

Documentation for MAMAP remote sensing spectroscopic data acquired within the POLAR 5 campaign AIRMETH in 2011

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Tables of MAMAP spectroscopic measurements

Filename convention: ch4-DD_MM_YYYY-zenith-EE[E]ms-table.txt

The file name denotes MAMAP's short-wave infrared channel (ch4), day (DD), month (MM) and year (YY) of the measurement. Furthermore the used optical port of MAMAP (zenith) and the exposure time (EE or EEE) in ms are included.

The format of the ASCII data is shown in the Figure below. For more information also refer to Krings et al. (2011, 2013), Gerilowski et al. (2011, 2015) and the C-MAPExp measurement campaign final report (2014).

```

#####
# SPEC: 000001
# VERSION: 1.4.0 PROCESSED-ON: 2011-06-05
# FILENAME: open_98ms_10x1_zenith_ch4_1.SPE
# DATE: 04.06.2011 TIME: 08:16:59.4 WINSPECTIME: 08:17:52 SYSTIME: 08:18:16.6
# LAT: N 053:30:12 LON: E 008:34:16 ALT: +00003
# P: +000.000 R: +000.000 Y: +000.000
# CHN: 1024 ROWS: 0001 RO: 00010 EXP: 00.09800 ACCUMS: 0001 SHUT: 1 SAT: 0 NADIR: 0
#####
00807 00717 00966 00816 00875 00844 00838 00831 00872 00866 00963 00847 00847 00843 00912 00796 00878 00784 008:
@@@
00802 00697 00962 00818 00870 00842 00829 00831 00878 00881 00973 00845 00838 00844 00902 00785 00854 00794 008:
@@@
00811 00708 00954 00794 00866 00844 00841 00840 00886 00864 00966 00844 00838 00857 00901 00792 00856 00795 008:
@@@
00815 00703 00954 00808 00864 00842 00819 00841 00869 00868 00973 00840 00838 00859 00901 00797 00851 00798 008:
@@@
00814 00710 00956 00810 00877 00840 00833 00821 00886 00877 00963 00860 00831 00849 00896 00794 00861 00798 008:
@@@
00814 00687 00961 00809 00874 00844 00827 00827 00870 00872 00950 00853 00838 00847 00895 00778 00859 00797 008:
@@@
00808 00708 00962 00804 00877 00842 00830 00833 00871 00875 00969 00839 00844 00850 00908 00800 00852 00807 008:
@@@
00804 00693 00960 00801 00868 00846 00835 00835 00880 00870 00965 00839 00829 00838 00902 00787 00852 00802 008:
@@@
00794 00712 00959 00806 00873 00832 00841 00830 00877 00865 00979 00852 00828 00851 00909 00793 00875 00797 008:
@@@
00803 00702 00938 00805 00881 00838 00844 00835 00877 00870 00975 00850 00831 00851 00905 00802 00862 00801 008:
@@@
#####
# SPEC: 000002
# VERSION: 1.4.0 PROCESSED-ON: 2011-06-05
# FILENAME: open_98ms_10x1_zenith_ch4_2.SPE
# DATE: 04.06.2011 TIME: 08:17:01.6 WINSPECTIME: 08:18:17 SYSTIME: 08:18:18.7
# LAT: N 053:30:12 LON: E 008:34:16 ALT: +00003
# P: +000.000 R: +000.000 Y: +000.000
# CHN: 1024 ROWS: 0001 RO: 00010 EXP: 00.09800 ACCUMS: 0001 SHUT: 1 SAT: 0 NADIR: 0
#####
00793 00705 00948 00810 00868 00836 00850 00834 00869 00864 00963 00848 00837 00845 00906 00802 00881 00801 008:

```

Figure 1: File format for MAMAP LOB spectra. The spectra are numbered (e.g. SPEC: 000001). Aircraft attitude (roll (R), pitch (P) and yaw (Y)) is not yet included in the file. CHN refers to the number of pixels in a row. ROWS is 1 for a line detector like the MAMAP short-wave infrared detector. RO refers to the number of readouts in a burst (before a new header occurs), EXP the exposure time for single measurements in seconds, ACCUMS the number of stacked spectra. SHUT : 1 indicates an open shutter, whereas a value of 0 denotes a dark current measurement. NADIR is a flag for the referred port. Note that the external telescope is coupled in via the zenith sky port and the flag is hence set to 0. The tag SAT refers to a flag for saturation which however is not implemented in the LOB spectra yet. The spectroscopic data is given in arbitrary units for the 1024 pixels, the different exposures in a burst divided by “@@@”.

Tables of MAMAP GPS, time and attitude information

File name convention: observer-YYYY-MM-DD-index.txt”: ASCII table of location, time and attitude information, where YYYY, MM and DD denote the year, month and day of the measurement:

2007	8	14	40	26	052	28	43	13	23	17	0.0	-1.049	1.868	-63.1	4	40	26	345								
-----			-----			-----			-----			-----			-----			-----								
V			V			V			V			V			V			V								
date			time			latitude			longitude			altitude			pitch			roll			yaw			computer's UTC time (HH MM SS milli)		

File format for MAMAP GPS files. Latitude and longitude are given in degrees, minutes and seconds, the aircraft attitude information in degrees. The aircraft altitude is given in m.

Tables of MAMAP spectroscopic white light source measurements

White light source (wls) measurements are performed to allow for the characterization of the pixel-to-pixel gain.

The file format is the same as for the regular spectral data, with the exception that 100 consecutive spectra are recorded.

File name convention: wls_ch4_TTC-DD_MM_YYYY-zenith-EE[E]ms-table.txt

Denoting year (YYYY), month (MM), day (DD), stabilized temperature of the optical bench (TT) given in degree Celsius (denoted by C) and the exposure time (EE or EEE) in ms.

Each wls spectra table contains four bursts numbered from 000001 to 000004. The index refers to:

- 000001: measurement with white light source (WLS), straylight and dark current (shutter open)
- 000002: measurement with WLS and dark current (shutter closed)
- 000003: measurement with straylight and dark current (shutter open)
- 000004: measurement with dark current (shutter closed)

Pixel mask

File name: mamap_pixel_mask.dat

ASCII table of pixels numbered from 0 to 1023, where a flag of “0” denotes a good pixel and a flag of “2” a bad pixel. A third column denotes the approximate wavelength (given in nm) of the pixel. However, a spectral calibration needs to be applied before analyzing the data.

References

Gerilowski, K., A. Tretner, T. Krings, M. Buchwitz, P. P. Bertagnolio, F. Belemezov, J. Erzinger, J. P. Burrows, and H. Bovensmann, MAMAP – a new spectrometer system for column-averaged methane and carbon dioxide observations from aircraft: instrument description and performance analysis, *Atmos. Meas. Tech.*, 4, 215-243, 2011.

Gerilowski, K., Krings, T., Hartmann, J., Buchwitz, M., Sachs, T., Erzinger, J., Burrows, J.P., Bovensmann, H.: Atmospheric remote sensing constraints on direct sea-air methane flux from the 22/4b North Sea massive blowout bubble plume, *Marine and Petroleum Geology*, Volume 68, Part B, Pages 824-835, doi:10.1016/j.marpetgeo.2015.07.011, 2015.

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C-MAPExp Final Report, University of Bremen, https://earth.esa.int/documents/10174/134665/C-MAPExp_Final_Report, July 2014.