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Executive Summary

The System Specification Document (SSD, deliverable D3.1) specifies the design of the operational system in order to generate and provide the Ozone ECV data products operationally. It includes an overall description of the main functions and scenarios. It consists of already available subsystems distributed over several organizations.

The new products created in this context are ozone Essential Climate Variables, which are used for an assessment of climate forcing, health impact and other environmental issues.
SSD - System Specification Document

This document specifies the system requirements for the CCI O3 system.

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1 Introduction

1.1 Scope and Applicability

This document describes the operational Ozone_CCI production system in order to handle the complete production processes and product provision procedures for the Ozone ECV products. It also includes information regarding lifecycle and possible hardware solutions. The system specification in this document is based on a System Requirements analysis [AD4] which was derived from the User Requirements [RD2] and Product Specifications [AD5] of the Ozone_cci project, but nevertheless it is general enough to be able to support the processes of other CCI projects. The system specification does not include specifications needed for the product validation processes.

The phase II processing system consists in a decoupled and fully distributed system spread over several organizations where each contributor provides existing systems for the generation of the committed ozone data sets. Based on this architecture, the following ECV parameters will be generated:

The production processes shall ensure the generation of the following ozone ECV parameters:

- Total Ozone from UV nadir instruments,
- Tropical Tropospheric Ozone Column from UV nadir instruments,
- Low vertical resolution ozone profiles from nadir sensors and
- Stratospheric and upper tropospheric ozone profiles from limb and occultation types of sensors

The Ozone ECV products shall be generated using the following data sets:

- Input data from GOME, SCIAMACHY, GOME-2A, GOME-2B, OMI and OMPS for total ozone ([CR1], in [AD1] chapter 1.2).
- Input data from GOME, GOME-2A, and GOME-2B for tropical tropospheric ozone column ([CR1], in [AD1] chapter 1.2).
- Input data from GOME, SCIAMACHY, GOME-2, OMI and IASI for Ozone nadir profiles ([CR1], in [AD1] chapter 1.2)
- Input data from MIPAS, GOMOS, SCIAMACHY, OSIRIS, SMR, ACE, SAGE II and HALOE for the generation of ozone limb profiles ([CR1], in [AD1] chapter 1.2) and optionally TPM.

1.2 Conventions

tbc

1.3 Definitions, Acronyms and Abbreviations

Terms, definitions and abbreviations are collected within this document.

1.3.1 Terms and Definitions

<table>
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<th>Explanation of the term</th>
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<td>Nominal Operation</td>
<td>The day to day operations, 98% of the time the system is operational</td>
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<tr>
<td>Ozone_cci</td>
<td>project for the development of the CCI ECV Ozone Processor</td>
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<tr>
<td>Processor</td>
<td>Software algorithm running in the Ozone_cci system to produce intermediate or ECV products according the Product Specification Document ([AD5])</td>
</tr>
<tr>
<td>Status Feedback</td>
<td>Automated status reports generated by the Ozone_cci system and provided to the Ozone_cci operator</td>
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### 1.3.2 Abreviations

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<td>Application Programming Interface</td>
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<td>ADM</td>
<td>Algorithm Development Management</td>
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<tr>
<td>CCI</td>
<td>Climate Change Initiative</td>
</tr>
<tr>
<td>CRG</td>
<td>Climate Research Group</td>
</tr>
<tr>
<td>CMUG</td>
<td>CCI Climate Modelling User Group</td>
</tr>
<tr>
<td>DARD</td>
<td>Data Access Requirements Document</td>
</tr>
<tr>
<td>ECMWF</td>
<td>European Centre for Medium-Range Weather Forecasts</td>
</tr>
<tr>
<td>ECV</td>
<td>Essential Climate Variable</td>
</tr>
<tr>
<td>EOST-1</td>
<td>EO Science Team for Total Column and Nadir Profile within the Ozone_cci project</td>
</tr>
<tr>
<td>EOST-2</td>
<td>EO Science Team for Limb Profile within the Ozone_cci project</td>
</tr>
<tr>
<td>ESA</td>
<td>European Space Agency</td>
</tr>
<tr>
<td>EUMETSAT</td>
<td>European Organisation for the Exploitation of Meteorological Satellites</td>
</tr>
<tr>
<td>GMES</td>
<td>Global Monitoring for Environment and Security is the European Programme for the establishment of a European capacity for Earth Observation</td>
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<tr>
<td>HMI</td>
<td>Human Machine Interface</td>
</tr>
<tr>
<td>KNMI</td>
<td>Royal Netherlands Meteorological Institute</td>
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<tr>
<td>LP</td>
<td>Limb Profile</td>
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<td>NASA</td>
<td>National Aeronautics and Space Administration</td>
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<td>NP</td>
<td>Nadir Profile</td>
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<td>O3</td>
<td>Ozone</td>
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<td>Ozone Total Column</td>
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<tr>
<td>O3NP</td>
<td>Ozone NadirProfile</td>
</tr>
<tr>
<td>O3LP</td>
<td>Ozone Limb Profile</td>
</tr>
<tr>
<td>OMI</td>
<td>Ozone Monitoring Instrument (aboard EOS-Aura)</td>
</tr>
<tr>
<td>OS</td>
<td>Operating System</td>
</tr>
<tr>
<td>PDU</td>
<td>Product Dissemination Unit</td>
</tr>
<tr>
<td>PSD</td>
<td>Product Specification Document</td>
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<tr>
<td>PM</td>
<td>Production Management</td>
</tr>
<tr>
<td>VALT</td>
<td>Validation Team or Group</td>
</tr>
<tr>
<td>VQM</td>
<td>Validation &amp; QA Management</td>
</tr>
<tr>
<td>SET</td>
<td>System Engineering Team within the Ozone_cci project</td>
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<tr>
<td>UPAS</td>
<td>Processor for Atmospheric Spectrometers</td>
</tr>
<tr>
<td>tbc</td>
<td>to be collected</td>
</tr>
<tr>
<td>tbd</td>
<td>to be defined (shall be defined later if the information is available)</td>
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<tr>
<td>TC</td>
<td>Total Column</td>
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1.4 Applicable Documents

[AD1] Ozone_cci Phase-II Technical Baseline, ESA RFO 3-13904/13/I-NB, 26/09/2013
[AD5] Product Specification Document (PSD)

1.5 Reference Documents

[RD1] CCI guidelines from the colocation meeting 1, Issue 1.0, EOP-DTEX-EOPS-SW-10-0002, 05/11/2010
[RD2] User Requirements Document
[RD3] Input Output Definition Document (IODD)
[RD4]

1.6 Document Overview

Chapter 2 contains the purpose and the scope of the Ozone_cci system.
Chapter 3 describes the design approach.
Chapter 4 gives an overview about the Ozone_cci system.
Chapter 5 lists the fundamental operations and the main operational scenarios.
Chapter 6 shows the component decomposition.
Chapter 7 gives an overview about the input, intermediate and output products which are handled during CCI phase 1 and 2.
2 General Description

2.1 Relation to Current Projects

The ESA sensors GOME, SCIAMACHY, GOMOS and MIPAS as well as the EUMETSAT sensor GOME-2 will be used in first priority to develop optimised ozone Essential Climate Variables (ECVs). Wherever feasible, ESA Third-Party Missions (TPM) and non-ESA missions will be included as well to further enhance the merged data sets. In particular, the OMI and OMPS instruments will be used to generate total ozone level-2 data sets, which, in turn, will be included in the merged data record. Also OMI will be included in the merged ECV data series for nadir profiles, while the NASA TOMS, SBUV and SAGE-II data sets will be used to validate the European ozone ECV.

The focus of the Ozone_cci project will be on developing three ozone ECVs, namely (1) total ozone from UV nadir instruments, (2) ozone profiles from nadir sensors and (3) ozone profiles from limb and occultation types of sensors. These ozone ECVs will be optimised to approach as closely as possible the GCOS requirements. To this aim, level-2 ozone retrieval and data merging algorithms will be developed and optimised, making best use of multi-sensors data archives in particular from ESA instruments. Corresponding data products will be generated, characterised, validated and assessed for their climate relevance.

2.2 Function and Purpose

The operational Ozone_cci system shall generate the ozone ECVs as specified in the PSD ([AD5]) according to the requirements stated in the URD ([RD2]). The ECVs shall be based on existing level 1 and/or level 2 data and auxiliary data. Level 2 processing and re-processing shall be possible if required in order to generate the ozone ECV output products defined in the PSD ([AD5]). The system specified in this document is based on a System Requirements analysis [AD4], which was derived from the User Requirements [RD2].

2.3 Relation to other Systems and End Users

The interfaces of the Ozone_cci system to external entities are illustrated in Figure 4-2. A complete list of all the data sources and data providers is defined in the DARD [AD6]. The Ozone_cci system requires interfaces to organizations which provide level 1 and ancillary data for generating the ECV products, and to organizations which provide ground-based reference data for validation procedures. A complete list of all output products is given in the PSD [AD5]. These output products shall be provided to the predefined end users.
3 Design Approach

This chapter describes the approaches used for the descriptions of the scenarios, system components and interfaces. UML diagrams are used for the description of the design. Additionally, non–UML diagrams and techniques are used where appropriate. The most often used diagrams are the context diagram and the sequence diagram.

3.1 Component Description Approach

Typically the context diagram is used in the overview of each design document to describe the usage environment of the system or the system components. Data/control flow diagrams are used where complex structures of components or elements interact together.

After decomposition of Ozone_cci system into individual subsystems and components each of those subsystems is described as follows:

- Description
- Components or Processors
- Functions
- Interfaces
- Hardware

3.2 Scenario Description Approach

Sequence diagrams are used to describe the main usage scenarios relying on the functionality provided by the actors like operators, the system, components or elements.

Scenarios are sequences of events and activities for different use cases of a system. They describe the functions of a system on a certain level of abstraction. The scenarios for the Ozone_cci system are described, using the following approach:

- First, a short description is given on how the corresponding scenario is initiated and its purpose and scope.
- Optionally a sequence diagram is given
- Finally, the flow of actions is described in a bulleted list, as an explanation to the sequence diagram.

3.3 Interface Description Approach

Each interface may consist of one or more interface items. The interface items are subdivided according to inputs and outputs of the subsystem.

An interface item covers an individual file, product or a method which is exchanged between components. A file or a product is easily understood as an interface item. A method is based on the concept of a client/server model.

The System Specification document lists all existing internal and external interfaces and interface items. The interface items of type product or file (auxiliary data) are described in three documents:

- the Product Specification Documents (PSD [AD4])
- the Data Access Requirement Document (DARD [AD6])
- the Input Output Definition Document (IODD [RD3]).
The PSD describes the format and content of the ECV output products. The DARD describes all external inputs which are required within the Ozone_cci system to be able to generate the required ECV output products. The IODD describes all internal interface items which are transferred between the Ozone_cci components and the external interfaces to the users. Each interface item is specified by a fixed set of fields. Products are special kinds of interface items insofar as they are archived or distributed to users and / or external entities e.g. validation systems. Therefore, a product specification is required to inform its users about the specific properties and performance characteristics of these products and to provide a detailed format specification which in general is much more sophisticated than for a normal interface item.
4 System Overview

The design of the Ozone_cci System is fundamentally influenced by the separation of the system functionality in four functional domains:

- Processing Domain
- Product Handling Domain
- Management Domain

Each functional group in the functional decomposition is implemented by one or more dedicated service components. The functional groups and their components will be introduced in the subsections following this introduction.

The Processing Domain groups the functions regarding the product processing. The Ozone_cci production system is defined by the use of already existing processing systems which are spread over different organizations. Each processing system is responsible for the production of one or more complete data sets which are either final or which are used by a subsequent processing step.

The Product Handling Domain is reduced to the provision of the generated data sets on an ftp server at BIRA in order to provide intermediate data sets to subsequent ozone_cci processing systems and to provide all generated output products via online access to the users.

The Management Domain groups the management functions for the organization of the production and dissemination.

The Processing and the Product Handling Domains are subdivided into technical components. However, the Management Domain is substituted into administrational components.

4.1 System Overview

Figure 4-1 shows the technical and administrational components of the Ozone_cci system. The administrational components are responsible for specific organisational operations. The technical components are provided by the specific science teams.
A detailed description of the functionality of the Ozone_cci components are described in chapter 6. An overview about their main functionalities is given in the following subchapters.

### 4.1.1 Processing Domain

The Processing Domain consists of:
- Processing System BIRA
- Processing System CHALM
- Processing System DLR
- Processing System FMI
- Processing System KIT
- Processing System KLMI
- Processing System RAL
- Processing System UoT
- Processing System UoFS
- Processing System UofT
- Processing System ULB
- Processing System UBR
4.1.1.1 Processing System BIRA

This system generates the L2 TC products from GOME, SCIA, GOME-2A, GOME-2B, OMI and OMPS L1 input data. The granularity is one orbit, there will be one L2 product per sensor/orbit. The system ensures the different steps necessary to the L2 TC production: ingestion of L1 and auxiliary data, processing of L1 data into L2 TC data, formatting of L2 product and uploading on the product handling domain.

4.1.1.2 Processing System DLR

This processing system takes as input the L2 TC products and generates the L3 TC products containing gridded monthly mean total ozone data separately for each sensor. Finally it merges these L3 TC products by applying spatial and temporal drift corrections in order to create the final TC ECV from all available sensors.

Additionally to the TC products this system is also capable to generate the L3 TTOC Products from L2 TC and cloud products created at DLR from GOME, GOME-2A, and GOME-2B L1 input data.

4.1.1.3 Processing System RAL

This system generates the L2 NP products from GOME, SCIA, GOME-2A, GOME-2B and OMI L1 input data. The granularity is one orbit, there will be one L2 product per sensor/orbit. The system ensures the different steps necessary to the L2 TC production: ingestion of L1 and auxiliary data, processing of L1 data into L2 TC data, formatting of L2 product and uploading on the product handling domain.

4.1.1.4 Processing System KNMI

This system uses the NP L2 products in order to generate NP L3 and L4 products. For the processing also meteorological data from ECMWF has to be available.

4.1.1.5 Processing System ULB

This system generates the L2 NP products from the IASI L1 input data. The granularity is one PDU. For the processing IASI level 2 meteorological data have to be available.

4.1.1.6 Processing System CHALM

This system generates the harmonized L2 LP and the L2 MLT products from the SMR L2 input data.

4.1.1.7 Processing System FMI

This system generates the harmonized L2 LP products, the L2 UTLS products and the L2 MLT products from the GOMOS L2 input data. Additionally on the basis of the harmonized L2 LP products all L3 Limb Profile products from all defined sensors are generated. Finally the resulting L3 Limb Profile products are merged to create multi-instrument L3 data.

4.1.1.8 Processing System KIT

This system generates the harmonized L2 LP, the L2 UTLS and the L2 MLT products from the MIPAS L2 input data. Additionally the MIPAS L3 MLT products are generated and finally merged together with the GOMOS, SMR and ACE L3 MLT products to the merged L3 MLT products.

4.1.1.9 Processing System UBR

This system generates the harmonized L2 LP and the L2 UTLS products from the SCIA L2 input data. Additionally the harmonized L2 LP products for OMPS, MLS, SAGE II and HALOE are generated within this system.

The system includes also the LNTOC Processor in order to generate the LNTOC products for ENVISAT and OMPS.
4.1.1.10 Processing System UofT
This system generates the harmonized L2 LP and the L2 UTLS products from the ACE L2 input data. Additionally the L2 and L3 MLT products are generated for ACE.

4.1.1.11 Processing System UofS
This system generates the harmonized L2 LP and the L2 UTLS products from the OSIRIS L2 input data.

4.1.2 Product Handling Domain
Product management is mainly provided by the ftp server at BIRA for an online access of all generated Ozone_cci output products. The online access provides the access of predefined data sets directly to the user via an ftp pickup point. The product provision is organized using a predefined hierarchical directory structure containing the CCI projects, product types and directory paths which are defined within the PSDs.

4.1.3 Management Domain

4.1.3.1 Production Management
Production Management provides tools and procedures for the operator to handle the system processes and to allow data access to the users. It is an organizational component which is responsible for the organization, monitoring and operation of all defined production and dissemination processes. The production processes itself are individually defined and handled by the processing systems in its organisations. The methods for the provision of the data to the external users act in accordance to the Data Standards for CCI Data Producers ([AD3]). The user access to the data is described on the Ozone CCI web page http://www.esa-ozone-cci.org.

4.1.3.2 Algorithm Development
This component is responsible to trigger and organize the whole work which is necessary to bring a new algorithm/processor into operation. This includes the development, testing, installation and system update and the validation. These procedures and tasks are defined and handled by the Science Team 1 and 2 (EOST-1 and EOST-2) and are coordinated via the Core Management Team (CRG).

4.2 External Interfaces
Figure 4-2 shows the main information which is exchanged by the external interfaces of the Ozone_cci system.
There are three types of external interfaces:

- **The interfaces to the data providers** in order to get all required input and auxiliary products needed for the internal production and processing chains:
  The input and auxiliary products are ingested by the specific processing systems from data providers using its proprietary ingestion services and procedures. The organization of the formal data procurement has to be done by the specific science teams itself. All required input data are listed and described within the DARD ([AD6]).

- **User Interface (UserIfc) to support the online access of the ECV products to the end users:**
  The user interface is defined to provide the output products of the system to the external users.
(e.g. the Climate Research Group or the Climate Modelling Group) via online access. All output products which are provided to the users are described within the PSD ([AD5]).

- **Science and Algorithm/Processor Interface (Science&AlgorithmIfc to support the algorithm/processor improvement and development tasks):**
  The science and algorithm/processor interface defines the management activities which are needed to organize and improve the algorithm/processor development and integration tasks.

### 4.3 Main Internal Interfaces

Figure 4-3 shows the main information which are exchanged by the internal interfaces.

![Ozone_cci System Decomposition with main Internal Interfaces](image)

**Figure 4-3 Ozone_cci System Decomposition with main Internal Interfaces**

A detailed description of the interfaces and interface items is given in chapter 6. The main internal interfaces are the interfaces to transfer the output products generated from one processing system to a subsequent processing system which needs these generated output products. The ftp server at BIRA provides the interfaces for these products transfer. In practice these products transfers are often handled directly by the production operators between the involved processing systems.

### 4.4 Ozone_cci Users

The Ozone_cci system interacts with the following users/operators:

- **Ozone_cci System Operator**
  For each Ozone_cci processing system the system operator is responsible for the installation, configuration and acceptance testing of the processors into the specific processor system.

- **Ozone_cci Production Operator (Member of Production Management)**
  The production operator is responsible to organize, schedule, execute and monitor all defined
production processes within a specific processing system. He shall be able to start, restart, stop or cancel all predefined processing or reprocessing scenarios. He generates reports and monitors the data provision and dissemination and handles all defined QA processes.

- **Ozone_cci System Engineer (Member of Algorithm/Processor Development Management)**
  The System Engineer is responsible to exchange processors or algorithms of the Ozone_cci system which are developed by the scientists.

- **Ozone_cci Scientist (Member of Algorithm/Processor Development Management)**
  The scientist develops algorithms/processors for the production and the quality control of the produced ECV products.

- **ECV User (external)**
  The ECV end user searches and gets the ECV data products from the Ozone_cci system.
## 5 Scenarios (Use Cases)

### 5.1 Fundamental Operations and Scenarios

This chapter describes the overall scenarios of the Ozone_cci system which are necessary to ensure the required ECV parameter production. The following table give an overview about all products which can be generated by the Ozone_cci system.

<table>
<thead>
<tr>
<th>L2 Data Product</th>
<th>Processing Facility</th>
<th>Processing Results in Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC_L2_GOME</td>
<td>BIRA</td>
<td>L2 total ozone product from GOME (1 file/orbit) for the period 1995-2011</td>
</tr>
<tr>
<td>TC_L2_SCIAMACHY</td>
<td>BIRA</td>
<td>L2 total ozone product from SCIAMACHY (1 file/orbit) for the period 2002-2012</td>
</tr>
<tr>
<td>TC_L2_GOME2A</td>
<td>BIRA</td>
<td>L2 total ozone product from GOME-2A (1 file/orbit) for the period 2007-2016</td>
</tr>
<tr>
<td>TC_L2_GOME2B</td>
<td>BIRA</td>
<td>L2 total ozone product from GOME-2B (1 file/orbit) for the period 2013-2016</td>
</tr>
<tr>
<td>TC_L2_OMI</td>
<td>BIRA</td>
<td>L2 total ozone product from OMI (1 file/orbit) for the period 2004-2016</td>
</tr>
<tr>
<td>TC_L2_OMPS#</td>
<td>BIRA</td>
<td>L2 total ozone product from OMPS (1 file/orbit) for the period 2012-2016</td>
</tr>
<tr>
<td>NP_L2_GOME</td>
<td>RAL</td>
<td>L2 ozone nadir profile product from GOME (1 file/orbit) for the period 1995-2011</td>
</tr>
<tr>
<td>NP_L2_SCIAMACHY</td>
<td>RAL</td>
<td>L2 ozone nadir profile product from SCIAMACHY (1 file/orbit) for the period 2002-2012</td>
</tr>
<tr>
<td>NP_L2_GOME2A</td>
<td>RAL</td>
<td>L2 ozone nadir profile product from GOME-2A (1 file/orbit) for the period 2007-2016</td>
</tr>
<tr>
<td>NP_L2_GOME2B</td>
<td>RAL</td>
<td>L2 ozone nadir profile product from GOME-2B (1 file/orbit) for the period 2013-2016</td>
</tr>
<tr>
<td>NP_L2_OMI#</td>
<td>RAL</td>
<td>L2 ozone nadir profile product from OMI (1 file/orbit) for the period 2004-2016</td>
</tr>
<tr>
<td>NP_L2_IASI</td>
<td>ULB</td>
<td>L2 Ozone nadir profile from IASI for all or part of the operation periods and for all or part of the pixel</td>
</tr>
<tr>
<td>LP_L2_SCIAMACHY</td>
<td>UBR</td>
<td>L2 ozone limb profile product from SCIAMACHY for the period 2002-2012</td>
</tr>
<tr>
<td>LP_L2_OMPS#</td>
<td>UBR</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L2_MIPAS</td>
<td>KIT</td>
<td>L2 ozone limb profiles from MIPAS for the whole instrument life period, processed out of the version 7 Level 1 Spectra</td>
</tr>
<tr>
<td>LP_L2_GOMOS</td>
<td>FMI</td>
<td>The dataset is created in Phase 1</td>
</tr>
<tr>
<td>LP_L2_OSIRIS</td>
<td>UofS</td>
<td>L2 Limb Profile product from OSIRIS (1 file/day) for the period 2001-2014</td>
</tr>
<tr>
<td>LP_L2_SMR</td>
<td>CHALM</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L2_ACE</td>
<td>UofT</td>
<td>tbd</td>
</tr>
<tr>
<td>L2 Products</td>
<td>Facility</td>
<td>Status</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td>LP_L2_SAGE II</td>
<td>UBR</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L2_HALOE</td>
<td>UBR</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L2_MLS</td>
<td>UBR</td>
<td>Production phase started, for L2 MLS Aura limb profile production for the period 2004-2011</td>
</tr>
<tr>
<td>UTLS_L2_SCIA</td>
<td>UBR</td>
<td>tbd</td>
</tr>
<tr>
<td>UTLS_L2_MIPAS</td>
<td>KIT</td>
<td>tbd</td>
</tr>
<tr>
<td>UTLS_L2_GOMOS</td>
<td>FMI</td>
<td>The related studies are ongoing</td>
</tr>
<tr>
<td>UTLS_L2_OSIRIS</td>
<td>UofS</td>
<td>L2 UTLS product from OSIRIS (1 file/day) for the period 2001-2014</td>
</tr>
<tr>
<td>UTLS_L2_ACE</td>
<td>UofT</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L2_MIPAS_DN_DCA*</td>
<td>KIT</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L2_GOMOS_DN_DCA*</td>
<td>KIT</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L2_ACE_DN_DCA*</td>
<td>UofT</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L2_SMR_DN_DCA*</td>
<td>CHALM</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L2_MIPAS_SM#</td>
<td>KIT</td>
<td>tbd</td>
</tr>
</tbody>
</table>

Table 5-1 L2 Products

<table>
<thead>
<tr>
<th>L3/L4 Data Product</th>
<th>Processing Facility</th>
<th>Processing Results in Phase 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC_L3_MRG</td>
<td>DLR</td>
<td></td>
</tr>
<tr>
<td>NP_L3_MRG</td>
<td>KNMI</td>
<td>Global monthly-mean 3D ozone fields from combined GOME, SCIAMACHY, GOME2 and OMI L2 data</td>
</tr>
<tr>
<td>NP_L4_ASSIM</td>
<td>KNMI</td>
<td>Global 6-hourly 3D ozone fields from combined GOME, SCIAMACHY, GOME2 and OMI L2 data</td>
</tr>
<tr>
<td>TTOC_L3_GOME</td>
<td>DLR</td>
<td>tbd</td>
</tr>
<tr>
<td>TTOC_L3_GOME2A∞</td>
<td>DLR</td>
<td>tbd</td>
</tr>
<tr>
<td>TTOC_L3_GOME2B∞</td>
<td>DLR</td>
<td>tbd</td>
</tr>
<tr>
<td>LNTOC_L3_ENVISAT</td>
<td>UBR</td>
<td>Available for SCIA-SCIA on UBR ftp server for for test phase. Will be moved to BIRA ftp</td>
</tr>
<tr>
<td>LNTOC_L3_OMPS</td>
<td>UBR</td>
<td>tbd</td>
</tr>
<tr>
<td>LNTOC_L3_OMPSG2#</td>
<td>UBR</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_SCIA_MZM</td>
<td>FMI</td>
<td>The dataset is created in Phase 1. If updated L2 dataset will be available, the MZM dataset will be replaced with a newer one.</td>
</tr>
<tr>
<td>LP_L3_OMPS_MZM#</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_MIPAS_MZM</td>
<td>FMI</td>
<td>The dataset is created in Phase 1. If updated L2 dataset will be available, the MZM dataset will be replaced with a newer one.</td>
</tr>
<tr>
<td>Dataset</td>
<td>Agency</td>
<td>Status</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>--------</td>
<td>--------------</td>
</tr>
<tr>
<td>LP_L3_GOMOS_MZM</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_OSIRIS_MZM</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_SMR_MZM</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_ACE_MZM</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_SAGEII_MZM</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_HALOE_MZM</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_MRG_MZM</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_MRG_SMM</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>LP_L3_FR</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>UTLS_L3_SCIA</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>UTLS_L3_MIPAS</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>UTLS_L3_GOMOS</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>UTLS_L3_Osiris</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>UTLS_L3_ACE</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>UTLS_L3_MRg</td>
<td>FMI</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L3_MIPAS_MZM_DN</td>
<td>KIT</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L3_MIPAS_MZM_DN_DCA*</td>
<td>KIT</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L3_MRG_MZM_DN</td>
<td>KIT</td>
<td>tbd</td>
</tr>
<tr>
<td>MLT_L3_MRG_MZM_DCA*</td>
<td>KIT</td>
<td>tbd</td>
</tr>
</tbody>
</table>
Table 5.2 Level 3 and L4 Products

5.1.1 Production of Ozone Total Column and Tropical Tropospheric Column

Figure 5.1 Overall ECV Production Scenarios for Total Column and Tropical Tropospheric Column

The system should be able to run the following processing steps:

- **Step 1**
  Ingest L1 input products from GOME, SCIAMACHY, GOME-2A, GOME-2B, OMI or OMPS. L1 products are consolidated orbits from ascending node to ascending node.

- **Step 2** (TC L2 Processor)
  Generate and archive L2 intermediate products for GOME, SCIAMACHY, GOME-2A, GOME-2B, OMI or OMPS using the GODFIT v3 algorithm.
  One L2 product is generated for each L1 product.

- **Step 3** (TC L3 Processor)
  Generate and archive L3 intermediate products for GOME, SCIAMACHY, GOME-2A, GOME-2B, OMI or OMPS.
  L3 products are gridded monthly means of a single sensor generated with all L2 products of a given month.

- **Step 4** (TC L3 Merge Processor)
  Generate and archive output O3TC ECV.
  O3TC ECV products are monthly means of merged L3 products from GOME, SCIAMACHY, GOME-2A, GOME-2B, OMI or OMPS.

5.1.1.1 Partial Reprocessing Scenario for Total Column

- The system should be able to run independently single steps from the full processing scenario in order to reprocess intermediate and/or final products, i.e. partial reprocessing by running steps 2.+3.+4., or by running steps 3.+4., or by running only step 4.
  Optionally it may be decided to provide a possibility to restrict the processing according to a given time range or orbit range.

5.1.1.2 Processing Scenario for TTOC Products

 The system should be able to run the following processing steps:

- **Step 1**
  Ingest L1 input products from GOME, GOME-2A and GOME-2B.
- Step 2 (TC&CL L2 Processor)
  Generate and archive L2 intermediate ozone and cloud products for GOME, GOME-2A and GOME2-B.
- Step 3 (TTOC L3 Processor)
  Generate and archive L3 intermediate products for GOME, GOME-2A and GOME2-B.
- Step 4 (TTOC L3 Merge Processor)
  Generate and archive output O3TTOC ECV.

5.1.2 Production of Nadir Ozone Profile ECV Parameter

![Figure 5-2 Overall ECV Production Scenarios for Nadir Profile](image)

The production chain for Nadir Ozone Profile is shown in Figure 5-2.

5.1.2.1 Full Processing Scenario for Nadir Profile

The system should be able to run the following processing steps:

- Step 1
  Ingest L1 input products from GOME, SCIAMACHY, OMI, GOME-2 and IASI and necessary auxiliary data products (ECMWF data).
  L1 products are consolidated orbits from ascending node to ascending node.
- Step 2 (NP L2 Processor)
  Generate and archive L2 intermediate products for GOME, SCIAMACHY, OMI GOME-2 and IASI.
  One L2 product is generated for each L1 product
- Step 3a (NP L3 Merge and NP L4 ASSIM Processor)
  Generate and archive merged L3 products for the nadir ozone profiles based on all L2 data.
- Step 3ab (NP L3 Merge and NP L4 ASSIM Processor)
  Generate and archive merged L3 products for the nadir ozone profiles based on all L2 data.

The detailed processing scenarios are provided in Figure 5-3 and in Figure 5-4. Note that the required meteorological fields from ECMWF need to be pre-processed before they can be used. This is provided in Figure 5-5.
Orbit based level 1 files

L2 processor capable of processing orbit based files from OMI, GOME, SCIAMACHY, and GOME2 into orbit based L2 files

Orbit based level 2 files

L3 ECV Merge processor ingests 1 month of L2 orbit files into a monthly averaged L3 O3NP file in a month with overlapping instruments (e.g., GOME and SCIAMACHY data is available), the pixels are averaged

Note the processing system is responsible to collect and provide the month of orbits and meteo files and signal the processor to start processing

Mothly averaged gridded L3 Ozone Nadir profile

ECMWF meteorological data
Daily data (temperature)

Figure 5-3 Detailed processing diagram O3NL L3

ECMWF meteorological data
Daily data (temperature)

One processing run on daily data of the LV4 ECV processor results in 4 O3NP L4 files, containing 6 hours of data each

L4 ECV Merge

Orbit based level 1 files

L2 processor capable of processing orbit based files from OMI, GOME, SCIAMACHY, and GOME2 into orbit based L2 files

Orbit based level 2 files

L4 ECV Merge ingest one day of orbits of all available instruments on that day.

Note the processing system is responsible to collect and provide the day of orbits and meteo files and signal the processor to start processing

Figure 5-4 Detailed processing diagram O3NP L4
**Figure 5-5 Detailed processing diagram Meteorological data**

### 5.1.2.2 Partial Reprocessing Scenario

- The system should be able to run independently single steps from the full processing scenario in order to reprocess intermediate and/or final products, i.e. partial reprocessing by running steps 2.+ 3., or by running only step 3.

### 5.1.3 Production of Limb Ozone Profile ECV Parameter

The production scenarios of the Limb Profile products can be subdivided into the following scenarios:

- Production of Limb Profiles based on the harmonized Limb Profile products.
- Production of UTLS products based on the harmonized Limb Profile products.
- Production of MLT products
- Production of LNTOC products
5.1.3.1 Full Processing Scenario for the harmonized Limb Profile Products

Figure 5-6 ECV Production Scenarios for harmonized MZM Limb Products

The production chain for the harmonized MZM Limb Ozone Profile is shown in Error! Reference source not found.. MLT L3 MIPAS Processor.

The system should be able to run the following processing steps:

- Generation of the harmonized 2 profiles (e.g. LP_GOMOs_L2, LP_MIPAS) using the sensor specific LP_L2 processor
  - Screening the original Level 2 profiles for invalid data
  - Interpolation to the HARMOZ pressure grid
  - Saving the data in the netcdf format (mandatory and optional parameters)

- Generation of the gridded and merged MZM L3 products
  - Creation of Level 3 data from each individual instrument (Monthly Zonal Mean and Semi-Monthly Mean data). Computing parameters and uncertainties associated with the Level 3 data
  - Creation of merged data based on individual L3 data (for MZM and SMM)
  - Creating netcdf files

5.1.3.2 Full Processing Scenario for the Generation of the MLT Products

Will be defined after the data generation.
The production chain for the generation of the MLT Limb products is shown in Figure 5-7. The system should be able to run the following processing steps:

- tbd

5.1.3.3 Full Processing Scenario for the Generation of the UTLS Products

Will be defined after the data generation.

The production chain for the generation of the UTLS Limb products is shown in Figure 5-8. The system should be able to run the following processing steps:

- tbd

5.1.3.4 Full Processing Scenario for the Generation of the LNTOC Products

The system should be able to run the following processing steps:

- tbd

5.1.4 Online Access to Ozone ECV Products

The ECV products are provided by the FTP Server at BIRA. The products are uploaded according to Data Standards Requirements for CCI Data Producer ([AD3]) from the processing systems. The users are then able to download the products directly from the FTP server. The products are provided on the server according to the directory path which is defined within the PSD ([AD5]). An overview about the directory paths and their content is provided on the top level of the entry point.
6 Subsystem and Subsystem Components

This chapter describes the further subsystem and component decomposition including their functions, interfaces and interface items which are exchanged between them. The production workflows described in chapter 5.1 are handled via already existing processing facilities in different organizations. The online access is provided by a central ftp server at BIRA. The following chapters describe how the Ozone_cci system is composed of physical subsystems including their components. The different subsystems are the specific processing facilities of the involved organizations and the data services at BIRA. Components are the specific processors in order to execute the required algorithms which are necessary to generate the required products.

6.1 Processing Facilities for Nadir Ozone_cci Products

The following processing facilities are used for the generation of all required nadir Ozone_cci products:

- Processing Facility at BIRA
- Processing Facility at DLR
- Processing Facility at KLMI
- Processing Facility at RAL
- Processing Facility at ULB

![Image of Processing Facilities for TC and TTOC](image1)

![Image of Processing Facilities for NP](image2)
6.1.1 Processing Facility at BIRA

6.1.1.1 Description

This processing facility provides the processors:

- TC L2 Processor

6.1.1.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>TC L2 Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>GODFIT V3</td>
</tr>
<tr>
<td>Description</td>
<td>The processor ingests binary or HDF level 1 data (GOME, SCIAMACHY, GOME-2, OMI or OMPS) on orbit basis as well as required auxiliary data, and produces a level 2 O3 total column product. The L2 processing is orbit oriented. One L1 orbit results in one L2 orbit product.</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>GODFIT V3</td>
</tr>
</tbody>
</table>

6.1.1.3 Functions

The processing facility provides the following functions for Phase 1 and 2:

- Generation of TC_L2_GOME products from GOME L1 products
- Generation of TC_L2_SCIA products from SCIA L1 products
- Generation of TC_L2_GOME2A products from GOME2A L1 products
- Transfer all generated and validated TC_L2 products to the FTP Server and/or the processing facility at DLR

The processing facility provides the following additional functions for Phase 2:

- Generation of TC_L2_GOME-2B products from GOME2B L1 products
- Generation of TC_L2_OMI products from OMI L1 products
- Generation of TC_L2_OMPS products from OMPS L1 products
- Transfer all generated and validated TC_L2 products to the FTP Server and/or the processing facility at DLR

6.1.1.4 Interfaces and Interface Items

Inputs

- L1_GOME original L1 GOME products
- L1_SCIA original L1 SCIA products
- L1_GOME2A original L1 GOME2A products
- L1_GOME2B original L1 GOME2B products
- L1_OMI original L1 OMI products
- L1_OMPS original L1 OMPS products
- Auxiliary Data
  - FRESCOv6 and/or OCRA/ROCINN cloud products for GOME, SCIAMACHY and GOME-2A and-2B
  - KNMI O2-O2 cloud product for OMI.
  - Coordinates product for OMI.
  - NASA cloud product for OMPS.
6.1.1.5 Hardware Environment

BIRA-IASB, where the TC L2 processor is located, is well equipped for the proposed tasks:
- Central file servers for scientific and operational datasets:
  - 380 TB net capacity for datasets.
  - All storage is configured for high availability.
  - Part of the storage is configured in a cluster file system for high performance data processing.
- Linux cluster for data processing purposes (400+ x86 compatible computing cores).
- Central compute servers, shared with our Space-Pole partners KMI and KSB: Large, single system image CC-Numa compute server with 192 computing cores and 576 GB RAM. Vmware Vsphere 5 based cluster for virtual servers. Fully redundant configuration.
- State-of-the-art compilers (Fortran 90/95, C/C++, etc.), data analysis tools (IDL, MatLab, etc.), and general purpose software.

6.1.2 Processing Facility at DLR

6.1.2.1 Description

This processing facility provides the processors:
- TC L3 Processor
- TC L3 Merge Processor
- TC&CL L2 Processor
- TTOC L3 Processor
- TTOC L3 Merge Processor

6.1.2.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>TC L3 Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>UCAS</td>
</tr>
<tr>
<td>Description</td>
<td>Level 3 processing: monthly regrid level 2 data, output to netCDF CF</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>existing Universal Climate processor for Atmospheric Spectrometers (UCAS)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>TC L3 Merge Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>UCAS</td>
</tr>
<tr>
<td>Description</td>
<td>ECV processing: monthly mean merge GOME, SCIAMACHY, GOME-2, OMI or optionally OMPS data, output to netCDF CF</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>existing Universal Climate processor for Atmospheric Spectrometers (UCAS)</td>
</tr>
</tbody>
</table>

| Title | TC&CL L2 Processor |
## Functions

The processing facility provides the following functions for Phase 1 and 2:

- Generation of TC_L3_GOME products from TC_GOME L2 products
- Generation of TC_L3_SCIA products from TC_SCIA L2 products
- Generation of TC_L3_GOME2A products from TC_GOME2A L2 products
- Generation of TC_L3_GOME2B products from TC_GOME2B L2 products
- Generation of TC_L3_MRG products from all generated TC L3 products
- Generation of TTOC_L3_MRG products from all generated TTOC L3 products
- Transfer all generated and validated TC_L3_MRG products to the FTP Server

The processing facility provides the following additional functions for Phase 2:

- Generation of TC_L3_OMI products from OMI L2 products
- Generation of TC_L3_OMPS products from OMPS L2 products
- Generation of TC_L3_MRG products from all generated TC L3 products by additional consideration of the OMI and OMPS L3 products
- Generation of TTOC_L3_GOME products
- Generation of TTOC_L3_GOME2A products
- Generation of TTOC_L3_GOME2B products
- Transfer all generated and validated TC_L3_MRG and the TTOC L3 products to the FTP Server

### Interfaces and Interface Items

#### Inputs

- **TC_L2_GOME**   Total Column L2 GOME products
- **TC_L2_SCIA**   Total Column L2 SCIA products
- **TC_L2_GOME2A** Total Column L2 GOME2A products
- **TC_L2_GOME2B** Total Column L2 GOME2B products
- **TC_L2_OMI**   Total Column L2 OMI products
- **TC_L2_OMPS**   Total Column L2 OMPS products
- **L1_GOME**   L1 GOME products
• L1 GOME-2 and L1 GOME-2A and GOME-2B products

**Outputs:**

• TC_L3_MRG the merged ozone Total Column L3
• TTOC_L3_MRG the merged ozone Tropical Tropospheric Column L3

### 6.1.2.5 Hardware Environment

Cluster of Linux (SuSE) computers.

### 6.1.3 Processing Facility at RAL

#### 6.1.3.1 Description

This processing facility provides the processors:

• NP L2 Processor

#### 6.1.3.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>NP L2 Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>RAL Ozone Profile Algorithm</td>
</tr>
<tr>
<td>Description</td>
<td>Ozone profiles are derived from nadir observations (Level 1b data) from GOME, SCIAMACHY, GOME-2 and OMI with an ozone profile Retrieval algorithm from RAL on an orbit basis. One L1 orbit results in one L2 orbit product.</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>RAL Ozone Profile Algorithm</td>
</tr>
</tbody>
</table>

#### 6.1.3.3 Functions

The processing facility provides the following functions for Phase 1 and 2:

• Generation of NP_L2_GOME products from GOME L1 products
• Generation of NP_L2_SCIA products from SCIA L1 products
• Generation of NP_L2_GOME2A products from GOME2A L1 products
• Transfer all generated and validated NP_L2 products to the FTP Server

The processing facility provides the following additional functions for Phase 2:

• Generation of NP_L2_GOME2B products from GOME2B L1 products
• Generation of NP_L2_OMI products from OMI L1 products
• Transfer all generated and validated NP_L2 products to the FTP Server and/or the processing facility at KNMI

#### 6.1.3.4 Interfaces and Interface Items

**Inputs**

• L1_GOME original L1 Gome products
• L1_SCIA original L1 SCIA products
• L1_GOME2A original L1 GOME2A products
• L1_GOME2B original L1 GOME2B products
• L1_OMI original L1 OMI products
• Auxiliary Data
  - ECMWF ERA Interim meteorological data
  - FRESCOv6 and/or OCRA/ROCINN cloud products for GOME, SCIAMACHY and GOME-2A and-2B
Coordinates product for OMI.
- KNMI O2-O2 cloud product for OMI

Outputs:
- NP_L2_GOME Nadir Profile L2 GOME products
- NP_L2_SCIA Nadir Profile L2 SCIA products
- NP_L2_GOME2ANadir Profile L2 GOME2A products
- NP_L2_GOME2B Nadir Profile L2 GOME2B products
- NP_L2_OMI Nadir Profile L2 OMI products

6.1.3.5 Hardware Environment

The Nadir Profile L2 processing is performed on the JASMIN-CEMS facility located at the Rutherford Appleton Laboratory (RAL) in the UK. JASMIN-CEMS provides a high-speed interface between a Panasas data repository (e.g., containing L1 and meteorological data) and the dedicated processing cluster, in addition to local temporary output product storage.

The processing is performed on 512 dedicated processing cores with frequent access to 3000 more when available. These processors mostly comprise Intel Xeon E5-2650 v2 "Ivy Bridge" (Viglen HX525T2i) each with 16 cores and either 128 or 512 Mb memory.

6.1.4 Processing Facility at KNMI

6.1.4.1 Description

This processing facility provides the processors:
- NP L3 Merge Processor
- NP L4 ASSIM Processor

6.1.4.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>NP L3 Merge Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The nadir ozone profiles are homogenized into a level 3 product by regridding and interpolation and into a level 4 product by assimilation within the TM5 chemical-transport model. Merging will take place based on the level 2 data.</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>NP L4 ASSIM Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
</tr>
<tr>
<td>Description</td>
<td>The nadir ozone profiles are homogenized into a level 3 product by regridding and interpolation and into a level 4 product by assimilation within the TM5 chemical-transport model. Merging will take place based on the level 2 data.</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td></td>
</tr>
</tbody>
</table>

6.1.4.3 Functions

The processing facility provides the following functions for Phase 1 and 2:
- Generation of NP_L3_MRG products from all NP L2 products
• Generation of NP_L4_ASSIM products from all NP L2 products
• Transfer all generated and validated NP_L3_MRG and the NP_L4_ASSIM products to the FTP Server

The processing facility provides the following additional functions for Phase 2:
• Generation of NP_L3_MRG products from all generated NP L2 products by additional consideration of the OMI and IASI L2 products
• Generation of NP_L4_ASSIM products from all generated NP L2 products by additional consideration of the OMI and IASI L2 products
• Transfer all generated and validated NP_L3_MRG and the NP_L4_ASSIM products to the FTP Server

6.1.4.4 Interfaces and Interface Items

Inputs
• NP_L2_GOME Nadir Profile L2 Gome products
• NP_L2_SCIA Nadir Profile L2 SCIA products
• NP_L2_GOME2A Nadir Profile L2 GOME2A products
• NP_L2_GOME2B Nadir Profile L2 GOME2B products
• NP_L2_OMI Nadir Profile L2 OMI products
• NP_L2_IASI Nadir Profile L2 IASI products

Outputs:
• NP_L3_MRG the merged Nadir Profile L3 products
• NP_L4_ASSIM the assimilated Nadir Profile L4 products

6.1.4.5 Hardware Environment

Special computing facilities consisting of blades and virtual blades on a central KNMI computing facilities

6.1.5 Processing Facility at ULB

6.1.5.1 Description
This processing facility provides the processors:
• NP L2 Processor

6.1.5.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>NP L2 Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>FORLI-O3</td>
</tr>
<tr>
<td>Description</td>
<td>The processor ingests binary (BUFR) level 1 data (IASI) on PDU basis and produces a level 2 O3 nadir profile product.</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>FORLI-O3</td>
</tr>
</tbody>
</table>

6.1.5.3 Functions

The processing facility provides the following functions for Phase 2:
• Generation of NP_L2_IASI products from IASI L1 products
• Transfer all generated and validated NP_L2_IASI products to the FTP Server and/or the processing facility at KNMI
6.1.5.4 Interfaces and Interface Items

Inputs:
- L1_IASI original L1 IASI products
- Auxiliary Data
  - IASI L2 meteorological data
  - FORLI look-up tables
  - orography/emissivity

Outputs:
- NP_L2_IASI

6.1.5.5 Hardware Environment

3 PC INTEL Servers each one includes:
- 8GB RAM
- 12TB storage (RAID-6)
- ARCH x86_64

2 NAS SYNOLOGY servers with a total of:
- 4GB RAM
- 46 TB storage (RAID-5)
- DSM 4.3

1 LINUX CLUSTER including:
- Torque/Maui PBS scheduler
- 21(23) nodes totaling 344(354) threads, running ArchLinux x86_64

6.2 Processing Facilities for Limb Ozone_cci Products

The following processing facilities are used for the generation of all required nadir Ozone_cci products:
- Processing Facility at CHALM
- Processing Facility at FMI
- Processing Facility at KIT
- Processing Facility at UBR
- Processing Facility at UofT
- Processing Facility at UoS

6.2.1 Processing Facility at CHALM

6.2.1.1 Description

This processing facility provides the processors:
- LP L2 SMR Processor
- MLT L2 SMR Processor
- MLT L3 SMR Processor
6.2.1.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>LP L2 SMR Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>MLT L2 SMR Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>MLT L3 SMR Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

6.2.1.3 Functions

The processing facility provides the following functions for Phase 2:

- Generation of harmonized LP_L2_SMR products
- Generation of the SMR L2 and L3 MLT products
- Transfer all generated and validated LP L2 products and the L2 and L3 MLT products to the FTP Server and/or the processing facility at FMI and KIT

6.2.1.4 Interfaces and Interface Items

**Inputs**

- L1_SMR original L1 SMR products
- Auxiliary Data
  - ?

**Outputs:**

- LP_L2_SMR harmonized LP L2 products for SMR
- MLT_L2_SMR_DN L2 Mesosphere-Low Thermospheric Ozone products for SMR
- MLT_L2_SMR_DN_DCA_L2 tbd
- MLT_L3_SMR_MZM_DN_L3 tbd
6.2.1.5 Hardware Environment

tbd

6.2.2 Processing Facility at FMI

6.2.2.1 Description

This processing facility provides the processors:

- LP L2 GOMOS HARMOZ Processor
- LP L3 MZM Processor
- LP MZM MERGE Processor
- LP L3 SMM Processor
- LP SMM MERGE Processor
- LP L3 FR Processor
- UTLS L2 GOMOS Processor
- UTLS L3 Processor
- UTLS MERGE Processor
- MLT L2 GOMOS Processor
- MLT L3 GOMOS Processor

Figure 6-4 Processing Facility at FMI – MZM Workflow
Figure 6.5 Processing Facility at FMI – MLT and UTLS Workflow

6.2.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>Processor Name</th>
<th>Description</th>
<th>Used Algorithm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>LP L2 GOMOS Processor</td>
<td>Filtering the data and creation of GOMOS data in the HARMOZ format. The software is developed with Matlab.</td>
<td>Details of data screening is described in (Sofieva et al., 2013, ESSD)</td>
</tr>
<tr>
<td>Title</td>
<td>LP L3 Processor</td>
<td>Creating monthly zonal mean data for each instrument using the HARMOZ level 2 data. Evaluation of uncertainties associated with the L3 data</td>
<td>Computing mean values in the spatio-temporal bins. Details of the method for evaluation of uncertainties are presented in (Sofieva et al., 2014, AMT) and User Manual.</td>
</tr>
<tr>
<td>Title</td>
<td>LP MZM MERGE Processor</td>
<td>Creation of merged monthly zonal mean data using the MZM data from individual instruments. Evaluation of associated uncertainties.</td>
<td>Merging is performed by computing weighted mean data according to the total uncertainties. The details are in the User Manual.</td>
</tr>
<tr>
<td>Title</td>
<td>LP L3 SMM Processor</td>
<td>Creating semi-monthly mean ozone profiles in $10^\circ \times 20^\circ$ latitude-longitude bins for each sensor. Evaluation of associated uncertainties.</td>
<td>The details are in User Manual.</td>
</tr>
<tr>
<td>Title</td>
<td>LP SMM MERGE Processor</td>
<td>Creating semi-monthly mean ozone profiles in $10^\circ \times 20^\circ$ latitude-longitude bins. Evaluation of associated uncertainties.</td>
<td>The averaging and merging is analogous to creation of the merged monthly zonal mean data. The details are in User manual</td>
</tr>
<tr>
<td>Title</td>
<td>LP L3 FR Processor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**References:**

- Sofieva et al., 2013, ESSD
- Sofieva et al., 2014, AMT
- User Manual
6.2.2.3 Functions

The processing facility provides the following functions for Phase 1 and 2:

- Generation of harmonized LP_L2_GOMOS products
- Generation of the LP_L3 products for all sensors
- Generation of LP_L3_MZM_MRG products from all generated LP_L3 products
- Generation of LP_L3_SMM products for all sensors from the harmonized LP_L2 products
- Generation of LP_L3_MRG_SMM products for all generated LP_L3 SMM products
- Generation of LP_L3_FR products for all sensors from the harmonized LP_L2 products
- Transfer all generated and validated LP_L3, LP_L3_MRG_MZM, LP_L3_SMM, LP_L3_MRG_SMM and LP_L3_FR products to the FTP Server

The processing facility provides the additional functions for Phase 2:

- Generation of UTLS_L2_GOMOS products
- Generation of MLT_L2 and MLT_L3 products for GOMOS
- Generation of the UTLS_L3 products for all sensors
- Generation of UTLS_L3_MRG products from all generated LP_L3 products
- Transfer all generated and validated UTLS_L3 and UTLS_L3_MRG products to the FTP Server
• Transfer all generated and validated MLT_L2 and MLT_L3 products for GOMOS to the FTP server and/or to KIT.

6.2.2.4 Interfaces and Interface Items

Inputs

- GOMOS_L2 original L2 GOMOS products
- Auxiliary Data
  - LP_L2_SCIA harmonized Limb Profile L2 products for SCIAMACHY
- LP_L2_OMPS harmonized Limb Profile L2 products for OMPS
- LP_L2_MIPAS harmonized Limb Profile L2 products for MIPAS
- LP_L2_OSIRIS harmonized Limb Profile L2 products for OSIRIS
- LP_L2_SMR harmonized Limb Profile L2 products for SMR
- LP_L2_ACE harmonized Limb Profile L2 products for ACE
- LP_L2_SAGEII harmonized Limb Profile L2 products for SAGEII
- LP_L2_HALOE harmonized Limb Profile L2 products for HALOE
- LP_L2_MLS harmonized Limb Profile L2 products for MLS
- UTLS_L2_SCIA Upper Troposphere - Lower Stratosphere L2 products for SCIAMACHY
- UTLS_L2_MIPAS Upper Troposphere - Lower Stratosphere L2 products for MIPAS
- UTLS_L2_GOMOS Upper Troposphere - Lower Stratosphere L2 products for GOMOS
- UTLS_L2_Osiris Upper Troposphere - Lower Stratosphere L2 products for OSIRIS
- UTLS_L2_ACE Upper Troposphere - Lower Stratosphere L2 products for ACE

Outputs:

- LP_L2_GOMOS harmonized Limb Profile L2 products for GOMOS
- LP_L3_SCIA_MZM gridded Limb Profile L3 products for SCIAMACHY
- LP_L3_OMPS_MZM gridded Limb Profile L3 products for OMPS
- LP_L3_MIPAS_MZM gridded Limb Profile L3 products for MIPAS
- LP_L3_GOMOS_MZM gridded Limb Profile L3 products for GOMOS
- LP_L3_Osiris_MZM gridded Limb Profile L3 products for OSIRIS
- LP_L3_SMR_MZM gridded Limb Profile L3 products for SMR
- LP_L3_ACE_MZM gridded Limb Profile L3 products for ACE
- LP_L3_SAGEII_MZM gridded Limb Profile L3 products for SAGEII
- LP_L3_HALOE_MZM gridded Limb Profile L3 products for HALOE
- LP_L3_MLS_MZM gridded Limb Profile L3 products for MLS
- LP_L3_MRG_MZM merged Limb Profile products on monthly mean
- LP_L3_SMM semimonthly-mean Limb Profile L3 products (resolved longitudinal structure), for individual instruments
- LP_L3_MRG_SMM merged semimonthly-mean Limb Profile L3 products (resolved longitudinal structure)
- LP_L3_MIPAS_FR fine-resolution L3 Limb Profile products for MIPAS
• LP_L3_GOMOS_FR  fine-resolution L3 Limb Profile products for GOMOS
• LP_L3_OSIRIS_FR  fine-resolution L3 Limb Profile products for OSIRIS
• LP_L3_ACE_FR    fine-resolution L3 Limb Profile products for ACE
• LP_L3_SMR_FR     fine-resolution L3 Limb Profile products for SMR
• LP_L3_SCIA_FR    fine-resolution L3 Limb Profile products for SCIA
• UTLS_L3_SCIA     Upper Troposphere - Lower Stratosphere L3 products for SCIAMACHY
• UTLS_L3_MIPAS    Upper Troposphere - Lower Stratosphere L3 products for MIPAS
• UTLS_L3_GOMOS    Upper Troposphere - Lower Stratosphere L3 products for GOMOS
• UTLS_L3_OSIRIS   Upper Troposphere - Lower Stratosphere L3 products for OSIRIS
• UTLS_L3_ACE      Upper Troposphere - Lower Stratosphere L3 products for ACE
• UTLS_L3_MRG      merged Upper Troposphere - Lower Stratosphere L3 products
• MLT_L2_GOMOS_DN  L2 Mesosphere-Low Thermospheric Ozone products for GOMOS
• MLT_L2_SMR_DN_DCA
• MLT_L3_SMR_MZM_DN
• MLT_L3_SMR_MZM_DN_DCA

6.2.2.5  Hardware Environment
Desktop computers, data storage

6.2.3  Processing Facility at KIT

6.2.3.1  Description
This processing facility provides the processors:
• LP_L2 MIPAS Processor
• MLT_L2 MIPAS Processor
• MLT_L3 MIPAS Processor
Figure 6-6 Processing Facility at KIT

6.2.3.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>LP L2 MIPAS Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>MIPAS IMK/IAA Scientific Level 2 Processor</td>
</tr>
<tr>
<td>Description</td>
<td>This processor ingests level 1 ozone Spectra of MIPAS produced by ESA and produces out of it</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>IMK/IAA Scientific + KOPRA/RCP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>UTLS L2 MIPAS Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>MIPAS IMK/IAA Scientific Level 2 Processor</td>
</tr>
<tr>
<td>Description</td>
<td>This processor ingests level 1 ozone Spectra of MIPAS produced by ESA and produces out of it</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>IMK/IAA Scientific + KOPRA/RCP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>MLT L2 MIPAS Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>MIPAS IMK/IAA Scientific Level 2 Processor</td>
</tr>
<tr>
<td>Description</td>
<td>This processor ingests level 1 ozone Spectra of MIPAS produced by ESA and produces out of it</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>IMK/IAA Scientific + KOPRA/RCP</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>MLT L3 MIPAS Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>MLT L3 MERGE Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

6.2.3.3 Functions

The processing facility provides the following functions for Phase 1 and 2:
- Generation of harmonized LP_L2_MIPAS products
- Generation of the MIPAS L2 and L3 MLT products
- Merging of the L3 MLT products
- Transfer all generated and validated LP lParam L2 products to the FTP Server and/or the processing facility at FMI
- Transfer all generated and validated MIPAS L2 and L3 MLT products to the FTP Server
- Transfer all generated and validated merged MLT products to the FTP Server

The processing facility provides the following additional functions for Phase 2:
- Generation of the MIPAS L2 and L3 MLT products
- Merging of the L3 MLT products
- Transfer all generated and validated MIPAS L2 and L3 MLT products to the FTP Server
- Transfer all generated and validated merged MLT products to the FTP Server

6.2.3.4 Interfaces and Interface Items

Inputs:
- MIPAS_L2: original L2 MIPAS products
- Auxiliary Data
  - ECMWF data analysis
- MLT_L3_GOMOS_MZM_DN: L3 Mesosphere-Low Thermospheric Ozone products for GOMOS
- MLT_L3_GOMOS_MZM_DN_DCA
- MLT_L3_SMR_MZM_DN: L3 Mesosphere-Low Thermospheric Ozone products for SMR
- MLT_L3_SMR_MZM_DN_DCA
- MLT_L3_ACE_MZM_DN: L3 Mesosphere-Low Thermospheric Ozone products for ACE
- MLT_L3_ACE_MZM_DN_DCA

Outputs:
- LP_L2_MIPAS: harmonized Limb Profile L2 products for MIPAS
- UTLS_L2_MIPAS: Upper Troposphere - Lower Stratosphere L2 products for MIPAS
- MLT_L2_MIPAS_DN: L2 Mesosphere-Low Thermospheric Ozone products for MIPAS
- MLT_L2_MIPAS_DN_DCA
- MLT_L3_MIPAS_MZM_DN
- MLT_L3_MIPAS_MZM_DN_DCA
- MLT_L3_MRG_MZM_DN
- MLT_L3_MRG_MZM_DN

6.2.3.5 Hardware Environment

TBD
6.2.4 Processing Facility at UBR

6.2.4.1 Description

This processing facility provides the processors:
- LP L2 SCIA Processor
- LP L2 OMPS Processor
- LP L2 SAGEII Processor
- LP L2 HALOE Processor
- LP L2 MLS Processor
- UTLS L2 SCIA Processor
- LNTOC SCIA Processor
- LNTOC OMPS Processor

Figure 6-7 Processing Facility at UBR

6.2.4.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>LP L2 SCIA Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>SCIAMACHY HARMOZ</td>
</tr>
<tr>
<td>Description</td>
<td>Filtering of SCIAMACHY ozone profiles, interpolation on the CCI grid and data production (See HARMOZ.pdf)</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>esacci_harmoz.pro processed with the IDL software</td>
</tr>
</tbody>
</table>
### Title
LP L2 OMPS Processor

**Name**: Not available yet  
**Description**: Not available yet  
**Used Algorithm**: Not available yet

### Title
LP L2 SAGEII Processor

**Name**: Not available yet  
**Description**: Not available yet  
**Used Algorithm**: Not available yet

### Title
LP L2 HALOE Processor

**Name**: Not available yet  
**Description**: Not available yet  
**Used Algorithm**: Not available yet

### Title
LP L2 MLS Processor

**Name**: HARMOZ MLS  
**Description**: Processing, regridding and interpolation of MLS ozone profiles on CCI-grid. Filtering and screening of bad data are performed. GHOr native geometrical altitude grid of MLS information is replaced by interpolated ECMWF altitude grid.  
**Used Algorithm**: harmoz_mls_v02.pro processed with IDL software

### Title
LNTOC SCIA Processor

**Name**: LNTOC_CODE_4  
**Description**: Available software developed by F.Ebojie. Performance in speed optimization and adjustment of NetCDF output for CCI.  
**Used Algorithm**: CODE_4_LIMB_NADIR_MATCH.pro processed with IDL software

### Title
LNTOC OMPS Processor

**Name**: Not available yet  
**Description**: Not available yet  
**Used Algorithm**: Not available yet

---

#### 6.2.4.3 Functions

The processing facility provides the following functions for Phase 1 and 2:

- Generation of harmonized LP_L2_SCIAMACHY products
- Transfer all generated and validated LP_L2 products for SCIAMACHY to the FTP Server and/or to the processing facility at FMI

The processing facility provides the additional functions for Phase 2:

- Generation of harmonized LP_L2_OMPS products
- Generation of harmonized LP_L2_SAGEII products
- Generation of harmonized LP_L2_HALOE products
- Generation of harmonized LP_L2_MLS products
- Generation of the LNTOC products for SCIA.
- Generation of the LNTOC products for OMPS.
- Transfer all generated and validated LP_L2 products for OMPS, SAGEII, HALOE and MLS to the FTP Server and/or to the processing facility at FMI
- Transfer all generated and validated LNTOC products for SCIA and OMPS to the FTP Server

6.2.4.4 Interfaces and Interface Items

**Inputs**
- SCIA\(_L2\) original L2 SCIAMACHY products
- OMPS\(_L2\) original L2 OMPS products
- SAGE II\(_L2\) original L2 SAGE II products
- HALOE\(_L2\) original L2 HALOE products
- MLS\(_L2\) original L2 MLS products
- SCIA\(_L2\) original L2 SCIAMACHY products
- Auxiliary Data
  - ECMWF data: Pressure, temperature and altitude

**Outputs:**
- LP\(_L2\)_SCIA harmonized Limb Profile L2 products for SCIAMACHY
- LP\(_L2\)_OMPS harmonized Limb Profile L2 products for OMPS
- LP\(_L2\)_SAGEII harmonized Limb Profile L2 products for SAGEII
- LP\(_L2\)_HALOE harmonized Limb Profile L2 products for HALOE
- LP\(_L2\)_MLS harmonized Limb Profile L2 products for MLS
- LNTOC\(_L3\)_ENVISAT tbd
- LNTOC\(_L3\)_OMPS tbd
- LNTOC\(_L3\)_OMPSG2 tbd

6.2.4.5 Hardware Environment

Local computer and cluster grid engine.

6.2.5 Processing Facility at UofT

6.2.5.1 Description

This processing facility provides the processors:
- LP L2 ACE Processor
- UTLS L2 ACE Processor
- MLT L2 ACE Processor
- MLT L3 ACE Processor

![Processing Facility UofT Diagram]
Figure 6-8 Processing Facility at UoT

6.2.5.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>LP L2 ACE Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>UTLS L2 ACE Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>MLT L2 ACE Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>MLT L3 ACE Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>tbd</td>
</tr>
<tr>
<td>Description</td>
<td>tbd</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>tbd</td>
</tr>
</tbody>
</table>

6.2.5.3 Functions

The processing facility provides the following functions for Phase 2:

- Generation of harmonized LP_L2_ACE products
- Generation of the UTLS L2 products for ACE
- Generation of the ACE L2 and L3 MLT products
- Transfer all generated and validated LP_L2 products, UTLS L2 products and the L2 and L3 MLT products for ACE to the FTP Server and/or the processing facility at FMI and KIT

6.2.5.4 Interfaces and Interface Items

Inputs

- ACE_L2 original L2 ACE products
- Auxiliary Data
  
Outputs:

- LP_L2_ACE harmonized LP L2 products for ACE
- UTLS_L2_ACE Upper Troposphere - Lower Stratosphere L2 products for ACE
- MLT_L2_ACE_DN L2 Mesosphere-Low Thermospheric Ozone products for SMR
- MLT_L2_ACE_DN_DCA_L2 tbd
- MLT_L3_ACE_MZM_DN_L3 tbd
- MLT_L3_ACE_MZM_DN_DCA_L3 tbd
6.2.5.5 Hardware Environment
tbd

6.2.6 Processing Facility at UoFS

6.2.6.1 Description
This processing facility provides the processors:
- LP L2 OSIRIS Processor
- UTLS L2 OSIRIS Processor

![Processing Facility UoFS Diagram]

Figure 6-9 Processing Facility at UoFS

6.2.6.2 Processors

<table>
<thead>
<tr>
<th>Title</th>
<th>LP L2 OSIRIS Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>SaskMART 5.07</td>
</tr>
<tr>
<td>Description</td>
<td>The processor ingests binary level 1 data (OSIRIS) on orbit basis and produces a level 2 O3 limb profile product.</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>SaskMART, SASKTRAN</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Title</th>
<th>UTLS L2 OSIRIS Processor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>SaskMART 5.07</td>
</tr>
<tr>
<td>Description</td>
<td>The processor ingests binary level 1 data (OSIRIS) on orbit basis and produces a level 2 O3 UTLS product.</td>
</tr>
<tr>
<td>Used Algorithm</td>
<td>SaskMART, SASKTRAN</td>
</tr>
</tbody>
</table>

6.2.6.3 Functions
The processing facility provides the following functions for Phase 2:
- Generation of harmonized LP_L2_OSIRIS products
- Generation of the UTLS L2 products for OSIRIS
- Transfer all generated and validated LP_L2 products and UTLS L2 products for OSIRIS to the FTP Server and/or the processing facility at FMI

6.2.6.4 Interfaces and Interface Items

Inputs
- OSIRIS_L2
- Auxiliary Data
  - None

Outputs
- LP_L2_OSIRIS
  - harmonized LP L2 products for OSIRIS
6.2.6.5 Hardware Environment

Special computing facilities consisting of servers at the University of Saskatchewan.

6.3 Data Handling Domain

6.3.1 Online Access via FTP Server (OA)

6.3.1.1 Description

This processing facility provides the processors:
- LP L2 ACE Processor
- UTLS L2 ACE Processor
- MLT L2 ACE Processor
- MLT L3 ACE Processor

6.3.1.2 Functions

The ftp server at BIRA is used for the following functions:
- listing of all available Ozone_cci products
- provision of all output products from the Ozone_cci project. The simple open public ftp archive makes all output products accessible all time.

6.3.1.3 Hardware Environment

TBC

6.4 Management Domain

6.4.1 Production Management (PM)

The Production Management is an organizational component and has to be done on each processing facility. It is responsible to fulfil the following functions:
- Organization, monitoring and control of all operational production processes. This includes the production of new data as well as the production of reprocessing procedures.
- Organization, monitoring and control of all operational quality control processes.
  A quality control process may be a complete QA processing of a processed data set which must be executed independently from the L2, L3 or ECV merge processing. A QA process can also be a final subsequent processing step of the operational processing. A subsequent QA control process detects then only these products which are annotated with bad quality.
- Organization, monitoring and control of all operational product procurement processes. This includes the procurement of all needed input data. Detection and elimination of production errors. Maintenance and update of the Ozone_cci components and system according to the common development of the used COTS and the approved pre-operational algorithm versions and Ozone_cci component deliveries.
- Maintenance of the resources of the Ozone_cci system regarding needed disk space, archive space, available processing nodes, available processing systems
- Monitoring of the Ozone_cci system.
  This includes the monitoring of logfiles as well the listing of all available Ozone_cci products
- Provision of all output products from the Ozone_cci project. The simple open public ftp archive makes all output products accessible all time.

6.4.2 Algorithm/Processor Development Management (AM)

The Algorithm/Processor Development Management is an organizational component. It is responsible to fulfil the following functions:

- Definition of algorithm development priorities
  Definition of algorithm/processor development priorities in order to control the operational product evolution.
  This task has to be coordinated in interaction with the Climate Research Group (CRG) and the CCI Climate Modelling Group (CRG), the relevant science users, relevant instrument teams and relevant space agencies.

- Definition of new requirements
  Collection and definition of new requirements for the development and improvement of the algorithms

- Coordination of algorithm development
  Coordination of the algorithm development, according to the new requirements. This includes the organisation of all necessary steps which ensure well defined version controlled algorithm deliveries.

- Integration of new algorithm versions
  Integration of new algorithm versions into the operational system within a pre-operational instance

- Triggering of validation procedure
  Assurance of scientific quality of the ECV products triggering a subsequent verification and validation process of the pre-operational instance.

- This validation process is handled by the Validation
7 Data Flow for ECV Production

7.1 Phase 1

The following table gives an overview about the data flow required for the production of the 3 ECVs. The amount of L2, L3 and ECV data is derived from the input data specified within the DARD reduced by predefined scaling factors for the several processing steps.

<table>
<thead>
<tr>
<th>Input Products</th>
<th>Total Column</th>
<th>Intermediate Products L2</th>
<th>Intermediate Products L3</th>
<th>ECV Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOME L1</td>
<td>1000</td>
<td>63 16 14 70 4 16 500 2 0.13 16 1000 1 0.06 16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SCIA L1</td>
<td>16000</td>
<td>1778 9 160 100 119 9 16000 1 0.11 9 16000 1 0.11 9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GOME2 L1</td>
<td>15000</td>
<td>3750 4 150 100 25 4 15000 1 0.25 4 15000 1 0.25 4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>32000</td>
<td>5590 270 40 4 0.49 3 0.42 37908</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7-1 Data Flow Phase 1

7.2 Phase 2

The following tables give an overview about the data flow required for the production in phase 2. The amount of L2, L3 and ECV data is derived from the input data specified within the DARD reduced by predefined scaling factors for the several processing steps.
### Table 7-2 Data Flow for Total Columns and Nadir Profile products in Phase 2

<table>
<thead>
<tr>
<th>Input Products</th>
<th>Total Column</th>
<th>Intermediate Products L2</th>
<th>Intermediate Products L3</th>
<th>ECV Merged and TTOC Products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gbyte</td>
<td>Gbyte/y</td>
<td>Cover. Years</td>
<td>Gbyte</td>
</tr>
<tr>
<td>GOME L1</td>
<td>720</td>
<td>45</td>
<td>16</td>
<td>42</td>
</tr>
<tr>
<td>GOME-2A L1</td>
<td>17600</td>
<td>1451</td>
<td>12</td>
<td>470</td>
</tr>
<tr>
<td>GOME-2B L1</td>
<td>22000</td>
<td>5500</td>
<td>4</td>
<td>550</td>
</tr>
<tr>
<td>GOME-3 L1</td>
<td>11310</td>
<td>875</td>
<td>13</td>
<td>5</td>
</tr>
<tr>
<td>OMI L1</td>
<td>13600</td>
<td>1944</td>
<td>7.0</td>
<td>10.0</td>
</tr>
<tr>
<td>OMPS L1</td>
<td>51000</td>
<td>6800</td>
<td>7.5</td>
<td>4.5</td>
</tr>
<tr>
<td>Total</td>
<td>96836</td>
<td>13996</td>
<td>18</td>
<td>7</td>
</tr>
</tbody>
</table>

### Table 7-3 Data Flow for Limb Products in Phase 2

<table>
<thead>
<tr>
<th>Input Products</th>
<th>UTLS L2 Products</th>
<th>UTLS L3 Products</th>
<th>UTLS Merged Products</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gbyte</td>
<td>Gbyte/y</td>
<td>Cover. Years</td>
</tr>
<tr>
<td>LP L2 SCIA</td>
<td>4.0909</td>
<td>0.4545</td>
<td>9.0</td>
</tr>
<tr>
<td>LP L2 MIPAS</td>
<td>0.0000</td>
<td>0.0000</td>
<td>9.0</td>
</tr>
<tr>
<td>LP L2 GOMOS</td>
<td>0.4590</td>
<td>0.0510</td>
<td>9.0</td>
</tr>
<tr>
<td>LP L2 OSIRIS</td>
<td>5.5000</td>
<td>0.4231</td>
<td>13.0</td>
</tr>
<tr>
<td>Total</td>
<td>10.0499</td>
<td>0.9286</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Tbd indicates a value that is not yet determined.
Appendix A