Royal Netherlands
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TROPOS

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Product Definition Document (PDD)

Product A-CTH
Product format version 11.50

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Product updates of SW v2 considered	2.0	Sec. 1, 2, 3, 5, 6	30-12-2016
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Product updates of SW v3 considered	3.0	Doc. Properties (comment 317, 471), Sec. 2.1, Sec. 2.2 (comment 373), Sec. 5 (comment 492, 573), Sec. 6 (comment 438)	31-07-2017
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Update for SW v8.0	8.0	Sec. 1, 5.1, 6.3, 6.4	22-01-2021
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Update for SW v9.1	9.1	Sec. 1, 5.1, 6.2, 6.3, 6.4	04-10-2021
Update for SW v10.0	10.0	Sec. 1, 5, 6.2, 6.3, 6.4	09-09-2022
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Update for SW v11.2	11.2	Sec. 1, 5, 6.3, 6.4	16-05-2024
Update for SW v11.3	11.3	Sec. 1, 5.1, 6	13-08-2024
Update for SW v11.40	11.40	Sec. 1, 5, 6	14-02-2025
Update for SW v11.50	11.50	Sec. 1, 5, 6	13-07-2025

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1 PURPOSE AND SCOPE

This document provides the format description for EarthCARE data product A-CTH containing the uppermost cloud top height derived from ATLID observations along track.

It is applicable to A-CTH format version 11.50.

The cloud top height (CTH) is defined as the upper geometrical boundary of the uppermost cloud layer in the atmosphere, i.e., the highest level in the atmosphere which contains cloud particles. The boundary is derived from the ATLID Mie co-polar signal by searching for characteristic signal gradients with a wavelet covariance transform (WCT) algorithm. Depending on the cloud optical thickness and the signal-to-noise ratio (SNR), the boundaries are detected with a horizontal resolution of 1 Joint Standard Grid (JSG) grid point (thick clouds) or 11 JSG grid points (thin clouds). The product contains a simplified classification of the uppermost cloud as well as quality indicators in terms of level of confidence of the detection and level of consistency with the A-TC product. The description of the code and the products was published in Atmospheric Measurement Techniques (AMT) as Wandinger et al., 2023 [RD7].

2 APPLICABLE AND REFERENCE DOCUMENTS

2.1 Applicable documents

[AD1] Clouds, Aerosol, Radiation - Development of INtegrated Algorithms (CARDINAL) for the EarthCARE Mission, ESA-EOPSM-ECAR-SOW-3800, issue 1, 15 Dec 2020

[AD2] EarthCARE Ground Processors General Requirements Baseline, EC-RS-ESA-SY-0152, issue 6, 18 Dec 2020

[AD3] EarthCARE Product Definitions, Vol. 1: Common Product Definitions, EC.ICD.ASD.SY.00005, issue 12, 25 Jul 2018

[AD4] ECGP Interface Control Document (ICD), EC.ICD.GMV.SY.00001, issue 1.1, 30 Jun 2014, sections 6.6 to 6.8 (ATLID/BBR/MSI level 1 formats)

[AD5] ECSL CL User Manual, E3.UM.GMV.SY.00001, issue 1.2, 27 Jan 2017

[AD6] EarthCARE PDGS Generic IPF Interface Specifications, EACA-GSEG-EOPG-TN-15-0001, issue 1.5, 21 Oct 2020

[AD7] EarthCARE product conventions, EC-TN-ESA-SYS-859, issue 3, 2 Mar 2017

[AD8] ATLID L1 Product Definitions, Vol. A: Nominal Products, EC.ICD.GMV.ATL.00001, issue 2.5, 26 October 2018

[AD9] ATLID L1 Product Definitions, Vol. B: Calibration Products, EC.ICD.GMV.ATL.00002, issue 2.6, 6 June 2019

2.2 Reference documents

[RD1] Earth Observation Ground Segment File Format Standard, PE-TN-ESA-GS-0001, issue 2.0, 3 May 2012

[RD2] Tailoring of the Earth Observation File Format Standard for the EarthCARE Ground Segment, EC-TN-ESA-GS-0218, issue 4, 2 Mar 2017

[RD3] EarthCARE Production Model, EC-TN-ESA-SYS-0380, issue 7, 12 Feb 2018

[RD4] EarthCARE ESA Product List, EC-ICD-ESA-SYS-0314, issue 5, 30 May 2017

[RD5] EOP-SM/1567/TW EarthCARE Mission Requirements Document, issue 5, 2 Nov 2006

[RD6] A-LAY ATBD
[RD7] Wandinger, U., Haarig, M., Baars, H., Donovan, D., and van Zadelhoff, G.-J.: Cloud top heights and aerosol layer properties from EarthCARE lidar observations: the A-CTH and A-ALD products, Atmos. Meas. Tech., 16, 4031–4052, https://doi.org/10.5194/amt-16-4031-2023, 2023.

3 PRODUCT OVERVIEW

The ATLID Cloud Top Height (A-CTH) product belongs to the ATLID Layer Properties defined in the EarthCARE Production Model and Product List [RD3, RD4]. ATLID can provide the cloud top height along track at nadir with high accuracy. The MRD [RD5] requires an accuracy of 300 m for ice cloud top height (see Table 4.2 in [RD5]). The product shall be derived with a vertical resolution of approx. 100 m (native ATLID vertical resolution).

The product is a pre-requisite for the ATLID-MSI Column Products algorithm (AM-COL), where it is used to improve the CTH indirectly retrieved from MSI observations for the entire swath. Therefore, the product is sampled on the Joint Standard Grid.

The product is complemented with a simplified classification of the uppermost cloud, indicating thick, thin and multi-layered clouds, and a quality indicator given in terms of a level of confidence (LoC). The LoC is derived from the actual values of SNR and WCT of the Mie co-polar signal in comparison to their threshold values. In addition, a level of consistency is derived by comparing the A-CTH values with the altitude of cloudy pixels provided in the A-TC product.

4 INPUT LIST

The A-CTH product is created by using the following inputs:

Input data	**Data source/Product Name**
ATLID Mie co-polar signal, error of the Mie co-polar signal (SNR), altitude vector	A-NOM
Joint standard grid coordinates, altitude vector, time, profile number per pixel, surface elevation height	X-JSG
ATLID target classification	A-TC

5 PRODUCT CHARACTERISTICS

5.1 Overview

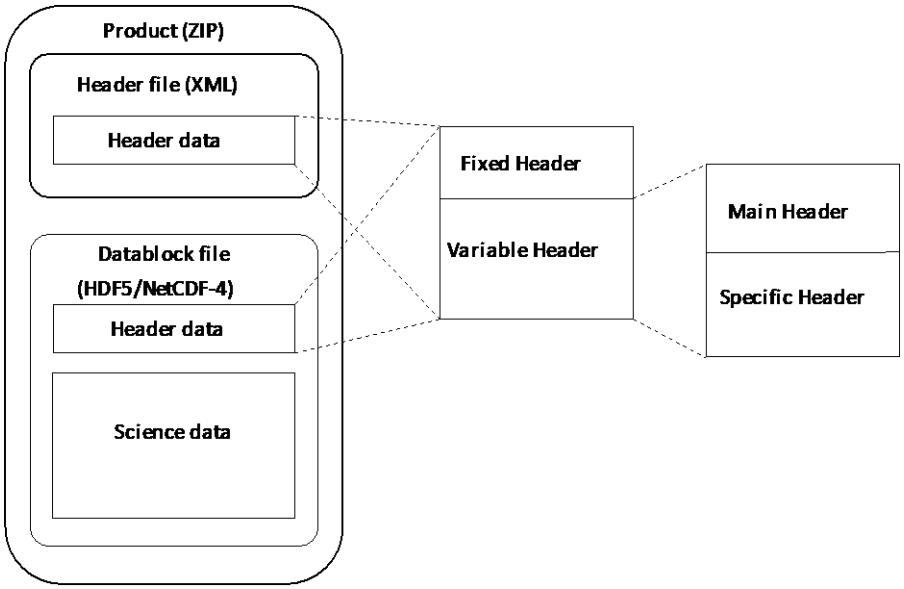
Identifier	A-CTH
Descriptive name	ATLID Cloud Top Height
Product level	2a
File name pattern	ECA_EXAA_ATL_CTH_2A_YYYYMMDDThhmmssZ_ YYYYMMDDThhmmssZ_ooooF
Format version	11.40
Metaformat	NetCDF4/HDF5. Versions and use of internal compression TBC.
Granularity	1 frame (= 1/8 orbit) per file

Frame margin	100 JSG grid points (about 100 km)	
File size	0.32 MB without compression (including 100% margin)	
	horizontal	*vertical*
Spatial extent	N/A (across track)	N/A
Spatial sampling	1 JSG grid point (along track)	N/A
Spatial resolution	1/11 JSG grid points (along track)	100 m
Data volume per day	40.0 MB without compression (including 100% margin)	

6 PRODUCT FORMAT

6.1 Overview

The product format follows the conventions in [RD1], [RD2], and [AD2]. In particular, each product consists of two files, a NetCDF4/HDF5 data block file and an XML header file, packaged into a zip archive (zip without compression). For convenience, a copy of the header data is provided in the data block file as well. These header parameters are defined in [AD2] and in section 6.2.1 below. They should not be confused with headers internally generated by HDF5/NetCDF-4 for describing the file structure.



Below the overall structure of the data block file is shown. The hierarchical structure is reflected in the XML header file by nesting of XML tags (see [RD1]).

Element			**Format reference**
Header data	Fixed Header		[AD2]
	Variable Header	Main Product Header	[AD2]
		Specific Product Header	this doc, section 6.2.16.2.1
Science data			this doc, section 6.2.2

6.2 Detailed format

This shows the full product format in tabular form, listing groups and variables with their names, units, dimensions, data types, and descriptions. The table is preceded by a definition of the dimensions used.

Only the specific product header and science data are defined here. Refer to [AD2] for the definitions of fixed and main product header.

Dimensions:

Dimension	Description	Number of elements (exact/*typical*)
along_track	Joint standard grid horizontal grid points along track	*5144*
cloud_top_height_ consistency_ dimension	Number of indicators used for cloud-top-height detection consistency check	2

6.2.1 Specific Product Header

The variables contained in the specific product header are defined by a verbatim copy of the xml configuration file used to generate the product. The configuration file parameters are described in detail in the A-LAY ATBD [RD6]. The entire configuration file is added to the output file as single text string. An example is shown in the header file information (see Section 6.4).

6.2.2 Science Data

Symbol	Name	Description	Data type	Dimensions	Units	Notes
a. Geolocation						
t	time	Time	double	along_track	s	[0,10^{10}], seconds since 2000-1-1 00:00:00.00
lat	latitude	Latitude	double	along_track	degree_north	[−90, 90]
lon	longitude	Longitude	double	along_track	degree_east	[−180, 180]
z_{geoid}	geoid_offset	Height of the geoid above WGS84 ellipsoid	float	along_track	m	-
b. Meteorological parameters						
	tropopause_h	Tropopaus	float	along_track	m	-

	eight_calipso	e height (as used by Calipso)				
	tropopause_height_wmo	Tropopause height (WMO definition)	float	along_track	m	-
c. Algorithm output						
z_{CTH}	ATLID_cloud_top_height	Cloud top height retrieved from ATLID Mie co-polar signal on 11 JSG pixels resolution.	float	along_track	m	Geodetic altitude (WGS84)
z_{CTH1}	ATLID_thick_cloud_top_height	Thick cloud top height retrieved from ATLID Mie co-polar signal on 1 JSG pixel resolution.	float	along_track	m	Geodetic altitude (WGS84)
C_{CTH}	ATLID_cloud_top_height_confidence	Level of confidence for ATLID cloud top height	byte	along_track	–	$0 \le C_{CTH} \le 10$, with 0 for no cloud, 1 for lowest and 10 for highest confidence
F_{CTH}	simplified_uppermost_cloud_classification	Simplified classification of the uppermost cloud	byte	along_track	–	$F_{CTH} = [0,1,2,3,4,5,6]$, 0 – no cloud, 1 – thick cloud, 2 – thin cloud, 3 – thin over thick cloud, 4 – thick over thick cloud, 5 – thin over thin cloud 6 – no cloud, but probably cloud influenced

X_{CTH}	ATLID_cloud_top_height_consistency	Level of consistency of ATLID cloud top height with A-TC product	byte	along_track, cloud_top_height_consistency_dimension	–	$0 \le X_{\mathrm{CTH}}(1) \le 3$, $0 \le X_{\mathrm{CTH}}(2) \le 10$, with (0,0) – no cloud in both, (1,0) – no cloud in A-TC, (2,0) – no cloud in A-CTH, $(3, j)$ – cloud in both and j = 1…10 for low to high consistency
Q_{CTH}	quality_status	Quality status of the A-CTH product	byte	along_track	1	0: good data, 1: valid, but level of confidence low, 2: Warning: large difference of CTH compared to A-TC , 3: Warning: cloud not detected by A-TC, 4: bad (input) data, -1: no cloud detected

The "Symbol" refers to the symbol used in the algorithm mathematical description in the ATBD. Standard netCDF fill values are used for the output data, if no retrieval is possible because of missing or out-of-bound input data, e.g. if no cloud is detected in the lidar profile.

6.3 Datablock file example (CDL header)

This shows the structure (declarations of dimensions, variables, attributes, groups, and types) of the datablock file in network Common Data form Language (CDL) as produced by running the command `ncdump -h` on the data product file. This is an example only. Actual values may vary from instance to instance.

```
// global attributes:
                string :Conventions = "CF-1.6" ;
                string :title = "" ;
                string :history = "20250711T083223.289614 /home/ecsim/processors/A-LAY-11.50/bin/A-
LAY /home/ecsim/processors/A-LAY-11.50/etc/A-LAY/JobOrder.xml" ;

group: HeaderData {

  group: FixedProductHeader {
    variables:
        string File_Name ;
        string File_Description ;
```

```
      string Notes ;
      string Mission ;
      string File_Class ;
      string File_Type ;
      string File_Version ;

    group: Source {
      variables:
        string System ;
        string Creator ;
        string Creator_Version ;
        string Creation_Date ;
      } // group Source

    group: Validity_Period {
      variables:
        string Validity_Start ;
        string Validity_Stop ;
      } // group Validity_Period
    } // group FixedProductHeader

  group: VariableProductHeader {

    group: MainProductHeader {
      variables:
        string productName ;
        string originalProductName ;
        string missionID ;
        string fileClass ;
        string fileCategory ;
        string productType ;
        string productLevel ;
        string sensingStartTime ;
        string sensingStopTime ;
        byte degradedProductQualityFlag ;
        string description ;
        string processorName ;
        short processorMajorVersion ;
        short processorMinorVersion ;
        short executableMajorVersion ;
        short executableMinorVersion ;
        short formatMajorVersion ;
        short formatMinorVersion ;
        byte subsettedProduct ;
        string acquisitionStation ;
        string processingCentre ;
        string processingStartTime ;
        string processingStopTime ;
        uint orbitNumber ;
        string frameID ;
        string ANXTime ;
        double ANXLongitude ;
        string stateVectorSource ;
        string stateVectorTime ;
        double xPosition ;
        double yPosition ;
        double zPosition ;
        double xVelocity ;
        double yVelocity ;
        double zVelocity ;
        double orbitSemiMajorAxis ;
        double orbitEccentricity ;
        double orbitInclination ;
        double perigeeArgument ;
        double rightAscension ;
        double meanAnomaly ;
        string frameStartTime ;
        string frameStopTime ;
        double frameStartMargin ;
        double frameStopMargin ;

      group: frameStartCoordinates {
        variables:
                float geographicLatitude ;
                float geographicLongitude ;
        } // group frameStartCoordinates

      group: frameStopCoordinates {
        variables:
                float geographicLatitude ;
                float geographicLongitude ;
```

```
        } // group frameStopCoordinates
      } // group MainProductHeader

    group: SpecificProductHeader {
      variables:
        string InputFileList ;
        string ConfigurationParameters ;

      group: QualityStatistics {
        } // group QualityStatistics
      } // group SpecificProductHeader
    } // group VariableProductHeader
  } // group HeaderData

group: ScienceData {
  dimensions:
        along_track = 5144 ;
        cloud_top_height_consistency_dimension = 2 ;
  variables:
        double time(along_track) ;
                time:long_name = "Time" ;
                time:notes = "-" ;
                time:units = "seconds since 2000-1-1 00:00:00.0 0:00" ;
                time:_FillValue = 9.96920996838687e+36 ;
        double latitude(along_track) ;
                latitude:long_name = "Latitude" ;
                latitude:notes = "[-90:90]" ;
                latitude:units = "degree_north" ;
                latitude:_FillValue = 9.96920996838687e+36 ;
        double longitude(along_track) ;
                longitude:long_name = "Longitude" ;
                longitude:notes = "[-180:180]" ;
                longitude:units = "degree_east" ;
                longitude:_FillValue = 9.96920996838687e+36 ;
        float geoid_offset(along_track) ;
                geoid_offset:long_name = "Height of the geoid above WGS84 ellipsoid" ;
                geoid_offset:notes = "-" ;
                geoid_offset:units = "m" ;
                geoid_offset:_FillValue = 9.96921e+36f ;
        float ATLID_cloud_top_height(along_track) ;
                ATLID_cloud_top_height:long_name = "Cloud top height retrieved from ATLID Mie co-
polar signal, 11 profiles horizontal average" ;
                ATLID_cloud_top_height:notes = "-" ;
                ATLID_cloud_top_height:units = "m" ;
                ATLID_cloud_top_height:_FillValue = 9.96921e+36f ;
        float ATLID_thick_cloud_top_height(along_track) ;
                ATLID_thick_cloud_top_height:long_name = "Cloud top height of thick clouds retrieved
from ATLID Mie co-polar signal without horizontal averaging" ;
                ATLID_thick_cloud_top_height:notes = "-" ;
                ATLID_thick_cloud_top_height:units = "m" ;
                ATLID_thick_cloud_top_height:_FillValue = 9.96921e+36f ;
        byte ATLID_cloud_top_height_confidence(along_track) ;
                ATLID_cloud_top_height_confidence:long_name = "Level of confidence for ATLID cloud
top height" ;
                ATLID_cloud_top_height_confidence:notes = "[0 - 10]" ;
                ATLID_cloud_top_height_confidence:_FillValue = -127b ;
        byte simplified_uppermost_cloud_classification(along_track) ;
                simplified_uppermost_cloud_classification:long_name = "Simplified classification of
the uppermost cloud" ;
                simplified_uppermost_cloud_classification:notes = "[0 - 6]" ;
                simplified_uppermost_cloud_classification:_FillValue = -127b ;
                simplified_uppermost_cloud_classification:definition = "0: no cloud\\n 1: thick
cloud\\n 2: thin cloud\\n 3: thin over thick cloud\\n 4: thick over thick cloud\\n 5: thin over thin
cloud\\n 6:no cloud, but probably cloud influenced" ;
        byte ATLID_cloud_top_height_consistency(along_track, cloud_top_height_consistency_dimension)
;
                ATLID_cloud_top_height_consistency:long_name = "Level of consistency of ATLID cloud
top height with A-TC product [0...3,0...10] = [comparison with A-TC]" ;
                ATLID_cloud_top_height_consistency:notes = "[0 - 3; 0 - 10]" ;
                ATLID_cloud_top_height_consistency:_FillValue = -127b ;
        byte quality_status(along_track) ;
                quality_status:long_name = "Quality status of cloud top height" ;
                quality_status:notes = "[-1 - 4]" ;
                quality_status:_FillValue = -127b ;
                quality_status:definition = "0: good data\\n 1: valid, but level of confidence low
(see configuration)\\n 2: Warning, large difference of CTH compared to A-TC (see configuration)\\n
3: Warning, cloud not detected by A-TC\\n 4: bad (input) data\\n -1: no cloud detected" ;
        float tropopause_height_wmo(along_track) ;
                tropopause_height_wmo:long_name = "Tropopause height (WMO definition)" ;
                tropopause_height_wmo:notes = "Variable from the input X-met file" ;
                tropopause_height_wmo:units = "m" ;
```

```
                tropopause_height_wmo:_FillValue = 9.96921e+36f ;
        float tropopause_height_calipso(along_track) ;
                tropopause_height_calipso:long_name = "Tropopause height (as used by Calipso)" ;
                tropopause_height_calipso:notes = "Variable from the input X-met file" ;
                tropopause_height_calipso:units = "m" ;
                tropopause_height_calipso:_FillValue = 9.96921e+36f ;
  } // group ScienceData
}
```

6.4 Header file example (XML)

This is an example only. Actual values may vary from instance to instance.

```
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<Earth_Explorer_Header xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">

  <Fixed_Header>
    <File_Name>ECA_EXAA_ATL_CTH_2A_20241231T183449Z_20250711T083223Z_39316D</File_Name>
    <File_Description></File_Description>
    <Notes>Test Notes</Notes>
    <Mission>EarthCARE</Mission>
    <File_Class>EXAA</File_Class>
    <File_Type>ATL_CTH_2A</File_Type>
    <Validity_Period>
      <Validity_Start>UTC=2024-12-31T18:34:49</Validity_Start>
      <Validity_Stop>UTC=2024-12-31T18:46:36</Validity_Stop>
    </Validity_Period>
    <File_Version>0001</File_Version>
    <Source>
      <System>TROPOSxxxx</System>
      <Creator>A_LAYxxxxx</Creator>
      <Creator_Version>1150</Creator_Version>
      <Creation_Date>UTC=2025-07-11T08:32:23</Creation_Date>
    </Source>
  </Fixed_Header>

  <Variable_Header>
    <MainProductHeader>
      <productName>ECA_EXAA_ATL_CTH_2A_20241231T183449Z_20250711T083223Z_39316D</productName>
      <originalProductName></originalProductName>
      <missionID>ECA</missionID>
      <fileClass>EXAA</fileClass>
      <fileCategory>ATL_</fileCategory>
      <productType>CTH_</productType>
      <productLevel>2A</productLevel>
      <sensingStartTime>UTC=2024-12-31T18:33:41</sensingStartTime>
      <sensingStopTime>UTC=2024-12-31T18:47:44</sensingStopTime>
      <degradedProductQualityFlag>0</degradedProductQualityFlag>
      <description></description>
      <processorName>A_LAY</processorName>
      <processorMajorVersion>11</processorMajorVersion>
      <processorMinorVersion>50</processorMinorVersion>
      <executableMajorVersion>11</executableMajorVersion>
      <executableMinorVersion>50</executableMinorVersion>
      <formatMajorVersion>11</formatMajorVersion>
      <formatMinorVersion>50</formatMinorVersion>
      <subsettedProduct>0</subsettedProduct>
      <acquisitionStation>Kiruna____</acquisitionStation>
      <processingCentre>TROPOSxxxx</processingCentre>
      <processingStartTime>UTC=2025-07-11T08:32:23</processingStartTime>
      <processingStopTime>UTC=2025-07-11T08:32:38</processingStopTime>
      <orbitNumber>39316</orbitNumber>
      <frameID>D</frameID>
      <ANXTime>2024-12-31T18:05:55.452397</ANXTime>
      <ANXLongitude>0.0000000000000000E+00</ANXLongitude>
      <stateVectorSource>ONBOARD_GPSxxxx</stateVectorSource>
      <stateVectorTime>2024-12-31T18:46:36.000000</stateVectorTime>
      <xPosition>2.2719518560000001E+06</xPosition>
      <yPosition>-5.8383110209999997E+06</yPosition>
      <zPosition>2.5759834700000002E+06</zPosition>
      <xVelocity>-3.1846028999999999E+02</xVelocity>
      <yVelocity>-3.2393467740000001E+03</yVelocity>
      <zVelocity>-7.0302126909999997E+03</zVelocity>
      <orbitSemiMajorAxis>0.0000000000000000E+00</orbitSemiMajorAxis>
      <orbitEccentricity>0.0000000000000000E+00</orbitEccentricity>
      <orbitInclination>0.0000000000000000E+00</orbitInclination>
      <perigeeArgument>0.0000000000000000E+00</perigeeArgument>
      <rightAscension>0.0000000000000000E+00</rightAscension>
```

```
      <meanAnomaly>0.00000000000000000E+00</meanAnomaly>
      <frameStartCoordinates>
        <GeographicCoordinates>
          <geographicLatitude>67.5000000</geographicLatitude>
          <geographicLongitude>-51.4825439</geographicLongitude>
        </GeographicCoordinates>
      </frameStartCoordinates>
      <frameStopCoordinates>
        <GeographicCoordinates>
          <geographicLatitude>22.5000000</geographicLatitude>
          <geographicLongitude>-68.7324829</geographicLongitude>
        </GeographicCoordinates>
      </frameStopCoordinates>
      <frameStartTime>UTC=2024-12-31T18:34:49</frameStartTime>
      <frameStopTime>UTC=2024-12-31T18:46:36</frameStopTime>
      <frameStartMargin>496.80</frameStartMargin>
      <frameStopMargin>1000.00</frameStopMargin>
    </MainProductHeader>
    <SpecificProductHeader>
      <InputFileList>ECA_EXAA_ATL_EBD_2A_20241231T183449Z_20250206T210704Z_39316D
ECA_EXAA_ATL_NOM_1B_20241231T183449Z_20240328T133122Z_39316D
ECA_EXAA_ATL_TC__2A_20241231T183449Z_20250206T210704Z_39316D
ECA_EXAA_AUX_MET_1D_20241231T183449Z_20230623T060856Z_39316D
ECA_EXAA_AUX_JSG_1D_20241231T183449Z_20240419T125214Z_39316D
ECA_EXAA_CFG_ALAY___20241231T183450Z_20250212T163257Z_1150
</InputFileList>
      <ConfigurationParameters><![CDATA[<?xml version="1.0" encoding="UTF-8"?>
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      <File_Description>A_LAY_2A Configuration file</File_Description>
      <Notes></Notes>
      <Mission>EarthCARE</Mission>
      <File_Class>EXAA</File_Class>
      <File_Type>CFG_ALAY</File_Type>
      <Validity_Period>
        <Validity_Start>UTC=2021-01-01T01:01:01</Validity_Start>
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      <File_Version>0001</File_Version>
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        <System>EarthCARE Level 2</System>
        <Creator>Athena A. Floutsi (TROPOS)</Creator>
        <Creator_Version>11.50</Creator_Version>
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    <Group name="general" description="general parameters">
      <Parameter name="internal_structure"           type="int"     dims="1" description="Allow or
suppress the identification of internal layers"                                    units="-"
>0</Parameter>
      <Parameter  name="tropopause_divider"                        type="float"           dims="1"
description="Tropopause height divided by this number defines the boundary between lower and upper
troposphere for threshold value settings" units="-"  >3</Parameter>
      <Parameter name="air_multilayer" type="int"   dims="1" description="Minimum number of pixel of
clean air between thin and thick cloud top boundaries for definition as multi-layer cloud" units="m"
>5</Parameter>
      <Parameter type="int" name="aerosol_resolution_setting" dims="1" description="Switch to either
read the number of JSG pixels used for averaging the optical properties from A-PRO (low=2/med=1) or
to the resolution used for the aerosol layer detection (alay=0)">1</Parameter>
      <Parameter          type="string"          name="logging_output_file"           dims="1"
description="file_name_for_logging_messages">./alay_logging.log</Parameter>
      <Parameter type="int" name="logging_level" dims="1" description="DEBUG = 0, INFO = 1, PROGRESS
= 2, WARN = 3, ERROR = 4">0</Parameter>
    </Group>
      <Group name="margin" description="margin parameters">
       <Parameter type="int" name="config_margins" dims="1" description="Set margins from config-
xml: 1=yes, 0=no (no margins applied)">0</Parameter>
       <Parameter type="double" name="start_margin_alay" dims="1" description="Length of margin
before frame start" units="km">30.0</Parameter>
       <Parameter type="double" name="stop_margin_alay" dims="1" description="Length of margin
behind frame stop" units="km">30.0</Parameter>
      </Group>
    <Group name="cloud" description="parameters for cloud top height retrieval">
      <Parameter name="dilation_cloud"               type="int"     dims="1" description="Number of
height bins of the dilation of the wavelet function for clouds"                    units="-"
>2</Parameter>
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      <Parameter name="wct_threshold_cloud_1"        type="float"   dims="1" description="Threshold value of the WCT at potential cloud tops in the lower troposphere"                units="-" >0.05</Parameter>
      <Parameter name="snr_threshold_cloud_1"        type="float"   dims="1" description="Threshold value of the mean SNR at potential cloud tops in the lower troposphere"          units="-" >6.0</Parameter>
      <Parameter name="wct_threshold_cloud_2"        type="float"   dims="1" description="Threshold value of the WCT at potential cloud tops in the upper troposphere"                units="-" >0.05</Parameter>
      <Parameter name="snr_threshold_cloud_2"        type="float"   dims="1" description="Threshold value of the mean SNR at potential cloud tops in the upper troposphere"          units="-" >5.0</Parameter>
      <Parameter name="wct_threshold_cloud_3"        type="float"   dims="1" description="Threshold value of the WCT at potential cloud tops in the stratosphere below 20 km"         units="-" >0.05</Parameter>
      <Parameter name="snr_threshold_cloud_3"        type="float"   dims="1" description="Threshold value of the mean SNR at potential cloud tops in the stratosphere below 20 km" units="-" >5.0</Parameter>
      <Parameter name="wct_threshold_cloud_4"        type="float"   dims="1" description="Threshold value of the WCT at potential cloud tops in the stratosphere above 20 km"         units="-" >0.05</Parameter>
      <Parameter name="snr_threshold_cloud_4"        type="float"   dims="1" description="Threshold value of the mean SNR at potential cloud tops in the stratosphere above 20 km" units="-" >5.0</Parameter>
      <Parameter name="snr_bin_number_cloud"         type="int"     dims="1" description="Number of height bins to calculate the mean SNR at potential cloud tops"                        units="-" >1</Parameter>
      <Parameter name="jsg_pixel_average_short"      type="int"     dims="1" description="Number of JSG pixels used for averaging along track to identify thick clouds"                  units="-" >1</Parameter>
      <Parameter name="jsg_pixel_average_long"       type="int"     dims="1" description="Number of JSG pixels used for averaging along track to identify thin clouds and aerosol layers" units="-" >11</Parameter>
      <Parameter name="consistency_criterion"         type="float"   dims="1" description="Allowed difference between cloud top from A-CTH and A-TC for consistency definition"     units="m" >100.0</Parameter>
      <Parameter   name="quality_consistency_threshold"                  type="int"        dims="1" description="Maximum difference (multiplied by consistency_criterion) between cloud top from A-CTH and A-TC for defining high quality status "   units="-" >5</Parameter>
      <Parameter   name="quality_confidence_threshold"                   type="int"        dims="1" description="Minimum level of confidence of cloud top height for defining high quality status " units="-" >5</Parameter>
    </Group>
    <Group name="aerosol" description="parameters for aerosol layers retrieval">
      <Parameter name="dilation_aerosol"             type="int"     dims="1" description="Number of height bins of the dilation of the wavelet function for aerosol"                     units="-" >12</Parameter>
      <Parameter name="wct_threshold_aerosol_1"      type="float"   dims="1" description="Threshold value of the WCT for aerosol layer boundaries in the lower troposphere"           units="-" >0.05</Parameter>
      <Parameter name="snr_threshold_aerosol_1"      type="float"   dims="1" description="Threshold value of the SNR for aerosol layer identification in the lower troposphere"    units="-" >1.0</Parameter>
      <Parameter name="wct_threshold_aerosol_2"      type="float"   dims="1" description="Threshold value of the WCT for aerosol layer boundaries in the upper troposphere"           units="-" >0.05</Parameter>
      <Parameter name="snr_threshold_aerosol_2"      type="float"   dims="1" description="Threshold value of the SNR for aerosol layer identification in the upper troposphere"    units="-" >1.3</Parameter>
      <Parameter name="wct_threshold_aerosol_3"      type="float"   dims="1" description="Threshold value of the WCT for aerosol layer boundaries in the stratosphere below 20 km"  units="-" >0.05</Parameter>
      <Parameter name="snr_threshold_aerosol_3"      type="float"   dims="1" description="Threshold value of the SNR for aerosol layer identification in the stratosphere below 20 km" units="-" >1.3</Parameter>
      <Parameter name="wct_threshold_aerosol_4"      type="float"   dims="1" description="Threshold value of the WCT for aerosol layer boundaries in the stratosphere above 20 km"  units="-" >0.05</Parameter>
      <Parameter name="snr_threshold_aerosol_4"      type="float"   dims="1" description="Threshold value of the SNR for aerosol layer identification in the stratosphere above 20 km" units="-" >1.3</Parameter>
      <Parameter name="quality_al_number_threshold"       type="int"   dims="1" description="Maximum number of aerosol layer for defining high quality status "   units="-" >5</Parameter>
      <Parameter  name="quality_al_backscatter_error_threshold"          type="float"     dims="1" description="Maximum relative error of the layer mean backscatter coefficient for defining quality status "   units="-" >0.1</Parameter>
      <Parameter  name="quality_consistency_threshold_aerosol"           type="int"       dims="1" description="Minimum agreement ratio of detection status (aerosol or clean)  from A-ALD and A-TC for defining quality status "   units="-" >8</Parameter>
    </Group>
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       <Group name="compression" description="parameters controlling internal compression in the
NetCDF-4/HDF5 output products">
      <Parameter name="deflate_level" type="int" dims="1" description="The gzip compression level
from 0 to 9. 0 indicates no compression. 9 is best compression/slowest">9</Parameter>
      <Parameter name="shuffle" type="int" dims="1" description="If non-zero (and deflate_level >
0), turn on the shuffle filter. This might improve compression ratios">1</Parameter>
    </Group>
  </Data_Block>
</Earth_Explorer_File>
]]></ConfigurationParameters>
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</Earth_Explorer_Header>
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