



# DOCUMENT

## Sen2Cor 2.2.1 - Software Release Note

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# APPROVAL

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# CHANGE LOG

Reason for change	Issue	Revision	Date
New Release	1	0	02/05/2016

# CHANGE RECORD

Issue 1	Revision 0		
Reason for change	Date	Pages	Paragraph(s)
Initial Delivery, release 1.0.1	June 2014		
First Maintenance Patch, Delivery for Sentinel-2 Level 2A Prototype Processor. Sen2Cor release 2.0.3	22 May 2015	13	3.1.6
Urgent fix for correcting the scaling problem on the Level 2A output files. Sen2Cor release 2.0.4	25 Oct. 2015	12	3.1.5
Fix for calibration problem between 60/20 and 10 m resolutions. Sen2Cor release 2.0.5.	26 Nov. 2015	12	3.1.4
Fix corrupted version of windows openjp2.dll Added correction parameter for sun-earth distance. Sen2Cor release 2.0.6.	01 Dec. 2015	9	3.1.3
Parallel processing on tile base, Sen2Cor release 2.1.0.	10 Feb. 2016	8	3.1.2
Integration of Look Up Tables for Summer / Winter /Rural / Water atmospheric conditions, automated ozone determination, automated aerosol / atmosphere detection, improved up- and downsampling routines, new scene classification, selection of planet DEM, release 2.2.1.	29 Apr. 2016	8	3.1.1



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## 1. INTRODUCTION

### 1.1 Purpose and Scope

This document is produced in the context of the development of the Level-2A prototype processor. Its purpose is to detail the delivery of the Sentinel-2 Level-2A Prototype Processor Software, its Documentation and Environment.

### 1.2 Reference Documents

**Table 1-1: Reference Documents**

Reference	Code	Title	Issue
[L2A-GLODEF]	S2PAD-VEGA-GLO-0001	S2PAD Project Glossary	3.4

### 1.3 Acronyms and Abbreviations

All acronyms and abbreviations are listed in [L2A-GLODEF].

## 2. SOFTWARE RELEASE OVERVIEW

Sen2Cor 2.2.1 is a combined delivery, consisting of the 2<sup>nd</sup> maintenance patch (EOW delivery of CCN 2) and the final delivery for CCN 4, Contract 4200021450/08/I-EC. It contains the following fixes and improvements according to CCN2, 2<sup>nd</sup> maintenance patch:

Ref. (according to CCN 2)	Description
P-6	Fixes of processor anomalies as listed for sections 3.1.1 and 3.1.2 (2 <sup>nd</sup> maintenance patch).
P-6	Improvement of Scene Classification for correct classification of water, dark features and snow.
P-6	Improvement of DEM usage for correction of height profiles and mountainous shadows.

And the following implementations and upgrades according to CCN4:

Ref. (according to CCN 4)	Description
IMP-18	Final delivery: <ul style="list-style-type: none"> <li>• Final pack of 24 LUTs (set 1 – 4)</li> <li>• Final Generation report</li> <li>• Updated TN.</li> <li>• Final L1C TDS</li> </ul>
IMP-21	Updated processor including all look up tables as specified above, user selectable and automated aerosol detection, ozone selection, PSD V 13.1 compliant.

### 2.1 Delivery List

Delivery number	Description
D1	Set of 24 LUTs, incl. documentation.
D2	Processor Software with integrated LUTs as specified above.
D3	Updated Documents SUM, ATBD, PFS, PSD for V13.1.
D4	This release note.

Details on the delivery are listed in section 3. All other items listed in CCN 4 are already part of the previous deliveries 2.0.6 and 2.1.0/1.

### **3. STATUS OF THE SOFTWARE CONFIGURATION ITEM**

#### **3.1 Evolution History**

##### **3.1.1 Evolution since version (2.1.0)**

###### **3.1.1.1 New Features**

###### **3.1.1.1.1 Integration of Look Up Tables for Summer / Winter / Rural and Water atmosphere**

A set of 24 (LUTs) have been integrated to cover most of atmospheric conditions on Earth for the Sentinel-2 mission. In the SEN2COR context, a set of LUTs is composed by 6 or 4 LUT files depending on the total water vapor columns content of the atmosphere. Different LUTs are calculated for the mid-latitude summer and mid-latitude winter atmospheres, with 6 different (sea level) ozone contents, a rural and a maritime aerosol, 6 or 4 different sea level water vapor columns. For each supported water vapor level, the ground-to-space water vapor column depends on elevation according to the atmosphere temperature / humidity vertical profile provided. Details can be found in the user manual for SEN2COR 2.2.1.

SEN2COR LUTs are calculated for:

- 2 different types of aerosols (rural and maritime)
- 2 different types of atmospheres (Mid\_Latitude SUMMER and Mid\_Latitude WINTER)
- 6 different types of ozone concentrations (depending on summer or winter case)
- 6 or 4 different amounts of water vapor column (depending on summer or winter)

User configuration

The LUT selection is configurable via the three entries: Aerosol\_Type, Mid\_Latitude and Ozone\_Content in the Look\_UP\_Tables selection of the User Configuration file (L2A\_GIPP.xml) located in the cfg directory specified by the SEN2COR\_HOME environment variable. The water vapor columns are set internally.

###### **3.1.1.1.2 Implementation of automated ozone determination**

If the Ozone\_Content is set to 'o' by the user, it will be determined automatically by the processor. In that case, the measured ozone concentration is read from the L1C metadata and the LUT with the best fit for the measured ozone concentration is used.

###### **3.1.1.1.3 Implementation of automated aerosol / atmosphere detection**

If the Aerosol\_Type and / or Mid\_Latitude are set to 'AUTO' by the user, it will be determined automatically by the processor. In that case the processor will process two (aerosol only) or four test trials before the final processing of the atmospheric correction takes place. After calculation of the scene path radiance in the blue and red region (as total minus reflected radiance, using the average values obtained for the dark reference pixels) the ratio of  $L_p(\text{blue, scene})$  to  $L_p(\text{red, scene})$  can be compared to the corresponding ratio for the existing libRadtran aerosols (RURAL, MARITIME) or atmospheres (SUMMER, WINTER).

The aerosol type for which the double ratio (dp) is closest to 1 is the best approximation for the scene and will be selected.

###### **3.1.1.1.4 Improvement of the up- and down sampling routines**

During the scientific evaluation campaign it has been shown, that using the previous selected methods for up and down sampling the different resolutions of the images (scipy.ndimage.interpolation.zoom), distortions of the colocation for equivalent pixels occurred. These routines have thus been replaced by the two routines skimage.measure.block\_reduce



for down- and skimage.transform.resize for up-sampling. These changes have the drawback of reducing the speed of reading of the JP2 input slightly, but improved the quality of the image data considerably.

### **3.1.1.1.5 *Improvement of Scene Classification based on automated DEM selection***

Previous versions of the processor had a tendency of false classification of water pixels inside of cloud borders and the correct discrimination between topographic and cloud shadow pixels. This has now been improved by taking the height information of an (optional) digital elevation map (DEM) as an additional input. To use this feature it is necessary to activate the reading of an appropriate DEM as is described in the User Manual.

### **3.1.1.2 *Fixes of Anomalies***

#### **3.1.1.2.1 *Correction of setup routines***

Upgrade to Anaconda 4.0.0 and cleanup of the dependencies to fix the issue described in: <http://forum.step.esa.int/t/sen2or-install-error/1690/12>

#### **3.1.1.2.2 *Correction of problems with the openjpeg2 drivers on Windows***

The openjpeg DLL shipped with the previous versions of Sen2Cor was compiled with VC++. The DLL needs msucr120.dll and msvep120.dll to load properly. These two libraries are in most cases part of the windows installation under Windows\System32, but in some cases and some systems, they are apparently not present. The new library provides with this release was built with mingw, and has no longer any dependency to the VC++ 120 runtime dll.

## **3.1.2 *Evolution since version (2.0.6)***

### **3.1.2.1 *New Features***

#### **3.1.2.1.1 *Implementation of parallelisation on tile base***

SEN2COR supports now a parallel processing on tile base.

The maximum of processes can be determined via the L2A\_GIPP.xml input configuration:

```
<Nr_Processes>AUTO</Nr_Processes>
```

Nr\_Processes can be an unsigned integer value specifying the number of processes intended to operate in parallel or: AUTO. If AUTO is chosen, the processor determines the number of processes automatically, using the CPU info of the given architecture.

If L2A\_Process is started with a L1C User product as the given directory argument, a series of tiles will be processed in parallel, according to the given Nr. of Processes in the L2A\_GIPP above. If the Nr of Processes is 1, only a sequential processing will take place as it was implemented in previous versions.

Memory requirements: the atmospheric correction processing for 10m resolutions uses a huge amount of memory due to the 10.000 x 10.000 pixel for each image. Multiple images must be kept at certain intervals completely in memory for performing correlations. Thus, for each processing at 10m resolution, as a general rule of thumb, a resource of at least 4 GB of memory per process should be available. Thus, unless you have a machine with sufficient memory, leave the Nr. of processes to single processing (1), otherwise memory overflow errors will occur during processing. On a 2 Core MAC / Linux workstation with 8 GB RAM, 2,8 GHz Intel i5 and 500 GB SSD, a 4 tiles parallel processing for 10m resolution images has been successfully performed. In systems which are equipped with hard disks, however more physical memory might be needed, due to swapping effects on the hard disk.

#### **3.1.2.1.2 *Implementation of the Manifest generation for L2A User Product***

Sen2Cor now replaces the L1C manifest with its own L2A manifest on the User product level.

#### **3.1.2.1.3 *Implementation of single tile generation***

A new feature for the processing of single tiles has been added. The pathname can now either point to a L1C user product or to a single tile of the user product.





If the argument points to a user product, all tiles of the user product will be processed subsequently. If the argument points to a single tile, only that tile will be processed. In the latter case, the configuration settings for parallel processing will be ignored.

### **3.1.2.1.4 Relative pathname for products and single tiles**

The <directory> argument of the command line can now be either a relative or an absolute pathname.

If a relative pathname is given, it is expected that the user is calling Sen2Cor from inside a parent directory. Sen2Cor will expand the absolute pathname for that directory.

Sen2Cor will use the L1C user product identifier for generating a subsequent L2A product. For this purpose, the L1C source directory must start with an identifier like 'S2A\_????\_??\_??L1C\*' which is the standard, if you download a L1C user product from the Sentinel 2 data hub. The generated product will get the identifier 'S2A\_????\_??\_??L2A\*', everything else will be inherited from the L1C source.

### **3.1.2.1.5 Upgrade of the PSD to version 13.1**

Support of the Metadata Format has been upgraded from version 12.0 to version 13.1

### **3.1.2.1.6 Improvements in the generation of L2A user products**

The routines for generating user products of different resolutions have been decoupled and generally improved:

- SEN2COR will now also work on existing L2A user products. This allows the generation of different resolutions in subsequent steps.
- If the user is specifying no resolution at all on the command line, all resolutions will be generated in three subsequent steps. This is the default. The selection of a 60 m resolution or 20m resolution via command line will only generate the resolution specified.
- If a resolution has already been processed for a given L2A product, Sen2Cor will not start a regeneration but will inform the user that this product already exists.
- The selection of a 10 m resolution requires the generation of a 20 m product. If a 20m product already exists from a previous processing, this will be taken as input, otherwise it will be generated in a first step, before the 10 m resolution product is processed. If the user wants to start from scratch, he must move, delete or rename the existing product.
- It is also possible to remove only single tiles of an existing product. These tiles will then be regenerated; the other existing tiles will be left untouched.

### **3.1.2.1.7 Implementation of PlanetDEM usage in parallel to CGIAR SRTM**

See the section on Terrain Correction in the User Manual.

## **3.1.2.2 Fixes of Anomalies**

### **3.1.2.2.1 L2A Processor exit conventions**

In previous versions SEN2COR terminated with "TRUE", after a successful processing. This has been changed now to return "0" for a successful processing and a value above 0 if processing errors occurred. The reasons for an unsuccessful termination can be found usually in the log file, except if a fatal error occurred which immediately killed the logging process.

### **3.1.2.2.2 L2A generation error if input L1C includes only 1 band**

It has been observed that the processor terminated with an error when a corrupt tile with incomplete band series was found. This has been fixed in the way that the processor will terminate the generation of this specific tile, but will continue with the generation of subsequent tiles.

### **3.1.2.2.3 Metadata file did not pass validation**

The validation of the metadata has been adapted to version PSD V 13.1 and will no longer generate errors during validation, if the input data have the correct format. A warning will only occur on the processor output, if the validation fails. If validation is successful, no output will be generated on the standard output, but only in the logfile.



#### **3.1.2.2.4 Issue in handling consolidated tiles**

It has been observed that the processor terminated with an error when a consolidated tile was found. This has been fixed. The processing of a consolidated tile however might generate a validation warning, as consolidated tiles do not follow the metadata conventions for valid tile names.

#### **3.1.2.2.5 Processor unable to process two (or more) data strips in one product**

This has been corrected. Multiple data strips will now be processed and the metadata will be updated accordingly.

#### **3.1.2.2.6 L2A generation error in case of black image**

It has been observed that the processor terminated with an error when an image did not contain any data. The atmospheric correction cannot work on completely empty tiles. The processor will now stop the processing of the tile in question, show a corresponding warning message and will continue with the processing of the subsequent tiles.

#### **3.1.2.2.7 Issue of DEM import when DEM support is activated**

In previous versions, it occurred that a DEM was not correctly generated after download. The routines for reading a DEM have been improved with respect to parallelisation.

#### **3.1.2.2.8 Issues reprocessing L1C product when L2A product is already present**

The routines for generating user products of different resolutions have been decoupled and generally improved:

- SEN2COR will now also work on existing L2A user products. This allows the generation of different resolutions in subsequent steps.
- If the user is specifying no resolution at all on the command line, all resolutions will be generated in three subsequent steps. This is the default. The selection of a 60 m resolution or 20m resolution via command line will only generate the resolution specified.
- If a resolution has already been processed for a given L2A product, Sen2Cor will not start regeneration but will inform the user that this product already exists.
- The selection of a 10 m resolution requires the generation of a 20 m product. If a 20m product already exists from a previous processing, this will be taken as input, otherwise it will be generated in a first step, before the 10 m resolution product is processed. If the user wants to start from scratch, he must move, delete or rename the existing product.
- It is also possible to remove only single tiles of an existing product. These tiles will then be regenerated, the other existing tiles will be left untouched.

#### **3.1.2.2.9 Problems with long pathnames on Windows**

Windows had a path length limitation of 260 characters in the past. Unfortunately, Windows Explorer on Windows 7 x64 is still subject to this path limit. As a consequence, the very long pathnames of a typical Level-1C or Level-2A user product can sometimes not be handled correctly.

**Since this release** Sen2Cor is adapted to handle long path names on windows correctly. However there might still be problems that generated Level 2A User products (as well as the L1C input folders) cannot be removed entirely using the Windows explorer. If this is the case, the path names must be manually shortened to a length below 260 characters before removing can take place. **Please note - this is a windows limitation and not in any case related to Sen2Cor.**

#### **3.1.2.2.10 Problem with file deletion / creation at 10 m resolution**

Previous versions had a problem on Windows with a file deletion at 10 m resolution if a file already existed. This has been fixed.

The fixes described above correspond to the following entries in the JIRA database:

L2A SPR Ref.	Title
<a href="#">SIIMPC-334</a>	<a href="#">Update of PSD XSDs to version 13.1 for Sen2Cor 2.1.0</a>

L2A SPR Ref.	Title
<a href="#">SIIMPC-287</a>	<a href="#">L2A processor Exit Codes convention</a>
<a href="#">SIIMPC-275</a>	<a href="#">L2A generation error if input L1C include only 1 band</a>
<a href="#">SIIMPC-271</a>	<a href="#">[Meeting action] 20151130-DQM-12: Change request on L2A product format</a>
<a href="#">SIIMPC-126</a>	<a href="#">[Sen2Cor] Metadata file did not pass validation running Sen2Cor</a>
<a href="#">SIIMPC-319</a>	<a href="#">Issue on Sen2Cor in handling Consolidated Tiles</a>
<a href="#">SIIMPC-220</a>	<a href="#">Sen2Cor is not able to process a User Product containing two (or more) datastrips</a>
<a href="#">SIIMPC-274</a>	<a href="#">L2A generation error in case of black image</a>
<a href="#">SIIMPC-297</a>	<a href="#">Sen2Cor: Issue of DEM import when DEM support is activated</a>
<a href="#">SIIMPC-199</a>	<a href="#">Sen2Cor: Issue when reprocessing an L1C and L2A product is already present</a>
<a href="#">SEN2COR-39</a>	Problems with long pathnames on Windows
<a href="#">SEN2COR-40</a>	Problem with file deletion / creation at 10 m resolution

### 3.1.3 Evolution since version (2.0.5)

Corrupted library for openjp2.dll on windows corrected.

Calibration factor for earth-sun-distance in reflectance to radiance conversion corrected. Radiances are computed for a fixed Earth-Sun distance of 1.0 astronomical units. This corresponds to the radiances values as stored in Sen2Cor look up tables used by the Atmospheric Correction module.

### 3.1.4 Evolution since version (2.0.4)

A scaling problem and additionally a mismatch between the 10m resolution output and the 20 / 60 m resolution and a strong distortion in the 10 m processing has been observed in the Level 2A output images for previous versions as reported by several beta test users. This has been identified and fixed:

1. increasing the input sensitivity according to a new reflectance to radiance routine to be aligned with the current inputs. This also works for the new planned 10000 scaling (instead of 1000).
2. improving the Dark Dense Vegetation classification, as the algorithm erroneously classified some water as dark pixels which then contributed to the observed distortions.

For the 60 and 20 m case, a re-scaling of the path radiance was performed if scaled path radiance for the blue band differs more than 3 % from the path radiance of the standard aerosol. This routine was only called when a visibility calculation is performed as is only the case for 60 and 20 m processing.

In the 10 m case this routine was not executed, as the visibility is resampled from 20 m. Thus, for 10 m bands the scaled path radiance for the blue band (sc\_lp\_blue) always remained to 1.0 due to the different treatment of the visibility calculation (see above).

These findings explain:

1. why the observed differences only occur in some of the images: - only if sc\_lp\_blue differs more than 3% from the default of 1.0, or if sufficient amount of water pixels are found, a rescaling takes place.
2. why the effect is stronger in some of the images: - the weight of the sc\_lp\_blue goes into the correction.
3. why the differences also occur between 60 and 20m, when the 20 m visibility was resampled from the 60 m bands instead of being calculated new.



The fixes listed above had been applied and the modified scaling for the blue channel path radiance for 20 and 60 m is stored in the configuration and is then reused for rescaling also during the 10 m processing. With this modification the results for the 10 m bands as for the 20 and 60 m are in the same range as to be expected.

New libRadtran Look up Tables generated with the 2015 spectral response are integrated in the processor and replace the previous one.

The reflectance to radiance conversion has been updated according to a review with R. Richter. It now reflects the proper scaling of the radiance values with respect to the extra-terrestrial solar irradiance (Es). The earth sun distance factor has been removed from the conversion formula, as the TOA radiance is already aligned.

### 3.1.5 Evolution since version (2.0.3)

The three following issues have been fixed for release 2.0.4:

L2A SPR Ref.	TITLE	COMMENT
<a href="#">SIIMPC-126</a>	Metadata file did not pass validation running Sen2Cor	the warnings concerning the metadata are now redirected in the log files and do no longer occur at the command line irritating the user. The warnings itself result from an evaluation of the L1C metadata against their templates and must be fixed on the L1C metadata level.
<a href="#">SIITBX-113</a> <a href="#">SIIMPC-189</a>	Sen2Cor has a different scaling on the L2A Output	Scaling of L2A outputs is now equivalent to L1C input and is read from the metadata instead from the L2A_GIPP file.
<a href="#">SIIMPC-189</a>	Size of the L2A preview file does not correspond to L1C	Is now in JP2 format and equivalent in size to the L1C input.

### 3.1.6 Evolution since version (1.0.1)

1. The reading and writing of the metadata have been updated in order to support PFS V12.
2. A syntax checker has been implemented which test the compliance of the product metadata before and after processing.
3. The following items have been implemented according to the SPR list provided by TAS: [S2-PDGS-TS-TR-027, issue: 01, date: 19/12/2014].

L2A SPR Ref.	TITLE	COMMENT
L2A-001	Hosted Processor installation procedure	SUM chapter 3 to be updated with comments in the present report section 2.3 Re: Complete rework of the installation procedure. See chapter 3.

L2A-002	Gdal	<p>Delivery and version compatibility with other user software shall be clarified</p> <p>Re: GDAL will be installed as a conda package under the umbrella of Anaconda. No dependency to any GDAL installation outside of anaconda exists, providing that the PATH variable points to '~/anaconda/bin'. These settings can be placed locally, in order not to interfere with any global python setup.</p>
L2A-003	Anaconda	<p>Clarification on use and installation of the tools to be provided.</p> <p>Re: See chapter 3.</p>
L2A-004	Pythonpath and bashrc	<p>Definition and setting procedure to be described. Launch by shell is mandatory.</p> <p>Re see chapter 3.</p>
L2A-005	User and rights	<p>Procedure related to user (sometimes root) and rights for Lic data to be confirmed</p> <p>Re: no administration rights are required, if a local installation is selected as is advised in chapter 3.</p>
L2A-006	Output directory	<p>Procedure to set output directory (different from input directory) to be enhanced and described.</p> <p>Re has been implemented and can be selected in the L2A_GIPP.xml processor configuration file.</p>
L2A-007	Launch parameters	<p>Procedure to set parameters at launch to be enhanced and described.</p> <p>Ree see section 3.2 Operation.</p>
L2A-008	Source shell is necessary in order to set environment variable for the L2A processor	<p>This is necessary in order to not modify centre user installation. This shell is updated with predefined variable during the L2A processor installation.</p> <p>See L2A_Bashrc in the Sen2Cor user directory.</p>
L2A-009	Execution shell is needed to start L2A processor	<p>This shell a source environment shell and launch the real L2A processor (../bin/L2A_Process)</p> <p>This is a special requirement for the PDGS. For this Purpose a Script named L2A_Process.bash has been generated in the Sen2Cor user directory. For operations under the S2Toolbox this script is not required.</p>
L2A-010	No dependencies must be defined for the L2A installation except for already installed IPF/DPC dependencies	<p>Fortunately, there is no problem with the delivered version because the dependencies are equal to those installed</p>
L2A-011	It is needed to change or comment the ProductionRequestParameters.xsd interface	<p>This is necessary to improve the launch of predefined version, type and options for the correct execution of the L2A processor</p> <p>Re: This information is provided by the L2A_Process.bash script. This does also contain the version number, if multiple versions of the Sen2Cor should be launched.</p>

L2A-012	Test data rights must be correct	<p>It is necessary to change owner and rights after installation. It is also possible to indicate the command in the L2A SUM.</p> <p>Test data are provided as a zipped tar file. Unpacking is described in the SUM. Installation in the correct environments is in the responsibility of the user.</p>
L2A-013	L2A SUM must indicate how to uninstall the L2A processor if needed (including Anaconda)	See chapter 3.0.
L2A-014	Correct Anaconda version must be delivered with the L2A processor	<p>Delivered Anaconda version is different from the one downloaded on internet and cannot be installed.</p> <p>There are no direct requirements on the anaconda version to be used. It is suggested to install the most recent anaconda release, see section 3.1</p>
L2A-015	Python installation 2.7 is needed but environment variable must be setting whit the 2.6 version	There is no need for any python environment setting, provided that the PATH includes a reference to anaconda/bin
L2A-016	Update of delivery note	Minor corrections to be done in the L2A-RPDN document, regarding the version of L2A-SRN and the FTP server.



## 4. INSTALLATION AND SETUP

This Application will support the three following Operating Systems:

**Linux, Mac OSX and Windows (64 bit is mandatory).**

The installation of the whole system is performed in two steps:

1. Installation or upgrade of the Anaconda Runtime Environment
2. Installation of the Processor itself.

The SEN2COR application works under the umbrella of the **Anaconda** (Python 2.7) distribution package. It is built with Anaconda2 V.4.0. Runtime Environment.

### 4.1 Anaconda Upgrade

If you have already installed Anaconda on you platform, then perform the following command via the command line:

```
C:\>conda update conda
```

```
Using Anaconda Cloud api site https://api.anaconda.org
```

```
Fetching package metadata: ....
```

```
# it should end with displaying the following information:
```

```
conda          4.0.5          py27_0
```

```
C:\>conda update anaconda
```

```
Using Anaconda Cloud api site https://api.anaconda.org
```

```
Fetching package metadata: ....
```

```
# it should end with displaying the following information:
```

```
anaconda       4.0.0          np110py27_0
```

Check the proper installation with:

```
C:\>python
```

```
Python 2.7.11 |Anaconda 4.0.0 (64-bit)| (default, Feb 16 2016, 09:58:36) [MSC v.1500 64 bit (AMD64)] on win32
```

```
Type "help", "copyright", "credits" or "license" for more information.
```

```
Anaconda is brought to you by Continuum Analytics.
```

```
Please check out: http://continuum.io/thanks and https://anaconda.org
```

```
>>>
```

You can skip the next section and continue with the setup of SEN2COR.

### 4.2 Anaconda installation from scratch

If you are new to Anaconda, then follow the steps below:

Download the recent version of the Anaconda python distribution for your operating system from:

<http://continuum.io/downloads> and install it according to the default recommendations of the anaconda installer. It is strongly recommended to choose a local installation, except if you have the full administrator rights on your machine.

At the end of the installation, open a command line window and check the proper installation by typing "python." It should display:

```
C:\>python
```

```
Python 2.7.11 |Anaconda 4.0.0 (64-bit)| (default, Feb 16 2016, 09:58:36) [MSC v.1500 64 bit (AMD64)] on win32
```

```
Type "help", "copyright", "credits" or "license" for more information.
```

```
Anaconda is brought to you by Continuum Analytics.
```

```
Please check out: http://continuum.io/thanks and https://anaconda.org
```

```
>>>
```

### 4.3 Deinstallation of an old Sen2Cor installation

A deinstallation of an existing Sen2Cor installation can be performed with:

```
C:\Users\umuellerwilm>pip uninstall Sen2Cor
```

```
Uninstalling Sen2Cor-2.0.6:
```

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```
c:\users\umuellerwilm\appdata\local\continuum\anaconda2\lib\site-packages\Sen2Cor-2.0.6-py2.7.egg
c:\users\umuellerwilm\appdata\local\continuum\anaconda2\scripts\l2a_process-02.02.06-script.py
c:\users\umuellerwilm\appdata\local\continuum\anaconda2\scripts\l2a_process-02.02.06.exe
c:\users\umuellerwilm\appdata\local\continuum\anaconda2\scripts\l2a_process-2.0.6-script.py
c:\users\umuellerwilm\appdata\local\continuum\anaconda2\scripts\l2a_process-2.0.6.exe
c:\users\umuellerwilm\appdata\local\continuum\anaconda2\scripts\l2a_process-script.py
c:\users\umuellerwilm\appdata\local\continuum\anaconda2\scripts\l2a_process.exe
```

Proceed (y/n)? y

Successfully uninstalled Sen2Cor-2.0.6

If you have multiple Sen2Cor versions installed, you can repeat the command until no further installations are found.

## 4.4 Sen2Cor Installation

### 4.4.1 For Windows:

Download the archive [Sen2Cor-2.2.1.zip](#) and extract it with an unzip utility.

Open the folder Sen2Cor-2.2.1, type “python setup.py install” and follow the instructions. The setup will install the SEN2COR application and all its dependencies under the Anaconda python distribution.

At the end of the installation you can select your home directory for the SEN2COR configuration data. This is by default: “C:\Users\<>your user account>\documents\Sen2Cor”

The setup script generates the following three environment variables:

**SEN2COR\_HOME** : this is the directory where the user configuration data are stored (see above). This can be changed later by you in setting the environment variable to a different location.

**SEN2COR\_BIN** : this is a pointer to the installation of the SEN2COR package. This is located in the “site-packages” folder of Anaconda. **Do not change this.**

**GDAL\_DATA** : this is a pointer to the directory where the GDAL coordinate system info is stored. This is located in the “Sen2Cor\cfg\gdal\_data” folder of the SEN2COR site\_package installation inside of Anaconda. **Do not change this.**

Open a new command line window, to be secure that your new environment settings are updated. From this new command line window, perform the following test:

Call the processor via “L2A\_Process --help”. This will give you a list of possible further options.

If no errors are displayed, your installation was successful.

### 4.4.2 For Linux and Mac:

Download the archive [Sen2Cor-2.2.1.tar.gz](#), and extract it with “tar -xvzf Sen2Cor-2.2.1.tar.gz”

Change the directory to the new created folder Sen2Cor-2.2.1, type “python setup.py install” and follow the instructions. The setup will install the SEN2COR application and all its dependencies under the anaconda python distribution.

At the end of the installation you can select your home directory for the SEN2COR configuration data. By default this is the directory where your \$HOME environment variable points to.

The setup script generates a script called “L2A\_Bashrc” and places it into your home directory. It contains the following three environment variables:

**SEN2COR\_HOME** : this is the directory where the user configuration data are stored (see above). This can be changed later by you in setting the environment variable to a different location.

**SEN2COR\_BIN** : this is a pointer to the installation of the SEN2COR package. This is located in the “site-packages” folder of the anaconda installation. **Do not change this.**

**GDAL\_DATA** : this is a pointer to the directory where the GDAL coordinate system info is stored. This is located in the “Sen2Cor/cfg/gdal\_data” folder of the SEN2COR site\_package installation inside of Anaconda. **Do not change this.**

These settings are necessary for the execution of the processor. There are two possibilities how you can finish the setup:

1. You can call this script automatically via your .bashrc or .profile script (OS dependent). For this purpose, add the line “source <location of your script>/L2A\_Bashrc” to your script.





2. You can call this script also manually via “source L2A\_Bashrc” every time before starting the processor. However this is not recommended, as it may be forgotten.

Finally, to check the installation after sourcing the L2A\_Bashrc, call the processor via “L2A\_Process --help”. This will give you a list of possible further options how to operate.

For further details how to operate the processor, read the Software User Manual which is located in the same folder as this short installation procedure.



## **5. ADVICE FOR USE OF THE SOFTWARE CONFIGURATION ITEM**

Follow the procedure as described in Section 3.1 of [L2A-SUM] for the installation of the software.

Follow the procedure as described in Section 3.2 of [L2A-SUM] for the configuration of the software.