A Way towards the DFM-17 GDP

GRUAN ICM-15, Bern, CH - J. Frielingsdorf – 12.03.2024

Motivation

DFM-09 radiosondes have been used in Singapore 2012-2015

DFM-17 radiosondes are used at potential candidate site in Dakar since 2019

There are lots of operational/research ascents which could profit from reprocessing into GDPs

Evolve the GRUAN spirit in the direction of truly open sourcing the complete processing (awesome for research)

Project Team

GRUAN-LC/DWD MOL-RAO Project Lead, laboratory characterization, development and implementation of algorithms

Graw Radiosondes (J. Frielingsdorf): calibration uncertainties, development of algorithms, co-implementation of algorithms

Graw Radiosondes (A. Kotik): implementation of GRUAN archive data format, implementation into sounding software

Scope

Single GRUAN Data Product for

— some DFM-09 radiosondes

— unheated DFM-17 radiosondes

— heated DFM-17 radiosondes

All share a common heritage and have lots of similarities

Common Framework

— use the existing framework of the RS41 GDP

— new modules in Python, maybe port old modules to Python as well

— new openly documented archive data format which can be created for old flights as well

— recalculate 1s interval data prior to processing as this is not native to the DFM data format

— make this data processing available to non-GRUAN users without sending data to the processing site

Road ahead

1) scope and general requirements (language, platform, supported sondes)

2) procedure regarding telemetry frames <> datasets

3) specific procedures for individual variables

4) completion of necessary laboratory tests, implementation

5) validation during ascents, publication of the beta GDP

ICM-16
6) finish writing the TD / paper

7) publication/certification of the GDP

Usage of GDPS

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for DFM-17, DFM-09 and RS92

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GRUAN Lead Centre, DWD

15th GRUAN Implementation and Coordination Meeting (ICM-15)

Bern, Session 6, 12 March 2024

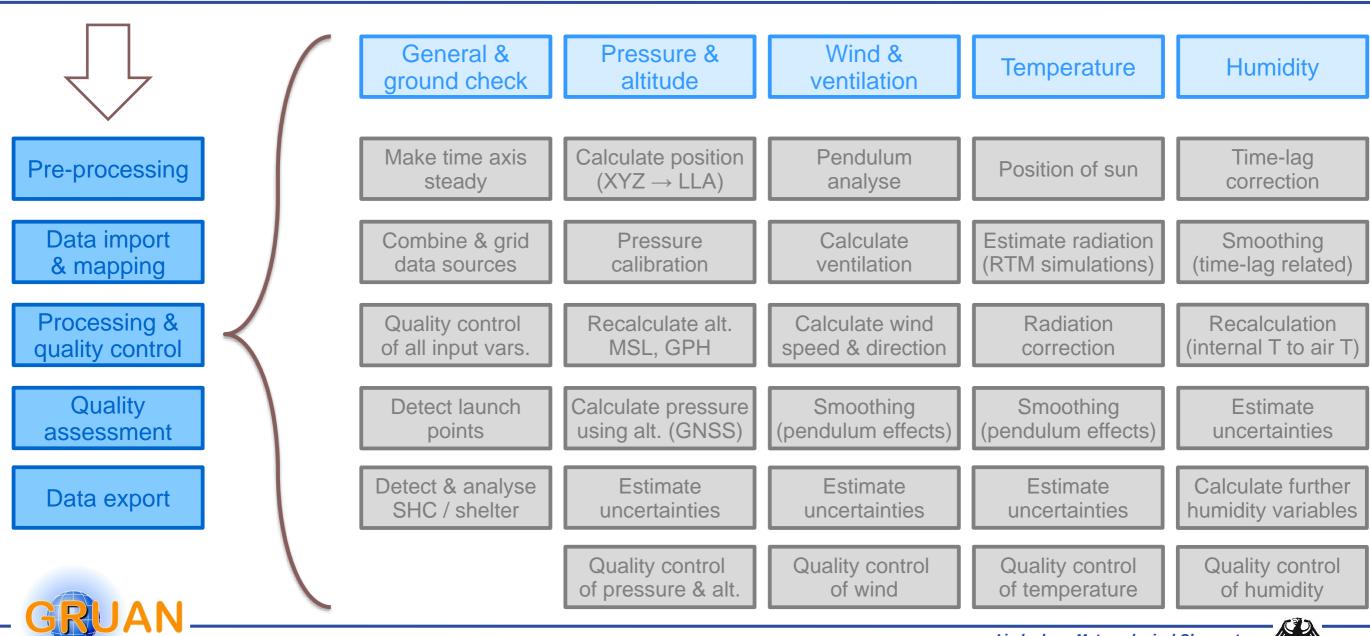➢ GDPS → GRUAN Data Processing System for Radiosounding

- o Modular processing system for the generation of GDPs based on radiosonde raw data provided by manufacturer

- o Generic system adaptable for various radiosonde types/models

- o Product files in NetCDF format

- o Optional generation of comprehensive analysis plots

➢ Currently operational use of GDPS → *RS41 GRUAN Data Product Version 1 (RS41-GDP.1)*

➢ Adaption for upcoming GDPs

- o Graw DFM-17 and DFM-09

- o Vaisala RS92 (Version 3)
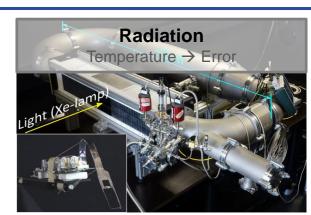
Scheme of GDPS and processing steps

General & ground check	Pressure & altitude	Wind & ventilation	Temperature	Humidity
Make time axis steady	Calculate position (XYZ → LLA)	Pendulum analyse	Position of sun	Time-lag correction
Combine & grid data sources	Pressure calibration	Calculate ventilation	Estimate radiation (RTM simulations)	Smoothing (time-lag related)
Quality control of all input vars.	Recalculate alt. MSL, GPH	Calculate wind speed & direction	Radiation correction	Recalculation (internal T to air T)
Detect launch points	Calculate pressure using alt. (GNSS)	Smoothing (pendulum effects)	Smoothing (pendulum effects)	Estimate uncertainties
Detect & analyse SHC / shelter	Estimate uncertainties	Estimate uncertainties	Estimate uncertainties	Calculate further humidity variables
	Quality control of pressure & alt.	Quality control of wind	Quality control of temperature	Quality control of humidity

Processing steps (left column):
- Pre-processing
- Data import & mapping
- Processing & quality control
- Quality assessment
- Data export

➤ Laboratory experiments (radiation error, time-lag, calibration check)

  o Analysis of existing experimental data

  o Repeat experiments and perform new measurements for actual versions of RS models and with the current state of setups

  o Evaluation of experimental data

  o Develop corrections to be implemented in GDP

➤ Further development of GDPS

  o Adaptation & optimisation of existing algorithms

  o Develop/modify algorithms for adaptation to different sensor types

  o Use of experience gained from previous analyses of the RS41-GDP.1

  o Initiate change of programming language (IDL to Python)

➤ Next milestone

  o ALPHA versions summer 2024

Radiation
Temperature → Error
Light (Xe-lamp)

Climate chamber
Humidity → Time-lag [+25 °C…−80°C]

Standard Humidity Chamber
Humidity → Calibration