

Service Level Agreement for

Spectral Classification and Value Added Products from EO image

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1 INTRODUCTION

1.1 Services Description / Abstract

Here are grouped closely related services that provide spectrally pre-classified or value added products from specific input products (see SLA details) and starting from the pre-classification provided by the SOIL MAPPER® algorithm of MEE0. These services, applied to images provided by the user, are available free-of-charge until June 30th 2010. User comments are encouraged and should be passed on to the [Earth Observation Help Desk](#).

The provided services are:

- Spectral pre-classification of user image
- Calibration of user image
- Vegetation index from user image
- NDVI from user image
- Snow index from user image

The “Spectral pre-classification of user image” service uses the SOIL MAPPER® to automatically map each pixel of the input image onto a discrete set of (up to) 56 spectral categories. The output can be in GeoTIFF or ENVI format.

The “Calibration of user image” service applies a radiometric conversion and correction to convert image digital numbers into physical units such as “Top Of Atmosphere” (TOA) reflectance for visible to short wave infrared bands and into “at sensor equivalent temperature” for thermal infrared bands. The output is in floating point GeoTIFF format.

The so-called “Value Added Products” consist of continuous spectral indexes, masks and masked indexes potentially useful for further application-dependent image analysis. A series of three services permits to calculate these products; these services are described below.

The “Vegetation index from user image” service permits to process a multispectral satellite image to generate three output files:

- a continuous Vegetation Index image where the vegetation Index is directly related to statistical parameters like Leaf Area Index (LAI) and/or Fractional Photosynthetically Active Radiation (PFAR). The output is in floating point GeoTIFF format;
- a vegetation mask extracted from the SOIL MAPPER® classification system;
- a masked version of the vegetation index.

The “Normalised Differential Vegetation Index (NDVI) from user image” service permits to process a multispectral satellite image to generate a classical NDVI image from radiometrically calibrated data. The service generates three output files:

- the NDVI image in GeoTIFF floating point format;
- a vegetation mask extracted from the SOIL MAPPER® classification system;
- a masked version of the NDVI image.

The “Snow index from user image” service permits to process a multispectral satellite image to generate a continuous water content index that is directly related to the presence of snow and it is suitable for separating water from built-up land. The service generates three output files:

- the Snow Index image in floating point GeoTIFF format;
- a water mask extracted from the SOIL MAPPER® classification system;
- a masked version of the Snow Index image computer only over non-water areas.

Note:

SOIL MAPPER® is an original remote sensing image classifier developed by Meteorological and Environmental Earth Observation (MEEEO - <http://www.meeo.it/>). It is a fully automated, spectral rule-based classifier, capable of mapping multi-spectral satellite images onto a discrete set of output spectral classes. SOIL MAPPER® can be currently applied to the following sensors / formats:

- LANDSAT 5 TM / CEOS
- LANDSAT 7 ETM+ / CEOS, GeoTIFF
- SPOT-4 HRVIR / DIMAP
- SPOT-5 HRG / DIMAP
- MODIS / HDF
- AVHRR / KLM/SHARP
- ATSR2-AATSR / ENVISAT
- IRS / LGSOWG (Super Structure)
- Quickbird / GeoTIFF
- IKONOS / GeoTIFF
- AVNIR-2 / CEOS

Besides classification maps, SOIL MAPPER® generates a series of “Value Added Products” providing continuous spectral indexes potentially useful for further application-dependent image analysis, like:

- Vegetation Index
- Normalised Differential Vegetation Index
- Snow Index

and a series of masks for:

- Vegetation
- Clouds
- Water.

1.2 Earth Observation Help Desk

For questions, problems, complaints, special requests, comments or recommendations about the service, users can contact the:

Earth Observation Help Desk

E-mail: EOHelp@esa.int (with subject "SSE Service")
Phone: +39 06 94180777

The help desk service is available during working hours of the ESRIN working days. The help desk will answer to the user within 5 working days from receipt of request.

1.3 Definitions and Acronyms

- User
The authorised user of SSE service
- Service Support Environment (SSE)
The ESA provided environment supporting provision of services published as Web Services.
- Spectral pre-classification of user image
The SSE Classification service described in this SLA.
- Calibration of user image
The SSE radiometric calibration service described in this SLA.
- Vegetation index from user image
The SSE Vegetation index extraction service described in this SLA.
- NDVI from user image
The SSE NDVI extraction service described in this SLA.
- Snow index from user image
The SSE snow index extraction service described in this SLA.
- Output Product
The output of each service. An Output Product is stored on a temporary FTP server for user transfer within the next 5 days. The link to the Output Product (FTP account information, i.e.: FTP address, username and password) is provided via the order information web page or the user order list within the SSE Portal.

2 SERVICE ELEMENTS

2.1 Components

Elementary components / services (not built from chaining other components / services).

2.2 Architecture

2.2.1 Spectral pre-classification of user image service

2.2.1.1 Input

The required inputs are:

- Input image (externally provided via FTP)
- Classification mode
 - "Complete set of classification classes", capable of detecting 55 output classes (see Annex 1, Table 1)

- “Intermediate set of classification classes ”, capable of detecting 26 output classes (see Annex 1, Table 2)
- “Corine Land Cover-Like (CLCL) classification mode”, capable of detecting 12 output classes (see Annex 1, Table 3) compliant with the CLC classification scheme.
- Output image format
 - “ENVI”, where each pixel is labelled with a pseudo colour, a numerical index, and an acronym with an associated semantic meaning; the ITTVis ENVI product is needed to open the image;
 - “GeoTIFF”, where each pixel is labelled with a numerical value and a pseudo-colour table; the list of spectral categories (see Annex 1) is needed to associate the class number with its semantic meaning.

2.2.1.2 Processing

The processing steps are:

- Download the image from user’s repository
- Read the input parameters (classification mode and output image format)
- Detect automatically the sensor / format from the input image
- Start the image classification:
 - Pre-processing stage

The input image is radiometrically calibrated into reflectance values by a sensor-specific radiometric correction algorithm. Digital numbers are transformed into physical units, namely, planetary (TOA) reflectance and at-satellite temperature, in order to permit a better classification result by using real reflectance values (permitting comparison of multi-temporal and multi-sensor images).
 - Classification processing stage

Each pixel is processed through the two-step / three stages SOIL MAPPER® classification system that allows generating:

 - The spectral classification maps;
 - The vegetation, cloud and water masks;
- Upload the Output Product (classification map) into the FTP temporary directory (link provided within the SSE user order list).

2.2.1.3 Output

The output consists of the Output Product, which is a GeoTIFF or an ENVI image characterised by:

- Spatial resolution: same as the input image
- Geocoding: same as the input image
- Data coding: 8 bit (256 levels)
- Classification map representation: output classes are represented as a discrete and finite set of pseudo colours / grey levels provided with a semantic meaning. In the ENVI format, pseudo colours are associated with numerical labels and acronyms whose meaning can be found in a coding table (see Annex 1). In the GeoTIFF format, numerical values for each pixel and a colour table included as GeoTIFF tag are provided; the semantic meaning of each value/colour can be retrieved by using the tables included in Annex 1.
- Number of output classes: as selected by the user (see Input).

2.2.2 Calibration of user image service

2.2.2.1 Input

The required input is:

- Input image (externally provided via FTP)

2.2.2.2 Processing

The processing steps are:

- Download the image from user's repository
- Detect automatically the sensor / format from the input image
- Start the image calibration. The input image is radiometrically calibrated into reflectance values by a sensor-specific radiometric correction algorithm. Digital numbers are transformed into physical units, namely, planetary (TOA) reflectance and at-satellite temperature, in order to permit a better interpretation of images by using real reflectance values (permitting comparison of multi-temporal and multi-sensor images).
- Upload the Output Product (calibrated set of images) into the FTP temporary directory (link provided within the SSE user order list)

2.2.2.3 Output

- The output is a set of images (one for each band) in floating-point GeoTIFF format with the following characteristics:
- Spatial resolution: same as the input image
- Geocoding: same as the input image
- Data coding: 32 bit (floating point values)

2.2.3 Vegetation index from user image service

2.2.3.1 Input

The required input is:

- Input image (externally provided via FTP)

2.2.3.2 Processing

The processing steps are:

- Download the image from user's repository
- Detect automatically the sensor / format from the input image
- Start the vegetation index extraction operation. The input image is radiometrically calibrated into reflectance values by a sensor-specific radiometric correction algorithm. A vegetation index is calculated taking into account VIS-to-MIR bands; the vegetation index image is calculated all over the scene.
- Start the SOIL MAPPER® classification operation to generate the vegetation mask file;
- Compute the masked vegetation index image;
- Upload the Output Products into the FTP temporary directory (link provided within the SSE user order list)

2.2.3.3 Output

- The output is a set of three images in floating-point GeoTIFF format (vegetation index and masked vegetation index files) and byte GeoTIFF format (vegetation mask) with the following characteristics:
- Spatial resolution: same as the input image
- Geocoding: same as the input image
- Data coding: 8/32 bit (byte values/ floating point values)

2.2.4 NDVI from user image service

2.2.4.1 Input

The required input is:

- Input image (externally provided via FTP)

2.2.4.2 Processing

The processing steps are:

- Download the image from user's repository
- Detect automatically the sensor / format from the input image
- Start the NDVI extraction operation. The input image is radiometrically calibrated into reflectance values by a sensor-specific radiometric correction algorithm; the NDVI image is calculated all over the scene.
- Start the SOIL MAPPER® classification operation to generate the vegetation mask file;
- Compute the masked NDVI image;
- Upload the Output Products into the FTP temporary directory (link provided within the SSE user order list).

2.2.4.3 Output

- The output is a set of three images in floating-point GeoTIFF format (NDVI and masked NDVI files) and byte GeoTIFF format (vegetation mask) with the following characteristics:
- Spatial resolution: same as the input image
- Geocoding: same as the input image
- Data coding: 8/32 bit (byte values/ floating point values)

2.2.5 Snow index from user image service

2.2.5.1 Input

The required input is:

- Input image (externally provided via FTP)

2.2.5.2 Processing

The processing steps are:

- Download the image from user's repository
- Detect automatically the sensor / format from the input image
- Start the snow index extraction operation. The input image is radiometrically calibrated into reflectance values by a sensor-specific radiometric correction algorithm. The snow index is calculated taking into account VIS-to-MIR bands; the snow index image is calculated all over the scene.
- Start the SOIL MAPPER® classification operation to generate the water mask file;
- Compute the masked snow index image;
- Upload the Output Products into the FTP temporary directory (link provided within the SSE user order list).

2.2.5.3 Output

- The output is a set of three images in floating-point GeoTIFF format (snow index and masked snow index files) and byte GeoTIFF format (water mask) with the following characteristics:
- Spatial resolution: same as the input image
- Geocoding: same as the input image
- Data coding: 8/32 bit (byte values/ floating point values).

2.3 Constraints

The following input formats are accepted by all services:

- Zip Compressed CEOS Landsat 5: the image consists of the sub directory SCENE1, that contains a series of files (LEA, DAT, TRA) related to the 7 spectral bands;

- Zip Compressed CEOS Landsat 7: the image consists of the sub directory SCENE1, that contains series of files (LEA, DAT, TRA) related to the 8 spectral bands and the panchromatic band;
- Zip Compressed GeoTIFF Landsat 7 Geocover Collection: the archive consists of the 8 spectral bands, the panchromatic band and the text metafile (*.met);
- Zip Compressed GeoTIFF Landsat 7 Level 1G: the archive consists of the 8 spectral bands, the panchromatic band and the metafile (*_MTL.TIF);
- Zip Compressed DIMAP Level 1 Spot 4 image: the image consists of a sub directory SCENE0X that contains a GeoTIFF multilayer file and a DIM metadata file;
- Zip Compressed DIMAP Spot 5 image the image consists of two sub directories SCENE0X that contains a GeoTIFF multilayer file and a DIM metadata file for the multispectral data (first directory) and a second directory for the panchromatic file that contains a single band GeoTIFF file and a dedicated DIM metadata file;
- Zip Compressed AVHRR/3 image daytime in SHARP-3 format; the archive must contain the following files: IMAGE, LEADER, NULL_VDF, TRAILER, VDF; night time images are accepted only by the Calibration of user image service;
- KLM format AVHRR/3 daytime data; night time images are accepted only by the Calibration of user image service;
- HDF-EOS MODIS TERRA Level 1B 1Km resolution (MOD021KM, MYD021KM) daytime data; night time images are accepted only by the Calibration service;
- HDF-EOS MODIS TERRA/AQUA Level 1B 1Km resolution (MOD021KM, MYD021KM) daytime; night time images are accepted only by the Calibration of user image service;
- ENVISAT ATSR-2 data compressed in .gz format;
- ENVISAT ATSR-2 data compressed in .gz format.

Only one image file at time can be processed; input files/archives containing multiple images are automatically discarded.

2.4 Special features

The sensor type and data format are automatically recognised by the SSE services, which performs also a format checking on the input dataset in order to avoid executing any operation over corrupted datasets.

3 SERVICE CHARACTERISTICS

3.1 Quality

ESA will ensure services' provision with professional and workmanlike quality standards consistent with industrial ones.

Users are encouraged to submit to the Earth Observation Help Desk comments, which might lead to improvements in the quality of the services or of the Output Product.

3.2 Availability

During the ESRIN working days, the services are always active, except when network or servers maintenance activities are being performed or due to circumstances beyond ESRIN control. The services are monitored on a daily basis.

3.3 Timing

The SSE services will be available starting from July 1st 2008 until June 30th 2010.

3.4 Limitations

There are no limitations for this service, except for the Terms and Conditions below.

4 TERMS AND CONDITIONS

4.1 Output Products

The following Term and Conditions apply to each Output Product.

The user acknowledges that copyrights subsist for any Output Product and that all property and other rights in the Output Products and all trademarks and logos used on or in relation with the Output Products shall remain with MEEO or the license providers.

4.1.1 Non-commercial reproduction

Products delivered via SSE are provided with the intent of being readily available for personal and public non-commercial use. They may be reproduced, in part or in whole and by any means, without charge or further permission from MEEO. However:

- The name of the algorithm SOIL MAPPER® and of its owner (MEEO S.r.l.) shall be mentioned any time an Output Product is reproduced in either paper or electronic form.
- The reproduction of any Output Product shall not be represented as an official version of the information and the Output Product reproduced, or as having been made, in affiliation with or with the endorsement of MEEO S.r.l..

4.1.2 Commercial reproduction

For commercial purposes, no part of the Output Products provided via SSE may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording or by any information storage or retrieval system, except with written permission from MEEO (contact point: MEEO Meteorological and Environmental Earth Observation Help Desk, e-mail: helpdesk@meeo.it, phone: +39 0533 57046).

4.2 Warranty

ESA does not provide any warranty for these services. ESA shall not be deemed liable in respect of a defective Output Product. All other conditions, warranties of any kind, written, oral, statutory, expressed or implied by statute or common law with respect to any Output Product including but not limited to the implied warranty of satisfactory quality, merchantability and fitness for purpose are hereby excluded.

4.3 Disclaimer

ESA does not assume any liability deemed to have been caused directly or indirectly by any content of the SSE Web site or by these services.

ESA shall not be liable for any failure to perform its obligations arising from circumstances outside their control.

With respect to documents or data provided via SSE, neither ESA nor any of its employees, make any warranty, explicit or implied, including the warranties of fitness for a particular purpose, or assume any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, Output Product, or process disclosed.

Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favour by ESA.

The views and opinions of authors expressed herein do not necessarily state or reflect those of ESA, and shall not be used for advertising or product endorsement purposes.

4.4 Termination

ESA reserves the right to terminate each of the services at any time without prior notification.

If the user defaults in or commits any breach of any of his obligations, ESA shall have the right forthwith to terminate the provision of the services.

In no case any refund shall be due to the user.

Any termination shall not prejudice or restrict the rights or remedies of ESA.

4.5 Trademarks

All brand names and product names are trademarks or registered trademarks or services marks of their respective owners.

4.6 Price

The services are free of charge for all authorised users.

4.7 Applicable Law

The license/SLA terms and conditions shall be governed by Italian law

4.8 Arbitration

Each and every dispute arising out of or relating to the interpretation or execution of this license/SLA terms and conditions shall be submitted to arbitration.

The arbitration proceedings shall take place in Rome.

The arbitration tribunal shall consist of three persons, one to be appointed by the User, one by the Agency and the third, who shall be chairman, by the two arbitrators so appointed. Should these two arbitrators not be able to agree on the nomination of the third, he shall be appointed by the president of the Court of Rome.

The arbitrators shall decide according to law, and awards by this arbitration tribunal shall be binding on the parties.

The proceedings and the enforcement of the award shall be governed by the Italian civil procedure law.

5 HOWTO

5.1 Spectral pre-classification of user image service

5.1.1 Locate the Service

Connect to the SSE Portal (<http://services.eoportal.org>) and:

- In the right-bottom part of the page, insert the words “Spectral pre-classification of user image” or “Classification” in the **Search** text box, select the **Services** radio button and press the **Go** button

or

- Select **All Services** in the top menu bar and look for the name of this service in the leftmost column

Click on the service name to open the service description page.

5.1.2 Activate the Service

Login into SSE (if not already logged in).

Press the **Order** button at the end of the service description page in order to activate the service order page.

In the service main page:

- Fill in the text box specifying the **FTP path** to the input product, following the standard form: <ftp://user:pass@host.name:portNumber/pathToFile/fileName.ext> (the port number is optional: default value is 21), where the file extension is .zip for Landsat and SPOT images, .hdf for MODIS images and .gz for (A)ATSR images
 - Choose the **Classification mode** in related combo box
 - Choose the **Format** of the output product in related combo box
 - Click on the **Proceed** button to reach the order confirmation page

Check the provided parameters in the order confirmation page.

If all parameters are correct, activate the service by clicking on the **Confirm** button, otherwise click on the **Cancel** button.

The system will provide an **Order Identifier**, which shall be used to retrieve the service result.

5.1.3 Retrieve Service Results

Login into SSE (if not already logged in).

When logged in:

- Select the **Order List** in the top menu bar
- Verify dynamically the status of all orders
- Retrieve the results by clicking on the **Order Identifier** link

5.2 Calibration of user image service

5.2.1 Locate the Service

Connect to the SSE Portal (<http://services.eoportal.org>) and:

- In the right-bottom part of the page, insert the words “Calibration of user image” or “Calibration” in the **Search** text box, select the **Services** radio button and press the **Go** button

or

- Select **All Services** in the top menu bar and look for the name of this service in the leftmost column

Click on the service name to open the service description page.

5.2.2 Activate the Service

Login into SSE (if not already logged in).

Press the **Order** button at the end of the service description page in order to activate the service order page.

In the service main page:

- Fill in the text box specifying the **FTP path** to the input product, following the standard form: <ftp://user:pass@host.name:portNumber/pathToFile/fileName.ext> (the port number is optional: default value is 21) where the file extension is .zip for Landsat and SPOT images, .hdf for MODIS images and .gz for (A)ATSR images

In the service order page:

- Click on the **Proceed** button to reach the order confirmation page

Check the provided parameters in the order confirmation page.

If all parameters are correct, activate the service by clicking on the **Confirm** button, otherwise click on the **Cancel** button.

The system will provide an **Order Identifier**, which shall be used to retrieve the service result.

5.2.3 Retrieve Service Results

Login into SSE (if not already logged in).

When logged in:

- Select the **Order List** in the top menu bar
- Verify dynamically the status of all orders
- Retrieve the results by clicking on the Order Identifier link

5.3 Vegetation index from user image service

5.3.1 Locate the Service

Connect to the SSE Portal (<http://services.eoportal.org>) and:

- In the right-bottom part of the page, insert the words “vegetation index from user image” or “Vegetation” in the **Search** text box, select the **Services** radio button and press the **Go** button

or

- Select **All Services** in the top menu bar and look for the name of this service in the leftmost column

Click on the service name to open the service description page.

5.3.2 Activate the Service

Login into SSE (if not already logged in).

Press the **Order** button at the end of the service description page in order to activate the service order page.

In the service main page:

- Fill in the text box specifying the **FTP path** to the input product, following the standard form: <ftp://user:pass@host.name:portNumber/pathToFile/fileName.ext> (the port number is optional: default value is 21) where the file extension is .zip for Landsat and SPOT images, .hdf for MODIS images and .gz for (A)ATSR images

In the service order page:

- Click on the **Proceed** button to reach the order confirmation page

Check the provided parameters in the order confirmation page.

If all parameters are correct, activate the service by clicking on the **Confirm** button, otherwise click on the **Cancel** button.

The system will provide an **Order Identifier**, which shall be used to retrieve the service result.

5.3.3 Retrieve Service Results

Login into SSE (if not already logged in).

When logged in:

:

- Select the **Order List** in the top menu bar
- Verify dynamically the status of all orders
- Retrieve the results by clicking on the Order Identifier link

5.4 NDVI from user image service

5.4.1 Locate the Service

Connect to the SSE Portal (<http://services.eoportal.org>) and:

- In the right-bottom part of the page, insert the words “NDVI from user image” or “NDVI” in the **Search** text box, select the **Services** radio button and press the **Go** button

or

- Select **All Services** in the top menu bar and look for the name of this service in the leftmost column

Click on the service name to open the service description page.

5.4.2 Activate the Service

Login into SSE (if not already logged in).

Press the **Order** button at the end of the service description page in order to activate the service order page.

In the service main page:

- Fill in the text box specifying the **FTP path** to the input product, following the standard form: <ftp://user:pass@host.name:portNumber/pathToFile/fileName.ext> (the port number is optional: default value is 21) where the file extension is .zip for Landsat and SPOT images, .hdf for MODIS images and .gz for (A)ATSR images

In the service order page:

- Click on the **Proceed** button to reach the order confirmation page

Check the provided parameters in the order confirmation page.

If all parameters are correct, activate the service by clicking on the **Confirm** button, otherwise click on the **Cancel** button.

The system will provide an **Order Identifier**, which shall be used to retrieve the service result.

5.4.3 Retrieve Service Results

Login into SSE (if not already logged in).

When logged in:

- Select the **Order List** in the top menu bar
- Verify dynamically the status of all orders
- Retrieve the results by clicking on the Order Identifier link

5.5 Snow index from user image service

5.5.1 Locate the Service

Connect to the SSE Portal (<http://services.eoportal.org>) and:

- In the right-bottom part of the page, insert the words “Snow index from user image” or “Snow index” in the **Search** text box, select the **Services** radio button and press the **Go** button

or

- Select **All Services** in the top menu bar and look for the name of this service in the leftmost column

Click on the service name to open the service description page.

5.5.2 Activate the Service

Login into SSE (if not already logged in).

Press the **Order** button at the end of the service description page in order to activate the service order page.

In the service main page:

- Fill in the text box specifying the **FTP path** to the input product, following the standard form: <ftp://user:pass@host.name:portNumber/pathToFile/fileName.ext> (the port number is optional: default value is 21) where the file extension is .zip for Landsat and SPOT images, .hdf for MODIS images and .gz for (A)ATSR images

In the service order page:

- Click on the **Proceed** button to reach the order confirmation page

Check the provided parameters in the order confirmation page.

If all parameters are correct, activate the service by clicking on the **Confirm** button, otherwise click on the **Cancel** button.

The system will provide an **Order Identifier**, which shall be used to retrieve the service result.

5.5.3 Retrieve Service Results

Login into SSE (if not already logged in).

When logged in:

- Select the **Order List** in the top menu bar
- Verify dynamically the status of all orders
- Retrieve the results by clicking on the Order Identifier link

6 Annex 1 – Processing model and Data Flow: SOIL MAPPER® classification modes

Three lists of spectral categories computed by SOIL MAPPER® are provided below; the user can decide to obtain as output of the “Spectral pre-classification of user image service“ the complete set of classes (see Table 1), an intermediate set of classes (see Table 2), or a Corine land Cover – Like classification map (see Table 3) that features a level of classification compliant with the CLC classification scheme.

6.1 Complete set of output spectral categories

Class index	Acronym	Label
0	Uncomputed	
1	TKCL	Thick Cloud
2	TNCL	Thin Cloud
3	SN	Snow
4	ICSN	Ice Or Snow
5	DPWA	Deep Clear Water
6	SLWA	Shallow Water
7	PBD	Dark Peat Bogs
8	PBM	Mid tone Peat Bogs
9	BPB	Bright Peat Bogs
10	SVD	Dark Strong Vegetation
11	SVB	Bright Strong Vegetation

Class index	Acronym	Label
12	AVB	Bright Average Vegetation
13	AVD	Dark Average Vegetation
14	WVB	Bright Weak Vegetation
15	WVD	Dark Weak Vegetation
16	SSRB	Bright Strong Shrub Rangeland
17	SSRD	Dark Strong Shrub Rangeland
18	ASRB	Bright Average Shrub Rangeland
19	ASRD	Dark Average Shrub Rangeland
20	SHR	Strong Herbaceous Rangeland
21	AHR	Average Herbaceous Rangeland
22	RLM	Mid tone Rangeland
23	BBB1	Bright Barren Land 1
24	BBB2	Bright Barren Land 2
25	BBB3	Bright Barren Land 3
26	BBB4	Bright Barren Land 4
27	SBB1	Strong Barren Land 1
28	SBB2	Strong Barren Land 2
29	SBB3	Strong Barren Land 3
30	SBB4	Strong Barren Land 4
31	ABB1	Average Barren Land 1
32	ABB2	Average Barren Land 2
33	ABB3	Average Barren Land 3
34	ABB4	Average Barren Land 4
35	DBB1	Dark Barren Land 1
36	DBB2	Dark Barren Land 2
37	DBB3	Dark Barren Land 3
38	DBB4	Dark Barren Land 4
39	RLB	Bright Rangeland
40	SHV	Shadow Vegetation
41	SHB	Shadow Barren Land
42	SHCL	Shadow Clouds
43	SHSN	Shadow Snow
44	WE	Wetland
45	TWA	Turbid Water
46	Unclassified	Unclassified / outlayer
47	AVVB1	Very Bright Average Vegetation 1
48	AVVB2	Very Bright Average Vegetation 2
49	SBB5	Strong Barren Land 5
50	RLD	Dark Rangeland
51	TKVCCl	Thick Very Cold Cloud
52	TKCLW	Thick Cloud Over Water
53	TNCLW	Thin Cloud Over Water
54	TNCLV	Thin Cloud Over Vegetation
55	DPWASH	Deep Water or Shadow

Table 1. List of the fifty-five spectral classes computed by SOIL MAPPER®.

6.2 Intermediate set of output spectral categories

Class index	Acronym	Label
0	Uncomputed	
1	TKCL	Thick Cloud
2	TNCL	Thin Cloud
3	ICSN	Ice Or Snow
4	DPWA	Deep Clear Water
5	SLWA	Shallow Water
6	PB	Peat Bogs
7	SV	Strong Vegetation
8	AV	Average Vegetation
9	WV	Weak Vegetation
10	SSR	Strong Shrub Rangeland
11	ASR	Average Shrub Rangeland
12	SHR	Strong Herbaceous Rangeland
13	AHR	Average Herbaceous Rangeland
14	DR	Rangeland
15	BBB	Bright Barren Land
16	SBB	Strong Barren Land
17	ABB	Average Barren Land
18	DBB	Dark Barren Land
19	SHV	Shadow Vegetation
20	SHB	Shadow Barren Land
21	SHCL	Shadow Clouds
22	TWASHSN	Shadow Snow
23	WE	Wetland
24	TWA	Turbid Water
25	Unclassified	Unclassified / outlayer
26	DPWASH	Deep Water or Shadow

Table 2. List of the twenty-six spectral classes computed grouping together (by semantic category) the complete set of classes generated by SOIL MAPPER® (see Table 1).

6.3 CLC-Like classification level

Class index	Acronym	Label
0	Uncomputed	
1	Clouds	Clouds
2	335	Glaciers and permanent snowfields (335)
3	5	Water Bodies (5)
4	412	Peat Bogs (412)
5	311	Deciduous Forest (311)
6	312	Evergreen Forest (312)
7	311-2	Deciduous Forest (311) and/or Agricultural Areas (2)

8	2-14	Agricultural Areas (2) and/or Artificial non agricultural areas (14)
9	32-2	Scrub/herbaceous vegetation (32) and/or Agricultural Areas (2)
10	1-33	Artificial Surfaces (1) and/or open spaces with little or no vegetation (33)
11	32	Scrub/herbaceous vegetation (32)
12	Unclassified	Unclassified / outlayer

Table 3. List of the twelve spectral classes computed grouping together the complete set of classes generated by SOIL MAPPER® following the Corine Land Cover Classification Scheme.