ReadMe - V_air_temperature_heath

Eeva Soininen
(eeva.soininen@uit.no)

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1 Protocol

Air temperature is measured using iButtons (Maxim Integrated, San Jose, California, USA) with a loggin interval of 4 hours following the COAT protocol 'protocol_temperature_loggers_air_temperature_varanger'.

1.1 Timing of sampling and changes in that

Temperature loggers are usually deployed the whole year and are downloaded once a year. However, there is some missing data in summer (between a few days and ca 2 month) when the loggers were changed.

1.2 Spatial layout of sampling and changes in that

Loggers were deployed in 2020 in the intensive sites in heath habitat at Vestre Jakobselv and Komagdalen

More detailed information about which sites were included in the study design and the different setups can be found in the auxialiary file 'V_air_temperature_heath_aux.txt'.

2 Description of the dataset

The dataset includes four differnt types of files and all files are saved as ;-separated txt-files:

- One data file per year (`V_air_temperature_heath_YEAR.txt`)
- One meatadata file per year with dates when the loggers were deployed and collected (`V_air_temperature_heath_metadata_YEAR.txt`)
- One coordinate file with coordinates of all sites (`V_air_temperature_heath_coordinates.txt`)
- One auxiliary file with information about which sites are included in the study design (`V_air_temperature_heath_aux.txt`)

2.1 Temperature data files

These files contain temperature values measured every four hours.

Example of the first rows of the data files:

```
  sn_region sn_locality        sn_section sc_type_of_sites_ecological
1  varanger  komagdalen komagdalen_midtre                   heath_far
2  varanger  komagdalen komagdalen_midtre                   heath_far
3  varanger  komagdalen komagdalen_midtre                   heath_far
     sn_site sn_plot     t_date   t_time           t_bintime v_logger_id
1 ko_km_hf_a       6 2020-07-26 22:29:01 2020-07-26 22:00:00  ko_km_hf_a
2 ko_km_hf_a       6 2020-07-27 02:29:01 2020-07-27 02:00:00  ko_km_hf_a
3 ko_km_hf_a       6 2020-07-27 06:29:01 2020-07-27 06:00:00  ko_km_hf_a
  v_height v_temperature v_comment
1        0        10.552        NA
2        0         8.545        NA
3        0        15.566        NA
```

Description of the columns included in the data files:

Column name	Description	Possible values
sn_region	Study region	varanger
sn_locality	Locality (within region)	komagdalen, vestre_jakobselv
sn_section	Section (within locality)	komagdalen_midtre, komagdalen_ovre, sandfjorddalen, bearalveaijohka, torvhaugdalen
sc_type_of_sites_ecological	Habitat type	heath_far, heath_near
sn_site	Unique Site ID	e.g. ko_km_hf_a, ko_km_hn_b, ko_ko_hf_e, ko_sa_hn_e, vj_be_hf_c
sn_plot	Corner of the sampling quadrat in which the logger was placed	6, 2
t_date	Logging date	yyyy-mm-dd
t_time	Logging time	hh:mm:ss
t_bintime	Consistent logging date and time for all loggers	yyyy-mm-dd hh:mm:ss
v_logger_id	Logger ID	e.g. ko_km_hf_a, ko_km_hn_b, ko_ko_hf_e, ko_sa_hn_e, vj_be_hf_c
v_height	Height in which the logger was deployed (cm)	0, 30, 100
v_temperature	measured temperature (°C)	[numeric]
v_comment	Comments	[character]

2.2 Metadata files

These files contain additional inforamtion for each logger, such as height of the logger and dates when the loggers were deployed and collected.

Example of the first rows of metadata files:

```
  sn_region sn_locality       sn_section sc_type_of_sites_ecological
1  varanger  komagdalen komagdalen_midtre                  heath_far
2  varanger  komagdalen komagdalen_midtre                  heath_far
3  varanger  komagdalen komagdalen_midtre                  heath_far
     sn_site sn_plot t_year v_logger_id v_height v_date_logger_in
1 ko_km_hf_a       6   2020  ko_km_hf_a        0             <NA>
2 ko_km_hf_b       6   2020  ko_km_hf_b        0             <NA>
3 ko_km_hf_c       6   2020  ko_km_hf_c        0             <NA>
  v_date_logger_out v_date_logger_started v_observer v_comment
1        2020-07-26            2020-07-19        hih      <NA>
2        2020-07-26            2020-07-19        hih      <NA>
3        2020-07-25            2020-07-19        hih      <NA>
```

Description of the columns included in the metadata files:

Column name	Description	Possible values
sn_region	Study region	varanger
sn_locality	Locality (within region)	komagdalen, vestre_jakobselv
sn_section	Section (within locality)	komagdalen_midtre, komagdalen_ovre, sandfjorddalen, bearalveaijohka, torvhaugdalen
sc_type_of_sites_ecological	Habitat type	heath_far, heath_near
sn_site	Unique Site ID	e.g. ko_km_hf_a, ko_km_hf_e, ko_km_hn_e, ko_ko_hn_e, ko_sa_hf_d
sn_plot	Corner of the sampling quadrat in which the logger was placed	6, NA
t_year	Year in which loggers were changed	e.g. 2005
v_logger_id	Logger ID	e.g. ko_km_hf_a, ko_km_hf_e, ko_km_hn_e, ko_ko_hn_e, ko_sa_hf_d
v_height	Height in which the logger was deployed (cm)	0, 30, 100
v_date_logger_in	Date when the logger was collected	yyyy-mm-dd
v_date_logger_out	Date when the logger was deployed	yyyy-mm-dd
v_date_logger_started	Date when the logger was started	yyyy-mm-dd

v_observer	Initials of observer	e.g. es (Eeva Soininen)
v_comment	Comments	[character]

2.3 Coordinate file

This file contains the coordinates of all sites included in the study desgin. Coordinates are given in decimal degrees and UTM 33 (WGS 84).

Example of the first rows of coordinate files:

```
     sn_site     e_dd     n_dd e_utm33 n_utm33
1 ko_km_hf_a 30.06800 70.33341 1060899 7873002
2 ko_km_hf_b 30.07373 70.33139 1061164 7872836
3 ko_km_hf_c 30.08209 70.32918 1061531 7872673
```

2.4 Auxiliary file

This file contains further information about the dataset such as the years when sites were first included in the study design and when sites were excluded from the study design.

Example of the first rows of auxiliary-files:

```
  sn_region sn_locality        sn_section    sn_site sn_site_old year_first
1  varanger  komagdalen komagdalen_midtre ko_km_hf_a        <NA>       2020
2  varanger  komagdalen komagdalen_midtre ko_km_hf_b        <NA>       2020
3  varanger  komagdalen komagdalen_midtre ko_km_hf_c        <NA>       2020
  year_last v_comment
1        NA        NA
2        NA        NA
3        NA        NA
```

3 Data cleaning and formatting

Raw metdata (entered in an excel-template) and temperature data (downloaded from the temperature loggers) are cleaned and formatted using the scripts `01_clean_metadata_temperature_data_heath_COAT.R` and `02_clean_cut_temperature_data_heath_COAT.R` .

1. Metadata: The scripts checks all variables for correct spelling and correct formatting. Errors will be corrected in the script and the data will be reformatted according to the requirements of the COAT data portal. The file will be saved as a ;-spearated txt-file and uploaded to to COAT data portal. In particular, the script checks for:

- **sn_site:** Correct spelling of all variables.
- **t_date:** Correct format (yyyy-mm-dd), dates in other formats are reformatted.
- **v_logger_id:** Missing observations. Are all loggers included in the metadata?

- **v_observer:** Correct format (initials and lowercase letters), observer is reformatted e.g. if full names were used.
- **v_comment:** Correct spelling and format (lowercase letters and english). Comments are edited or translated if necessary.

All corrections that lead to differences between rawdata and cleaned data are double-checked in the fieldbooks and a comment is added.

2. Temperature data: The script removes the days when the logger was not deployed in the field , reformats the data according to the requirements of the COAT data portal and saves the data as ;-separated txt-tiles which can be uploaded to the COAT data portal. In particular, the script includes the following steps:

- Checking if the logger was started before it was deployed in the field and was stopped after it was collected.
- Removing days when the logger was not deployed (based on t_date_logger_in and t_date_logger_out in the metadata).
- Reformatting the columns t_date and t_time and adding t_bintime.
- Checking the recorded temperature values. Sometimes the logger jumps to extreme values (above +40 °C and below - 40 °C), these will be set to NA.
- Adding all other necessary columns such as spatial variables and loggerID.