

EnMAP Frequently Asked Questions



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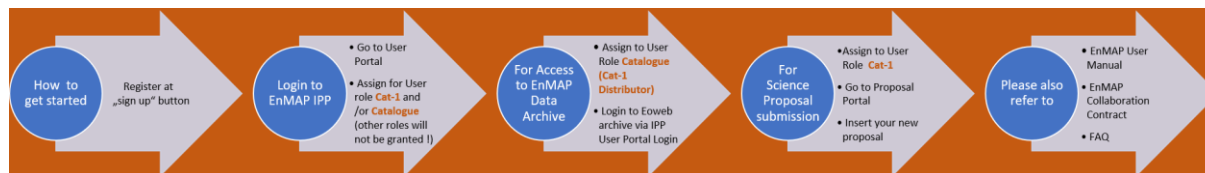
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Registration and Role Requests

1.1 Q: How to get started ?



1.2 Q: How can I register at the EnMAP Instrument Planning Portal?

A: Go to the “sign in” button at the front page and fill out the registration form. You should also provide full name and full address including street name, zip code, city and country.

EnMAP Service is obliged to carry out an EU Sanctions List Check for every user and requires this information, otherwise your EnMAP user account cannot be approved, if the information is not complete.

1.3 Q: How can I update my registration data?

A: You can update your registration data, by logging into the EnMAP Instrument Planning Portal. In the User Portal you find the “Update Registration” button.

1.4 Q: I have trouble logging into the EnMAP Instrument Planning Portal

A: You should be sure to use the right User Name and User password. The user name is the name you inserted at the registration form.

1.5 Q: Which User Role should I choose?

A: For access to the EnMAP Data archive you should go to the User Portal and assign to the user role **Catalogue User (Cat-1 Distributor)**. For proposal submission and future observations requests please assign to the Role **Cat-1**.

All other user roles either are designated for external users but not yet released (**Cat-2**) or are available to internal users only (**PI-AO, Reviewer, Charter, Internal**). Therefore, requests for one of those roles will be rejected.

Proposal Submission and Observation Requests

1.6 Q: How can I submit a Proposal?

A: You should first assign to the User Portal for the Role **Cat-1**. You should also choose which of the Announcements of Opportunities (here: A00001) is appropriate for your proposal.

A proposal can be submitted by entering the Proposal Portal within the Instrument planning portal. You should select the A0 you are assigned to, click on “Create Proposal” and fill out the proposal information. Please don’t forget to also add an observation to your proposal, otherwise the proposal

submission is not finalized. Also, don't forget to press the final "submit" button. Your proposal should now have the status **NEW**.

Status **SUB** indicates, that your proposal is still in submission in progress and cannot be reviewed.

After successful submission, your proposal will then go through a review process, and once approved you will be able to submit future orders through the Observation Request Portal.

1.7 Q: Is there a deadline for Proposal submission?

A: There is currently no deadline for proposal submission. The general AO (A00001) will be open for the entire mission life time, so you are most welcome to submit your proposal here any time.

1.8 Q: How can I submit an Observation Request?

A: The Observation Request Portal can be used as planning support for future orders or future orders can be submitted. It calculates real visibility contacts over a certain time period, which gives you the opportunity to check possible acquisitions for your area of interest. It also gives you the information about how many numbers of tiles per acquisition are needed to cover your area of interest.

Once your proposal is reviewed and accepted every **Cat-1 User** also receives full access to the observation request portal to submit own future orders.

1.9 Q: How do I know if the Foreground Mission is covering my area of interest

A: The monthly updates about date and location of Foreground Mission orders acquiring 1000 km long flightlines during the vegetation period (March to October) can be found on https://www.enmap.org/data_tools/foreground_mission

EnMAP Data Archive

1.10 Q: I have trouble logging into the EOWEB Geoportal

A: To access the EnMAP data archive via the Eoweb Geoportal (EGP) you need a dedicated EnMAP account, a standard EOWEB account registered at EGP won't work here.

To get this account please login with your EnMAP IPP account at planning.enmap.org and apply for an EnMAP role that includes access to EnMAP archive data at EGP (**Catalogue User (Cat-1 Distributor)**).

If such a role is granted, a dedicated sub-account is created with role-specific access rights. Within the IPP User Portal you will then find a "login" button that allows you to login to EGP with that dedicated sub-account including access to EnMAP data in EGP. The EOWEB accounts available to you are shown in the User Portal of IPP (near the bottom), together with direct links to the EGP login.

We strongly recommend not to directly go to EGP with this account. The way to access EnMAP data at EGP is to log into EnMAP Instrument Planning Portal, go to User Portal and at the bottom of the page you see your role-specific sub-accounts, e.g. **Melanie.Mustermann-cat1distributor**. For each sub-account there is a login-button with jumps into EGP.

The password remains the same as for your IPP account.

1.11 Q: How can I access the EnMAP Data Archive?

A: To access the EnMAP Data Archive you should go to the User Portal and assign for the User Role **Catalogue User (Cat-1 Distributor)**. If such a role is granted, a specific EOWEB account for EGP is created with role-specific access rights (you may consider them sub-accounts to your EnMAP IPP accounts).

EOWEB accounts available to you are shown in the User Portal of IPP (near the bottom), together with direct links to login to EGP. The password is the same as for your IPP account.

1.12 Q: How can I order L1B, L1C and L2A Products in EOWEB, I only see L0?

A: EOWEB archive generally stores all data in L0 for search and browse, so that the user can order different levels of processing (L1B, L1C, L2A) individually on request.

Once you found a scene (or several scenes) in the catalogue you would like to order, please select the scene(s) and go to the “shopping basket” sign. The order will go to the order request flow, where you will be able to choose different processing levels (L1B, L1C, L2A land.)

1.13 Q: What should be done after an IPS maintenance to ensure that the new software is loaded by the browser?

A: Please delete the cache of the browser.

EnMAP Data Processing and Data quality

1.14 Q: What is the reason for the apparent noise in some EnMAP L1C and L2A products in the spectral range between 900 and 1000 nm?

A: The EnMAP instrument consists of two separate spectrometers, one covering the visible and near-infrared (VNIR) and the other covering the shortwave infrared (SWIR). The spectrometers overlap in the spectral range between 900 nm and 1000 nm with 12 VNIR and 10 SWIR bands. Since EnMAP L1C/L2A products contain a single spectral data cube with all bands ordered by wavelength (not separated by sensor), the spectra have interleaved VNIR and SWIR bands between 900 nm and 1000 nm. Therefore, any slight signal mismatch between the sensors is seen as a zig-zag (spectral noise) pattern in the overlapping spectral range. This is most obvious in low-radiance and/or inhomogeneous regions.

There are two main reasons for the effect. First, the two spectrometers, which are independently calibrated in orbit, have distinct sensor responses in the overlapping range. The differences are especially important for low signals as they usually occur, for instance, in water bodies or forests. Second, the different lines of sight of VNIR and SWIR and any slight errors in the co-registration performed at L1C level will contribute to the mismatch between the sensors. Pixels in inhomogeneous regions or at the border between different surfaces are particularly affected.

Overall, the mismatch is a feature of operating two independent spectrometers with a spectral overlap and providing L1C/L2A spectra ordered by wavelength. For spectral visualization and specific application algorithms, the user can remove one of the two sensors in the overlapping wavelength domain or arrange L1C/L2A data cubes sensor-wise and decide how to handle the overlapping VNIR and SWIR bands. In particular, the user can identify the indices of VNIR and SWIR bands within L1C/L2A products by reading the items “vnirProductQuality/expectedChannelsList” and

“swirProductQuality/expectedChannelsList” in the corresponding product metadata or by using available reader routines (e.g., [EnMAP-Box plug-in for QGIS](#)).

1.15 Q: How to compute the scene view zenith and azimuth angles for EnMAP products?

A: TBD

1.16 Q: What is the spectral response function of the EnMAP VNIR and SWIR instruments?

A: All the required information for the estimation of the spectral response functions can be found in the product metadata file. The basic information on band center wavelength and full width at half maximum (FWHM) assuming a Gaussian response function are given in the structure bandCharacterisation in units of nm:

```
<bandCharacterisation>
  <bandID number="1">
    <wavelengthCenterOfBand>418.416</wavelengthCenterOfBand>
    <FWHMOfBand>6.99561</FWHMOfBand>
    <GainOfBand>0.0001</GainOfBand>
    <OffsetOfBand>0</OffsetOfBand>
  </bandID>
  ...
```

In many push-broom sensors the band center wavelengths change very slightly across the sensor field of view. This effect is called “spectral smile”. For EnMAP, this effect is small and within specifications, so there is no smile correction needed in the processing chain. For expert users, the full smile specification as a 4th order polynomial is also provided in the metadata within the following structure:

```
<smileCorrection applied="no" parametrization="polynomial">
  <VNIR>
    <bandID number="1">
      <wavelength unit="nm">418.42</wavelength>
      <coeff0 unit="nm">-2.17157E-01</coeff0>
      <coeff1 unit="nm">4.65630E-04</coeff1>
      <coeff2 unit="nm">-1.23312E-08</coeff2>
      <coeff3 unit="nm">-4.46007E-11</coeff3>
      <coeff4 unit="nm">-7.96608E-16</coeff4>
    </bandID>
    ...
```

All details are documented in Ch. 5.9 in the [L2A Processor Land ATBD \(EN-PCV-TN-6007\)](#). A description of the EnMAP pre-flight calibration and characterization results can be found in [Baur et al 2022](#).

1.17 Q: Are the spectral properties of EnMAP VNIR and SWIR instruments constant over time?

A: In general, the spectral properties of EnMAP VNIR and SWIR instruments are stable over time and monitored with frequent spectral calibrations. The spectral characterization of the instruments is only updated at rare intervals and always documented in the metadata.

There was one exception: as requested by the science segment, the SWIR band configuration did change on July 5, 2023. In all EnMAP products after that date, one band was added at 1450 nm, two bands were added at 1770 nm and 1780 nm, and three bands at 1939 nm, 1948 nm and 1958 nm were removed. The total number of SWIR bands remains constant since launch. Consequently, when addressing the data by band number (and not by wavelengths), SWIR bands #45 to #75 (full cube bands #136 to #167) are shifted by one band between the periods before and after 05.07.2023. It is highly recommended to always use the band center wavelengths as documented in the metadata.

1.18 Q: The radiance spectra look unexpected – am I doing something wrong? What are the units of the radiance products?

A: The EnMAP L1B and L1C products contain at-sensor radiances in units of $W\ m^{-2}\ sr^{-1}\ nm^{-1}$, but a band-wise scaling factor has to be applied to the spectral image files. These band-wise gain and offset factors are documented in the metadata in the following structure:

```
<bandCharacterisation>
  <bandID number="1">
    <wavelengthCenterOfBand>418.24</wavelengthCenterOfBand>
    <FWHMOfBand>6.99561</FWHMOfBand>
    <GainOfBand>3.39022404391e-06</GainOfBand>
    <OffsetOfBand>0.0603759994494</OffsetOfBand>
  </bandID>
  ...
```

1.19 Q: Why is there a feature in the O₂-A absorption band (around 760 nm) in some EnMAP L2A products (bottom-of-atmosphere reflectances)?

A: The oxygen concentration simulated for the atmospheric correction is constant. It is scaled with the digital elevation model (DEM), but a residual feature around the O₂-A absorption band can remain in EnMAP L2A spectra due to DEM errors, clouds, or deviations from the assumed theoretical O₂ profile. In addition, pixel-to-pixel fluctuations in this wavelength range could be also due to the across-track wavelength variations. In fact, the O₂ band absorption line is quite narrow (only one band in EnMAP) and the atmospheric correction assumes the same central wavelength for all pixels across-track.

1.20 Q: The geometric accuracy of some EnMAP L1C and L2A products from 2022 and 2023 has been considerably improved. What is the reason for this and how to ensure the best available geometry accuracy in any given EnMAP L1C or L2A product?

A: The geometric accuracy of the EnMAP products has been significantly improved since the launch of the satellite on April 1st, 2022. This was achieved in several geometric calibration steps and by improving and bugfixing the L1C processing software. In detail, the following steps have been performed during the commissioning phase (CP) and the operational phase (OP):

- 01.08.2022 (CP) Fix of attitude processing
 - Improvement of absolute geolocation (w/o matching)
- 20.09.2022 (CP) Boresight Calibration
 - Improvement of absolute geolocation (w/o matching)
- 03.11.2022 (end of CP) 1st Geometric Calibration
 - Improvement of absolute geolocation (w/o matching)
 - Improvement of VNIR/SWIR co-registration (~0.8 pix -> ~0.4 pix)
- 11.02.2023 (OP) 2nd Geometric Calibration

- Improvement of VNIR/SWIR co-registration (~0.4 pix -> ~0.15 pix)
- 29.03.2023 (OP) Processor update (v01.02.00)
 - Improvement of VNIR/SWIR co-registration (~0.15 pix -> ~0.06 pix)
- 05.05.2023 (OP) Processor update (v01.03.01)
 - Improvement of geolocation accuracy

A large part of the geometric processing of EnMAP products is performed on datatake level to ensure the geometric consistency within all tiles of one datatake. Therefore, these parts of the processing are executed during L0 processing.

Note that this means that it is possible to get a L1C/L2A product processed with the latest version of the L1C/L2A processor, while the L0 product from which it was generated was processed with an earlier version of the processor and thus with lower geometric accuracy. Users should see the tag *archivedVersion* in the metadata file to determine which processor version was used for the L0 processing of their data. Version 01.03.01 or higher ensures the best possible geometric accuracy for any given product. Currently, the whole EnMAP L0 archive is being reprocessed (including data from commissioning phase).

1.21 Q: What is the difference between the processing mode options (land mode, water mode, combined mode) for EnMAP L2A products?

A: There are three possible processing options when you order L2A products: combined, land and water mode. If you are interested only in water surfaces, you should choose the water mode, which converts the top-of-atmosphere radiances (level L1B or L1C) into “underwater reflectance” and “normalized water leaving reflectance”. More details on these products can be found in Ch. 2.5 in the [L2A Processor Water ATBD \(EN-PCV-TN-6008\)](#). Should you be interested in the land surface, you are advised to order the data in land mode. The combined mode can be used if you are interested in both land surface and water bodies within one datatake: L2A atmospheric correction is then performed through different algorithms depending if the pixel is in a land or water surface. For further details on the land and combined mode, please refer to Ch. 4.2 in the [L2A Processor Land ATBD \(EN-PCV-TN-6007\)](#).

1.22 Q: How are the "across off nadir" und "along off nadir" angles in the metadata defined?

A: The along/acrossOffNadirAngle values are the viewing angle relative to nadir (in the LTS coordinate system, see [here](#) in chapter 13.3).

This applies:

- acrossOffNadirAngle:
 - > 0: scene on the right of satellite in flight direction (sensor roll to the left)
 - < 0 : scene on the left of satellite in flight direction (sensor roll to the right)
- alongOffNadirAngle:
 - > 0: scene ahead of satellite in flight direction (sensor pitch backwards)
 - < 0: scene behind of satellite in flight direction (sensor pitch forwards)

If the angles are all 0, the scene should therefore be exactly below the satellite.

1.23 Q: What is the difference between the EnMAP product collections “EnMAP-HSI (L0)” and “EnMAP-HSI (L0), Low Quality” in the EOWEB GeoPortal?

A: The quality rating of EnMAP products is based on image parameters, such as illumination conditions (i.e., sun elevation angle) and image defects, and on possible anomalies in the image data or instrument telemetry. These parameters are retrieved during the pre-processing and are added to the metadata and quality layers for every archived L0 product. In [EOWEB GeoPortal](#) two collections of EnMAP L0 products are available: “EnMAP-HSI (L0)” and “EnMAP-HSI (L0), Low Quality”. An L0 product is assigned to the low-quality collection if the corresponding metadata item `qualityFlags.overallQuality` is equal to 2 (low quality). This happens for products with a significant number of striping, saturation, artefact or dead pixels, when the screening of data and instrument indicates non-nominal behavior or, in the majority of cases, when the sun elevation angle is less than or equal to 0 (e.g., night scenes). A detailed definition of `qualityFlags.overallQuality` is given in Sec. 4.4.9 in the [L1B ATBD \(EN-PCV-TN-4006\)](#).

Please refer to the [Portals User Manual](#) or the [EnMAP Collaboration Contract](#) for further details.