data

Radiosonde Type – Vaisala RS92

Pibal Type – Vaisala RS90

Humidity Sensor – Vaisala RS90

Pressure Sensor – Capacitance Aneroid

Temperature Sensor – Capacitance Bead

Winds – GPS for radiosonde, radar for pibal

Sounding System Software – Digicora III MW31 3.66B

Solar and infrared correction applied by radiosonde system

No humidity corrections applied

Geopotential Height calculated from pressure

2320 UTC 20 Feb sounding has noisy data stream

### **Williamtown, Australia Radiosondes**

49 radiosondes at 2 second vertical resolution (typically at 00 UTC)

Source – GTS real time BUFR data

Radiosonde Type – Vaisala RS41 AUTOSONDE

Humidity Sensor – Humicap capacitance sensor with active de-icing method

Pressure Sensor – Derived from GPS height

Temperature Sensor – Resistive sensor

Winds – GPS

Sounding System Software – Digicora III MW41 2.6.1

Solar and infrared correction - applied by radiosonde system

Humidity corrections – Solar radiation and time lag correction provided by manufacturer

Geopotential Height - calculated from GPS height

No data quality issues of note

### **Woomera, Australia Radiosondes**

41 radiosondes at 2 second vertical resolution (typically at 00 UTC)

Source – GTS real time BUFR data

Radiosonde Type – Vaisala RS41 AUTOSONDE (RS92 Autosonde 14/15

January)

Humidity Sensor – Humicap capacitance sensor with active de-icing method (Vaisala RS90 14/15 January)

Pressure Sensor – Derived from GPS height (capacitance aneroid 14/15 January)

Temperature Sensor – Resistive sensor (capacitance bead 14/15 January)

Winds – GPS

Sounding System Software – Digicora III MW41 2.6.1 (AS14 3.66.0B 14/15 January)

Solar and infrared correction - applied by radiosonde system

Humidity corrections – Solar radiation and time lag correction provided by manufacturer (no correction 14/15 January)

Geopotential Height - calculated from GPS height (from pressure 14/15 January)

No data quality issues of note

### Multi-Network Composite Highest Resolution Radiosonde Data

Contains all of the above radio/dropsosonde data sets

[http://data.eol.ucar.edu/datafile/nph-get/552.039/readme\\_SOCRATES\\_High\\_Res\\_Composite\\_V1.0.pdf](http://data.eol.ucar.edu/datafile/nph-get/552.039/readme_SOCRATES_High_Res_Composite_V1.0.pdf)

The data are in files by day, so all soundings for a particular day are concatenated into a single file ordered by time. The file naming convention is:

SOCRATES\_50m\_yyyymmdd.cls where yyyy is the year, mm is the month, and dd is the day of the month.

### 4.4 Sample Data

The following is a sample of the 50m vertical resolution radiosonde data in ESC format.

```

Data Type: AVAPS SOUNDING DATA, Channel 1/Descending
Project ID: SOCRATES
Release Site Type/Site ID: Gulfstream V/N677F
Release Location (lon,lat,alt): 145 48.54'E, 46 44.40'S, 145.809, -46.740, 6142.6
UTC Release Time (y,m,d,h,m,s): 2018, 01, 19, 01:32:20
Sonde Id/Sonde Type: 171330194/RSS421
Reference Launch Data Source/Time: IWGADTS Format (IWG1)/01:32:21
System Operator/Comments: Remote Operator/none, none
Post Processing Comments: Aspen V3.3-693; Created on 13 Sep 2018 17:37 UTC; Configuration mini-dropsosonde
/
Nominal Release Time (y,m,d,h,m,s):2018, 01, 19, 01:32:20
Time Press Temp Dewpt RH Ucmp Vcmp spd dir Wcmp Lon Lat Ele Azi Alt Qp Qt Qrh Qu Qv QdZ
sec mb C C % m/s m/s m/s deg m/s deg deg deg deg m code code code code code code
-----
460.0 1010.1 11.5 5.6 66.8 9999.0 9999.0 999.0 999.0 999.0 9999.000 999.000 999.0 999.0 0.0 1.0 1.0 1.0 9.0 9.0 9.0
455.6 1004.1 11.1 5.3 67.7 9.2 2.4 9.5 255.2 -9.2 145.934 -46.739 999.0 999.0 50.0 1.0 1.0 1.0 1.0 1.0 99.0
451.1 998.1 10.5 5.0 68.6 9.2 2.7 9.6 253.6 -13.5 145.934 -46.739 999.0 999.0 100.0 1.0 1.0 1.0 1.0 1.0 99.0

```

### 4.5 Station List

Site ID	WMO ID	Site Name	Country	Latitude	Longitude	Elev (m)
N677F	N/A	GV HIAPER	US	Mobile	Mobile	Mobile
VNAA	N/A	RSV Aurora Australis	AU	Mobile	Mobile	Mobile

VLMJ	N/A	R/V Investigator	AU	Mobile	Mobile	Mobile
	94672	Adelaide	AU	-34.952	138.520	2
	94802	Albany	AU	-34.950	117.800	69
	89611	Casey	AQ	-66.283	110.523	41
	94653	Ceduna	AU	-32.130	133.698	16
	89571	Davis	AQ	-68.575	77.966	18
	94638	Esperance	AU	-33.831	121.891	27
	94975	Hobart	AU	-42.839	147.499	22
	93844	Invercargill	NZ	-46.418	168.330	2
	94637	Kalgoorlie	AU	-30.784	121.454	366
	94995	Lord Howe Island	AU	-31.542	159.077	7
	94998	Macquarie Island	AU	-54.499	158.937	6
	89564	Mawson	AQ	-67.602	62.874	10
	94866	Melbourne	AU	-37.670	144.830	113
	93417	Paraparaumu	NZ	-40.905	174.984	7
	94610	Perth	AU	-31.928	115.976	15
	94767	Sydney	AU	-33.948	151.173	5
	94910	Wagga Wagga	AU	-35.160	147.460	223
	94776	Williamstown	AU	-32.793	151.836	9
	94659	Woomera	AU	-31.156	136.805	167

## 5.0 Data Quality Control Procedures

The quality control procedures were conducted on the native resolution data files. No additional quality control has been performed on these 50m vertical resolution data files.

The 50m data were interpolated from the native resolution data using a weighted average of the values used on either side based on the distance from the interpolation height. If a record was at exactly the 50m height interval, it was used as is unless the data were flagged "Bad".

Data of the highest possible quality in the native resolution data files was used in the development of the interpolated 50 m vertical resolution data. The data quality flags in these 50m data are the worst quality flag of the data used to interpolate the value.

### 5.1 Data Quality Issues of Note

See the readme files linked above for details on the data quality issues in each individual sounding data set.

## 6.0 References

DOE/ARM MARCUS RSV Aurora Australis Radiosonde Data  
<http://dx.doi.org/%2010.5439/1150271>

Loehrer, S. M., T. A. Edmands, and J. A. Moore, 1996: TOGA COARE upper-air sounding data archive: development and quality control procedures. *Bull. Amer. Meteor. Soc.*, 77, 2651-2671.

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UCAR/NCAR - Earth Observing Laboratory, UCAR/NCAR - Earth Observing Laboratory. 2018. NCAR/EOL Quality Controlled Dropsonde Data. Version 1.1. UCAR/NCAR - Earth Observing Laboratory. <https://doi.org/10.5065/D6QZ28SG>. Accessed 13 Nov 2018.

UCAR/NCAR - Earth Observing Laboratory. 2018. NCAR/EOL Quality Controlled Radiosonde Data. Version 1.0. UCAR/NCAR - Earth Observing Laboratory. <https://doi.org/10.5065/D69P30HG>. Accessed 10 Apr 2019.

UCAR/NCAR - Earth Observing Laboratory. 2018. Multi-Network Composite Highest Resolution Radiosonde Data. Version 1.0. UCAR/NCAR - Earth Observing Laboratory. <https://doi.org/10.5065/D6S181CS>. Accessed 11 Apr 2019.