

Collection of DESIS Frequently Asked Questions

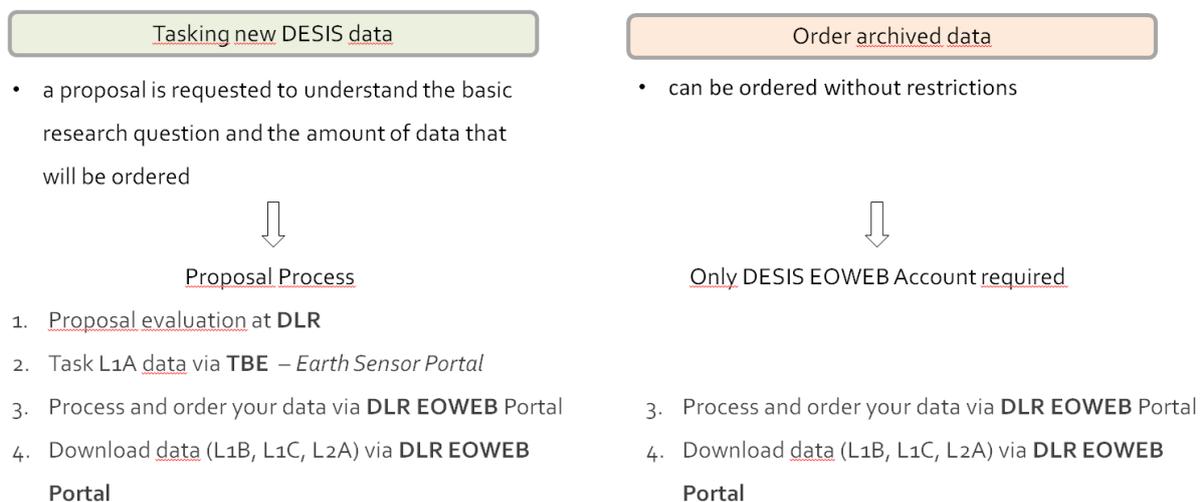
1. Data Access

Q: How can I get DESIS data?

A: First of all, the user has the possibility to query data in the EOWEB archive. The EOWEB archive host data that are already tasked by other users. This data is freely available and open for scientific purposes. It can be downloaded by every user without a scientific proposal. In order to search for the data, you can use any EOWEB account. If the user want to download data, you need a specific DESIS user account. For getting this, please contact desis-scientific@dlr.de.

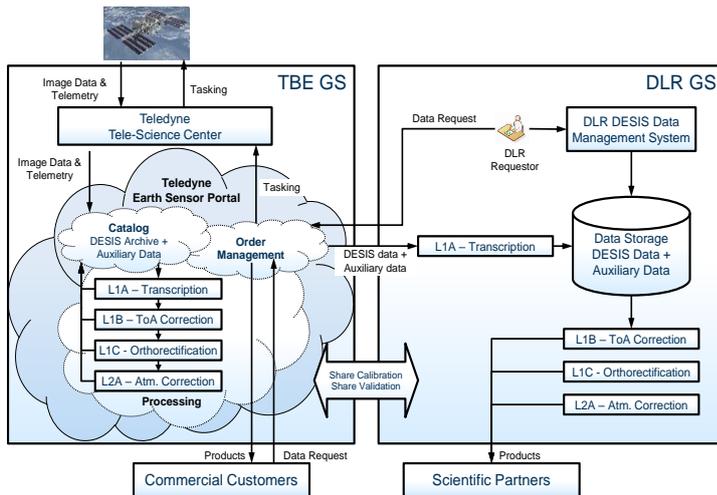
If users want to get DESIS data for their specific area of interest and time window, they have to prepare a proposal as a first step and send it to desis-scientific@dlr.de. Please use the template provided at the DESIS website: https://www.dlr.de/eoc/desktopdefault.aspx/tabid-13629/23675_read-54295/. The user will get informed about the subsequent steps.

DESI Data Access for Scientific Purposes – Two Possibilities



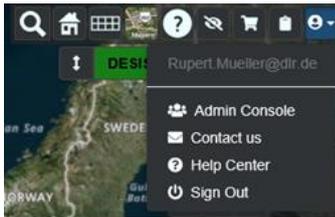
Q: Why do I have to task data first in ESP (Earth Sensor Portal @ Teledyne) and then use EOWEB (Earth Observation WEB @ DLR) for ordering and processing?

A: There are two DESIS ground segments that can archive and process data. The ESP @ Teledyne allows to task new data, but also to order from the catalogue. The EOWEB GeoPortal @ DLR is an independent archive at DLR for scientific applications, which automatically receives the L1A data from ESP when a scientific user, registered as a DESIS user, orders/tasks data at ESP. The figure below illustrates the relation between the two Ground Segments. A detailed description for accessing data can be found at https://www.dlr.de/eoc/PortalData/60/Resources/dokumente/desis/desis_dataaccess/PAV-DLR-PLN-010_AO.pdf



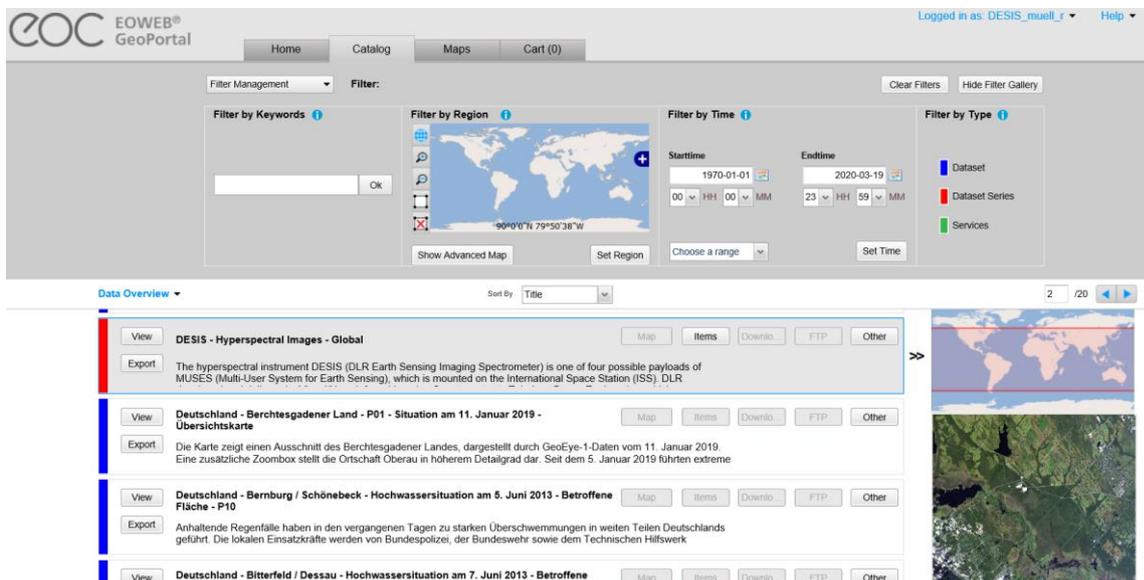
Q: Where can I get information how to use the ESP (Earth Sensor Portal @ Teledyne)?

A: The ESP offers a „Help Center“, where the Tasking/Ordering/Searching is explained step-by-step. To get there use the upper most right button for the top down menu.

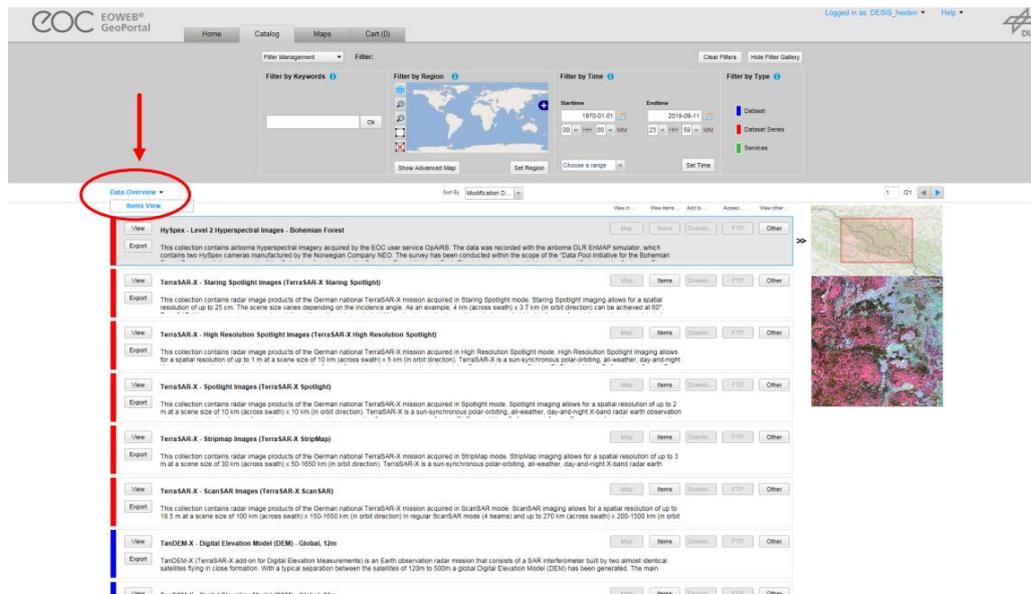


Q: How to use the EOWEB GeoPortal @ DLR for DESIS data?

A: After logging in search for the DESIS collection and press the “Items” button of the DESIS collection. You can browse the image collections (see also “Sort by”). The “Help Pages” can be found on the top right of the window.



An alternative way is to switch from “Data Overview” to the “Items View”



And select DESIS using the “Collection Filter”

2. ISS Orbit Specification and Prediction of Data Acquisitions

Q: What are the specifics of the ISS orbit and how does it affect the DESIS acquisitions?

A: The ISS has no polar orbit with a fixed equatorial crossing time. This leads to a greater variability in image acquisition. Due to the ISS orbit with an inclination of 51.6° , DESIS cannot acquire data further north than 55° N or further south than 52° S. The ISS orbit altitude also varies by about ± 5 km from the nominal 405 km. DESIS can acquire data either on the ascending or descending side of the orbit. Furthermore, data acquisition can be carried out over a longer period of time during the day, which results in a wider range of solar zenith angles during data acquisition and thus can influence the image quality.

Q: Is there a flight schedule for DESIS similar to the Landsat and the Sentinel fleet?

A: No, DESIS is not a mapping mission, which means there is no fixed flight plan or path/row information. DESIS is a tasking mission and only acquires data for regions and times users have requested.

Q: I plan a field campaign. How can I get informed about the potential acquisition possibilities of my area at a given time?

A: Currently, a precise forecast isn't possible. However, there are several possibilities to get approximations.

- In order to see whether the area of interest is at a given time in the field of view of the ISS, there are several online webtools allowing tracking the ISS. An example is: <https://www.satflare.com/track.asp#TOP> . Note: The DESIS platform is able to tilt up to -45° (backboard) to +5° (starboard) across track and -40° to +40° (along track). This might result in more acquisition possibilities that cannot be estimated by ISS tracker tool.
- During the set-up of the tasking request in the ESP tasking tool from Teledyne Brown Engineering, a feasibility report has to be made by the system. If this report fails, there are no tasking opportunities under the given user constraints. If the feasibility report is successful, there are tasking opportunities. However, the report does not inform about exact tasking dates or other constraints.
- In urgent cases (such as for large and expensive user campaigns) please contact desis-scientific@dlr.de in order to get more detailed information.

Q: What is the average revisit time?

A: There is no fixed revisit time since the ISS orbit is changing. An approximate average revisit time can be given, which differs by latitude and solar/sensor zenith angle restrictions. In general, at higher latitudes (North or South), there may be many grouped opportunities with large breaks in between. At the middle latitudes, the revisit opportunities will be more evenly spaced but less frequent. For example, at 30° latitude, with sensor zenith angles up to 25°, the average revisit time is 10 days, while at 15° latitude, with sensor zenith angles up to 25°, the average revisit time is 12 days. To get an impression of the ISS orbit (also in the future) several online tracking tools are available (e.g. <https://www.satflare.com/track.asp?q=25544#TOP>)

3. DESIS Product Information

Q: Which products can I order?

A: The following products at different processing options are available. See also https://www.dlr.de/eoc/PortalData/60/Resources/dokumente/DESI/DESI_Products/PAV-DLR-ICD-003.pdf

Product Type	Description	Order Parameters
L1B	Radiometric and sensor specific corrected data Top of Atmosphere (TOA) radiance ($mW \cdot cm^{-2} \cdot sr^{-1} \cdot mm^{-1}$) All metadata attached for further processing	<ul style="list-style-type: none">• Spectral Binning
L1C	L1B data ortho-rectified and resampled to a specified grid using global SRTM 1 arcsec DEM for terrain correction using global Landsat ETM+ references for sensor model refinement	<ul style="list-style-type: none">• Map Projection• Resampling
L2A	L1C data atmospherically corrected (Bottom-of-Atmosphere reflectance) generating several masks (water, land, cloud, shadow,...)	<ul style="list-style-type: none">• Terrain Correction• Ozone Column

Q: What is the quality of the products?

A: Summarizing the data quality for the different product types

- Absolute radiometric calibration is well within ~ 10% at the TOA radiance and TOA reflectance level when validated against RadCalNet, Sentinel-2 and Landsat-8
- Spectral calibration after smile correction is typically better than ~0.5 nm, and always within 1/3 of a spectral pixel
- SNR is greater than 200 (investigated at five bands at 443 nm, 482 nm, 562 nm, 655 nm, 865 nm) and is in agreement with ground based measurements
- MTF@Nyquist (across track) is about 0.3 - 0.4
- Geometric accuracy with respect to reference is ~ 20 m (< 1 pixel) linear RMSE in the case that GCPs can be derived from image-to-image matching; otherwise RMSE is 300 - 500 m
- BOA reflectance within <~ 10% based on RadCalNet, Pinnacles, and Sentinel-2 comparison

A detailed data quality analysis can be found at <https://www.mdpi.com/1424-8220/19/20/4471>

Q: Where can I get more information on the products from the DESIS?

A: there are different sources to get information about DESIS products. (1) [Official WEB portal](#) (2) [Publications](#)

Q: What information contains the metadata file?

A: The metadata file contains general information like license text, processing parameters like map projection, base information like bounding polygon and specific information like band characterization. A detailed description is given in the metadata section of the document https://www.dlr.de/eoc/PortalData/60/Resources/dokumente/DESI/DESI_Products/PAV-DLR-ICD-003.pdf. The Algorithm Theoretical Basis Document (ATBD) https://www.dlr.de/eoc/PortalData/60/Resources/dokumente/DESI/DESI_Products/PAV-DLR-TN-004.pdf contains additionally metadata fragments describing in more details specific metadata values. Additionally to the metadata xml file an ENVI header file (*.hdr) is provided with information on the center wavelength (cm) and full width half maximum (fwhm).

Q: Are there any acquisition constraints?

A: If a L2A product is being requested, there are some solar zenith angle (SZA) restrictions: SZA > 55° produces reduced quality L2A product SZA > 65° produces low quality L2A product SZA > 70° not processible to L2A.

Q: Why is the geometric accuracy sometimes very low?

A: Existing global reference data with high geometric accuracy are used to improve the sensor model parameters. The improvement consists of an on-the-fly image matching with the reference data to extract Ground Control Points (GCP). If image matching is not possible due to low textured image pairs (e.g., rain forest, deserts, and cloud and haze cover) or drastic changes in the land cover between the acquisition times of the reference image and the DESIS scene (e.g., agriculture fields and snow cover), geometric processing will rely only on the on-board position and attitude measurements, the laboratory geometric calibration, and the calibrated boresight angles. In this case RMSE of 300 - 500 m (up to 1 km peak) can be obtained.

Q: Are there any data restrictions?

A: Some areas are not allowed to be acquired by DESIS such as Israel. The restrictions are a requirement of NOAA.