ESCAPE Data Documentation Readme File for SPEC KPR onboard Learjet

PI: Paul Lawson
Organization: SPEC (Stratton Park Engineering Company), Inc.
Contact: 3022 Sterling Cir, Ste. 200, Boulder, CO 80301, (303)449-1105, plawson@specinc.com
DM: Qixu Mo, mo@specinc.com
Stipulations on Use: Users are strongly encouraged to consult PI and/or DM prior to use.
Author(s): Paul Lawson, SPEC Inc., plawson@specinc.com; Qixu Mo, SPEC Inc, Mo@specinc.com; Roelof Bruintjes, NCAR, roelof@ucar.edu

1.0 Data Set Description

Data Version: R0 (Final), March 2024
Project: ESCAPE, June 1-20 2022, https://www.eol.ucar.edu/field_projects/escape
Platform(s): SPEC Learjet
Instrumentation: Ka-Band Precipitation Radar (KPR, https://www.prosensing.com/kpr-2/)

2.0 Instrument Description

Following information was obtained from https://www.prosensing.com/kpr-2/

Equipment: Ka-band Precipitation Radar (KPR)

Manufacturer: PROSENSING

Frequency: 35.6 GHz

Transmitter: 10 W solid state power amplifier

Antennas: 14 cm flat-plate array, 4.5 deg. beam-width

Pulsing: Interleaved short RF and linear FM pulses

Range Resolution: 30 m

Delta T: 1 K @ 200 ms integration (5 Hz data rate)

Rec. Noise Temp.: 440 K

Radomes: Matched Rexolite window

Weight: 25 lb (40 lb with canister)

Power: 50 W AC; 100 W 28 VDC

3.0 Data Collection, Processing, Analysis Guidelines

The KPR was mounted on the Learjet during ESCAPE. The instrument was operational in all of the 11 research flights.

The raw data follow the SPP data format. The initial processing was done by Dr. Alexei Korolev at Environment and Climate Change Canada. The raw powers from the SPP file were first converted into reflectivity, velocity, and spectral width units per bin using IDL code provided by the Andrew Pazmany from Prosensing Inc. [1, 2]. These bin values above and below the plane were then set to fixed 15m height bins above sea level. The approximate height of each radar bin was estimated from the original bin range and the altitude and orientation of the aircraft. No corrections were made to remove ground reflections or other bad data, except for masking out the first 10m above and below the aircraft. The velocity values were not adjusted for the movement nor orientation of the aircraft. The sign of the downward pointing radar velocities was flipped so that positive always refers to up and negative to down with respect to the orientation of the plane.

The processed data has a .mat format. Using SPEC's SPECPLOT program in Matlab, the .mat data was plotted into jpeg files that are archived in the NCAR data repository/archive.

REFERENCES

[1] Pazmany, A. L., and S. J. Haimov, 2018: Coherent Power Measurements with a Compact Airborne Ka-Band Precipitation Radar. J. Atmos. Oceanic Technol., 35, 3–20, https://doi.org/10.1175/JTECH-D-17-0058.1

[2] A. L. Pazmany and J. B. Mead, "Millimeter-wave solid-state cloud and precipitation radars and signal processing," 2018 IEEE Radar Conference (RadarConf18), Oklahoma City, OK, USA, 2018, pp. 0104-0109, https://doi.org/10.1109/RADAR.2018.8378539