MapEO Field Software User Manual

Version**:** 2.6
Release Date: 21/04/2023

Contact info / Technical support and service

support@mapeo.be

VITO Remote Sensing, Boeretang 200, 2400 Mol, Belgium

http://remotesensing.vito.be/

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About this document

MapEO is VITO's drone image processing/analytics platform which provides end2end services for specific industries like agriculture, water quality, governmental asset management, etc.
The high-level MapEO workflow consists of following steps:

- Plan
- Fly
- Upload using MapEO Field Software
- Analyse
- Inspect
- Connect

The details of these operational steps are further explained in the MapEO academy documents, listed in Table 1. This document describes how to install the MapEO Field Software, explains its functionality and how to use it.

Symbols

The warning symbol appears in this document, urging the user to pay more attention to any actions or checks.

References

MapEO reference documents are listed in Table 1

RD1	MapEO Field Software Quick Start Guide
RD2	MapEO Academy - Phenotyping - flight procedures RGB
RD3	MapEO Academy - Phenotyping - flight procedures MSP
RD4	MapEO Academy - GCP measurement procedures
RD5	MapEO Academy - Phenotyping - product overview
RD6	MapEO Academy - Phenotyping - product ordering procedures
RD7	MapEO Academy - Phenotyping – data analysis procedures

Table 1: MapEO reference documents

Document change record

Version 2.6
Release Date 21/04/2023
Affected sections:
Section 5.1.1.2: Updated ‘Data quality thresholds’ description
Section 7.2: Removed ‘drone data products’ table
Section 13: Removed this section
Multiple sections: updated pictures in line with latest software version
Multiple sections: minor textual modifications

Version 2.5
Release Date 21/09/20222
Affected sections:
Added disclaimer

Version 2.4
Release Date 1/08/2022
Affected sections:
Java appendix up to date with new Adoptium website

Version 2.3
Release Date 13/6/2022
Affected sections:
Added network troubleshooting appendix

Version 2.2
Release Date 5/6/2022
Affected sections:
Java requirement set to JDK 11

Version 2.1
Release Date 24/05/2022
Affected sections:
Section 8: Loading a previously stored mission

Version 2.0
Release Date 01/04/2022
Affected sections:
All

Version 1.0
Release Date 02/2020
Initial version

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LIST OF ABBREVIATIONS

CSV	Comma-Separated Values
EPSG	European Petroleum Survey Group
EXIF	EXchangeable Image File
GCP	Ground Control Point
GUI	Graphical User Interface
JRE	Java Runtime Environment
KML	Keyhole Markup Language
MSP	MultiSPectral
RGB	Red Green Blue
ROI	Region Of Interest
SDK	Software Development Kit
UTM	Universal Transverse Mercator

1. INTRODUCTION

The MapEO Field Software tool which is described has two main purposes:

- Quality check of the acquired drone data
- Actual upload of the acquired drone data to the MapEO backend

A first quality check is conducted in the field, just after the drone mission has been flown, to analyse data quality and field coverage. Details can be found in section 5 Validating drone data.

Data upload can be carried out back in the office once a high-speed internet connection is available. Details can be found in section 6 Uploading drone data.

Whenever the drone data does not meet the quality requirements, the pilot needs to **REFLY** the mission and re-run the quality checks until all requirements are met.

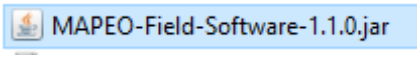
2. GETTING STARTED

2.1 System requirements

- Java capable computer with minimally 1 GB – preferably 2 GB of RAM.
  Tested on Windows, Linux & MacOS
- Java version 11 or higher (17 LTS is recommended).
  Go directly to **https://adoptium.net** to install the latest compatible Java version. See section 10 Appendix A: Java/JDK setup – Windows or section 11 Appendix B: Java/JDK setup - MacOS for more information.
- Internet access for Java – on first run
  Some firewall/internal policies block access or present a pop up when launching Java for the first time, you must **allow Internet access for Java!**

2.2 Starting the application

You should have received a link to a jar file. Download it somewhere locally on your hard drive (eg. Desktop), no install is needed. Then double click on it to run the application:



In case you encounter problems at start-up, try some troubleshooting first.

Most of the launch issues are related to an incompatible Java/JDK version. See section 10 Appendix A: Java/JDK setup – Windows or section 11 Appendix B: Java/JDK setup - MacOS for the installation of a compatible JDK.

Specific for **Windows**, if you have memory warnings, look at section 10.4 Solving a Java Heapspace warning or OutOfMemory issue .

Specific to **MacOS** launch issues, check section 11.4 Solving a crash of the tool after login.

2.3 Authentication and login

When starting the Field Software, a log-in dialog box will pop-up (Figure 1):

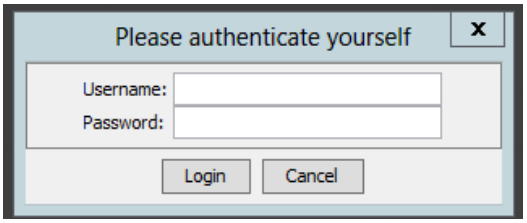


Figure 1: Login screen

Type your username and password and then click "**Login**".
After successful authentication, you are no longer required to login for a period of 60 days.

The Field Software main window is displayed.
On the right of the lower window border, in the status bar (Figure 2), you find:

- the username
- the next time a login is required for this user
- the "switch user" button , in case you want to switch to a previously used account
- the "logout/login" button to login as a different user

Figure 2: Login info in the status bar

When you start the Field Software for the very **first time**, you need:

Internet access
A user account

So, before going in the field without internet access, you should have run the jar at least once and logged in with the active Windows/MacOS/Linux user!

2.4 GUI elements and features

To clarify the meaning of the terms used in this manual, some basic elements of the MapEO Field Software's GUI's are labeled in the following images.

Upon successful authentication, the Field Software starting page is displayed.
The first time the Field Software is being used, a world map is displayed (Figure 3).

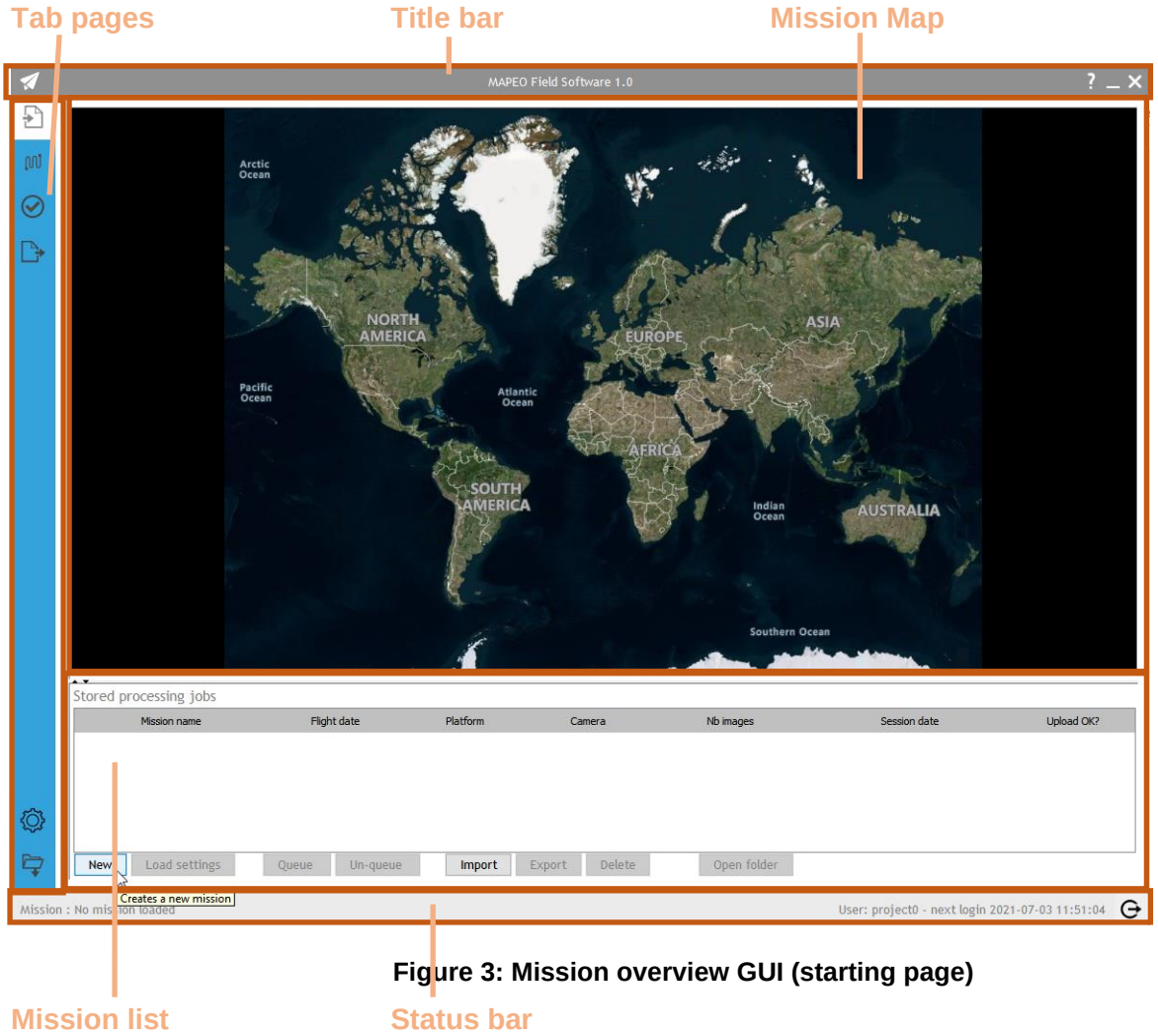


Figure 3: Mission overview GUI (starting page)

As soon as missions have been created, mission locations and details are displayed (Figure 4).

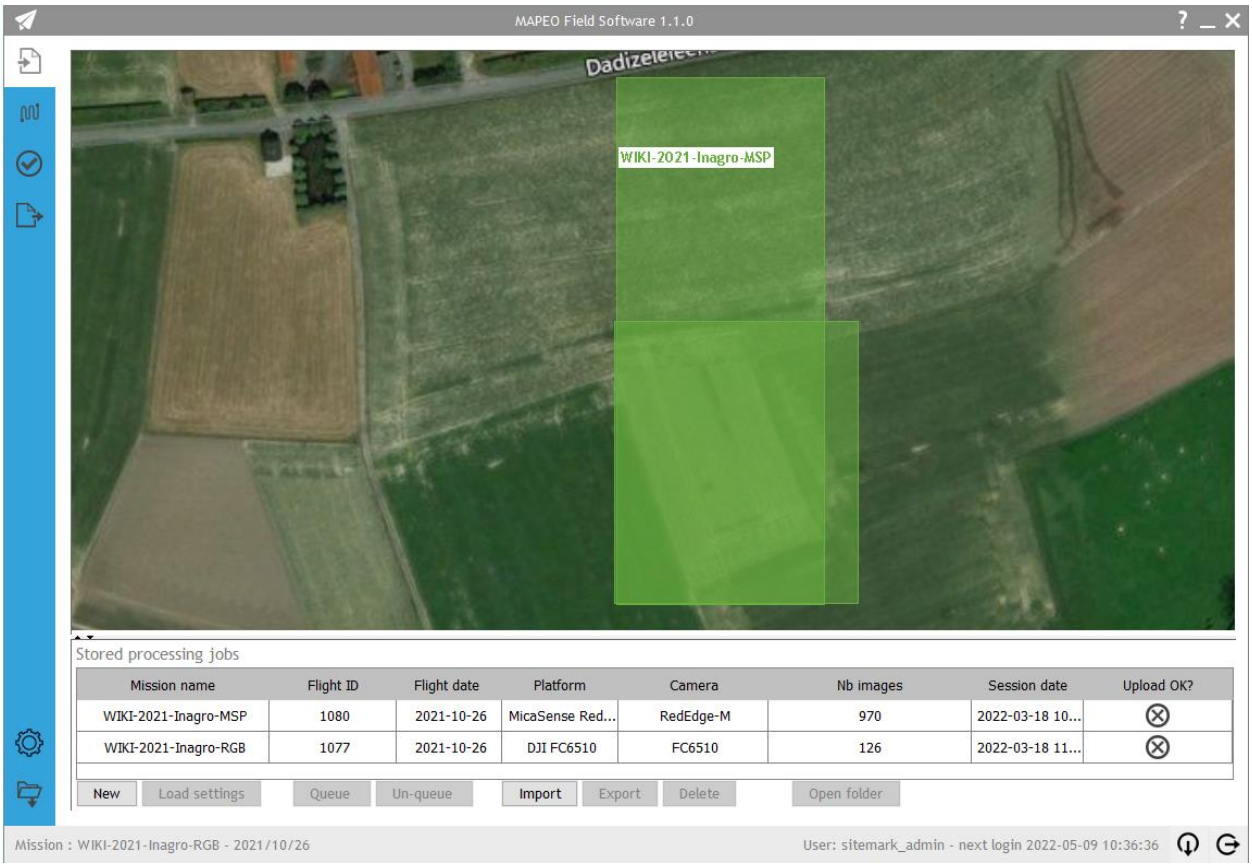


Figure 4: Mission overview GUI

2.4.1 Title bar

The title bar is located at the upper window border.
The title bar is displaying the version of the Field Software you are currently using. This version information will be requested whenever you contact the MapEO support team.

Furthermore, the title bar provides controls to resize and close the GUI (cfr section 2.5.2 Resizing the GUI).

2.4.2 Status bar

The status bar is located at the lower window border.
It displays information about the currently loaded mission and the user account that has been used during login, and contains the “switch user” and “logout” button (cfr section 2.3 Authentication and login).

2.4.3 Mission map

When no missions have been created yet, a world map will be shown. As soon as missions have been saved, the mission map will show a zoomed image, in which the mission locations are indicated by blue dots (Figure 5).

Figure 5: Mission indication on the Mission Map

2.4.4 Mission list

The mission list pane provides an overview of all missions that have been previously created within the Field Software (if any), with their details.
It allows the user to create new missions or to load data from a previously stored mission (Figure 6).

Stored processing jobs

Mission name	Flight ID	Flight date	Platform	Camera	Nb images	Session date	Upload OK?
WIKI-2021-Inagro-MSP	1080	2021-10-26	MicaSense Red...	RedEdge-M	970	2022-03-18 10...	⊗
WIKI-2021-Inagro-RGB	1077	2021-10-26	DJI FC6510	FC6510	126	2022-03-18 11...	⊗

New | Load settings | Queue | Un-queue | Import | Export | Delete | Open folder

Figure 6: Mission list pane

The provided functionality includes:

New
Create a new mission.
Load settings
Load the settings of the active mission, i.e. the mission selected in the mission list.

Queue
Prepare the selected mission for upload, add them to the ‘upload queue’. The active mission = the last selected mission.
Un-queue
Removes the selected missions from the ‘upload queue’.

Export
Export the selected mission to an archive file.
Eases information exchange with the MapEO support team in case troubleshooting needs to be done.
Import
Import mission information from an archive file to your local storage.
Delete
Delete the information of the selected mission from your local storage.

Note that **only the mission properties are imported/exported/deleted**, not the actual drone imagery. The mission properties are the metadata being generated during mission creation in the Field Software.

Open folder
Open the folder on your local storage where the mission properties are stored.

2.4.5 Tab pages

The left window border provides access to tabbed pages, each providing specific views and interfaces to guide the user through the complete process from mission creation to mission data verification, mission data upload and download of the processed products.

The following tab pages are identified:

Mission overview
Mission creation
Mission validation
Mission upload
Tool settings
Mission download

2.4.5.1 Mission overview

The mission overview page is the actual Field Software starting page, its content has been explained in the previous paragraphs.

2.4.5.2 Mission creation

The mission creation page guides the user through the following steps:

Step 1 of 4: Mission (flight and) profile selection (Figure 7 and Figure 8)
Step 2 of 4: Mission data selection (Figure 9)
Step 3 of 4: Mission flight description (Figure 10)
Step 4 of 4: Mission data processing options selection (Figure 11)

The ‘Previous’, ‘Next’ and ‘Finish’ buttons allow browsing between the different steps.
All details related to the mission creation are provided in section 5.1 Creating a new mission.

Note that:

- Step 1 will show a different user interface, depending on whether the drone flight has been pre-ordered using the MapEO website or not. In case of pre-ordering, the drone flight can be selected by to the user.
- Step 4 is restricted to selected users, depending on the user account.

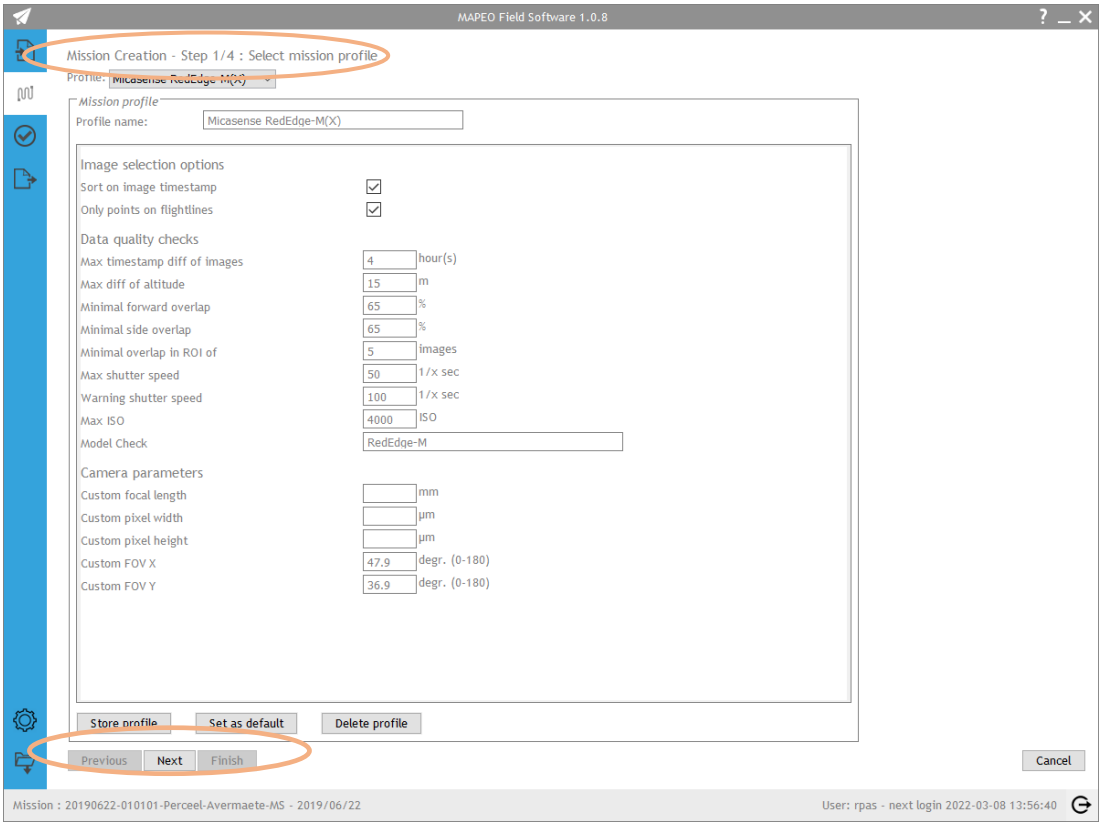


Figure 7: Mission profile GUI

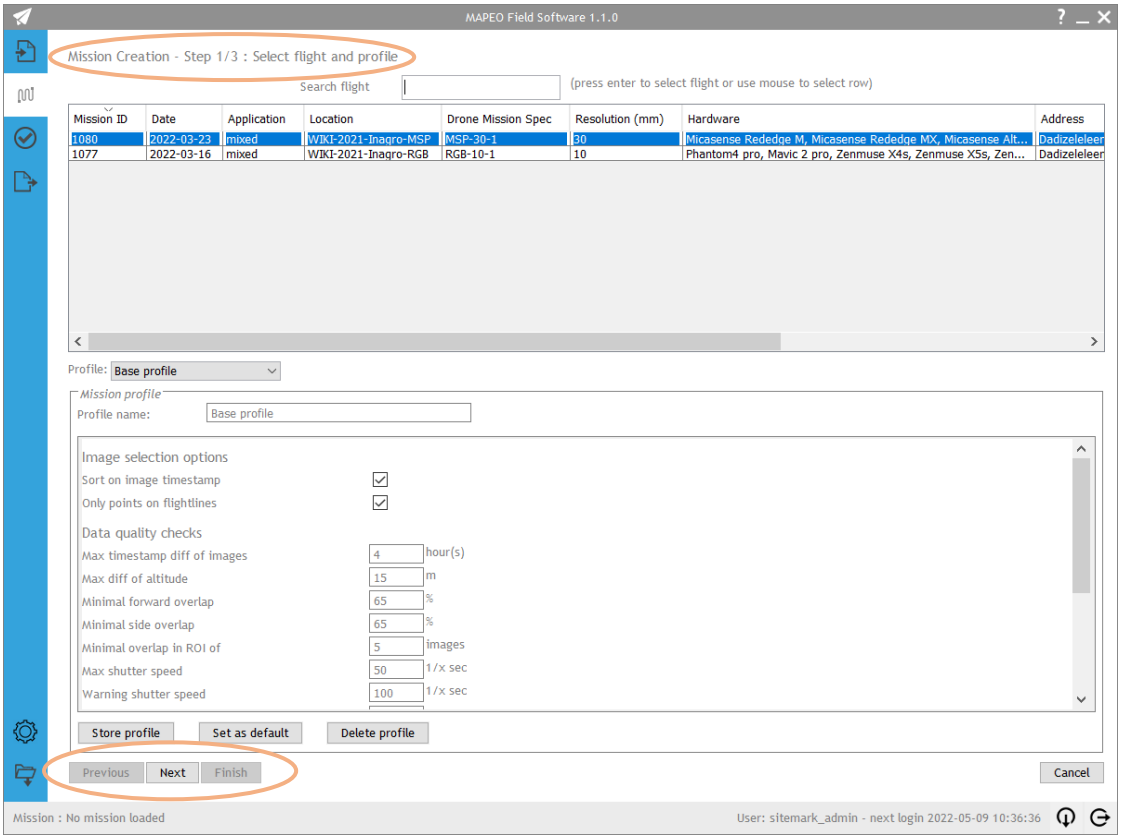


Figure 8: Mission flight and profile GUI

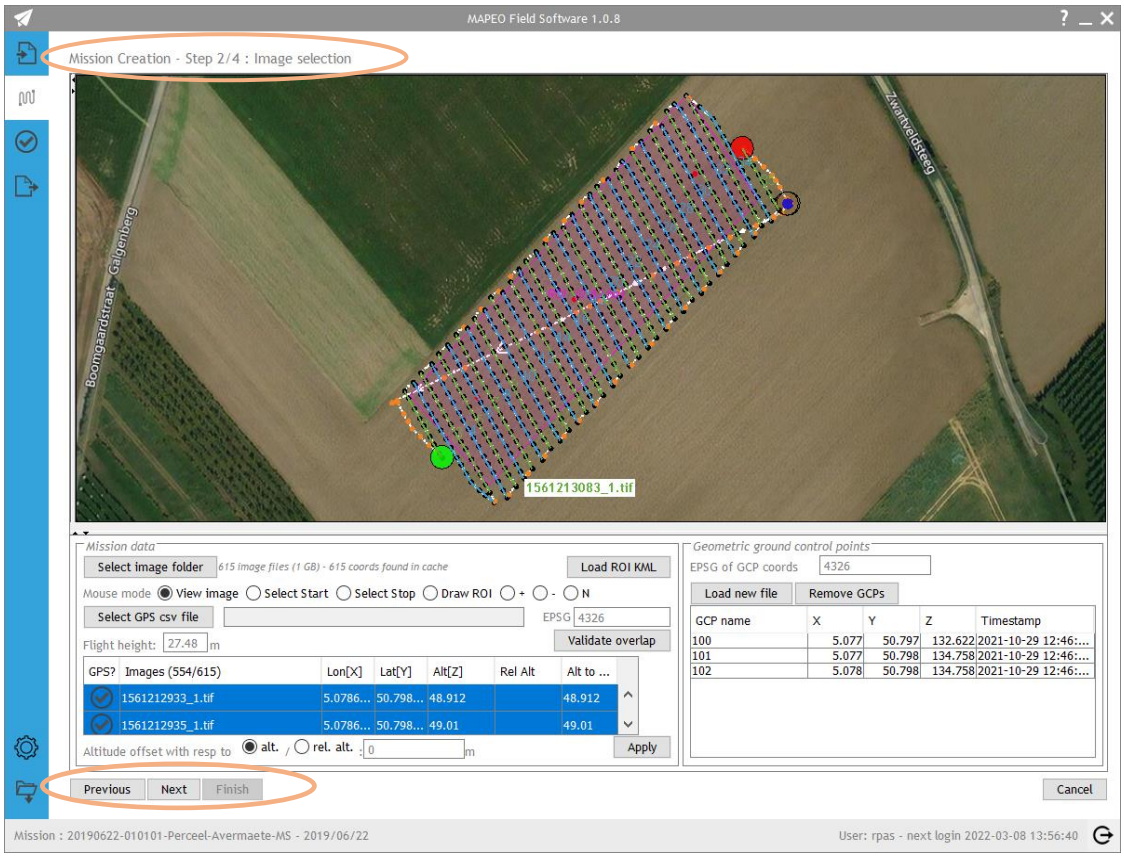


Figure 9: Mission data GUI

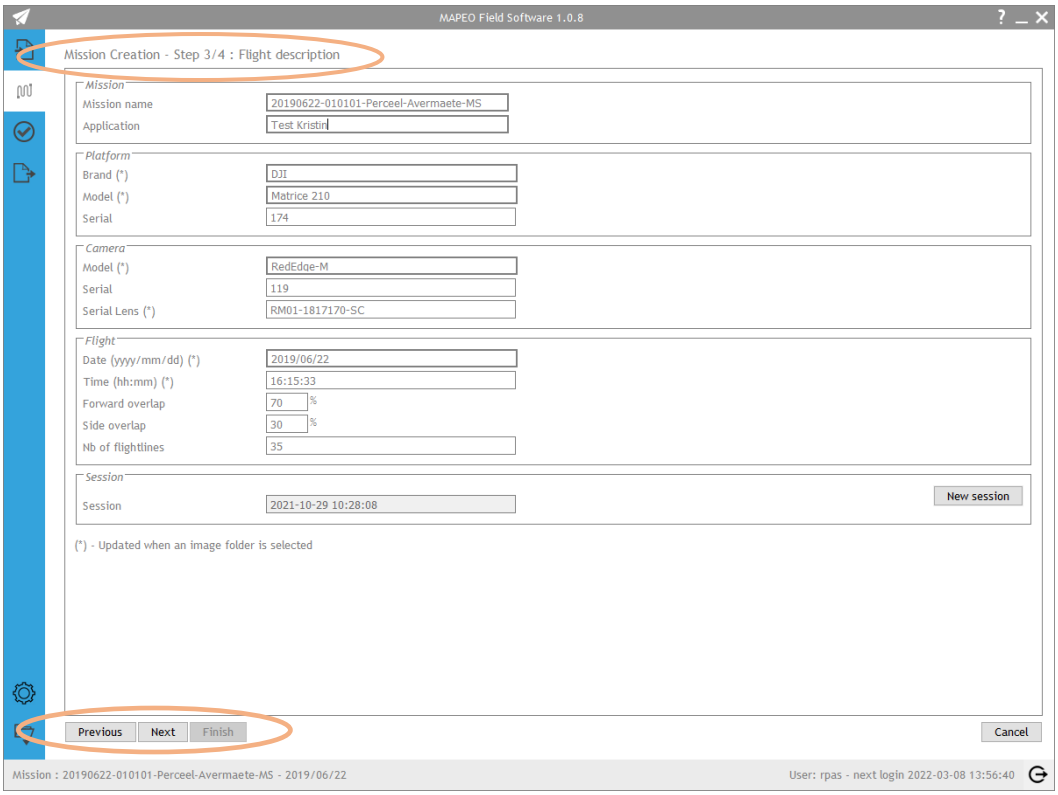


Figure 10: Mission flight description GUI

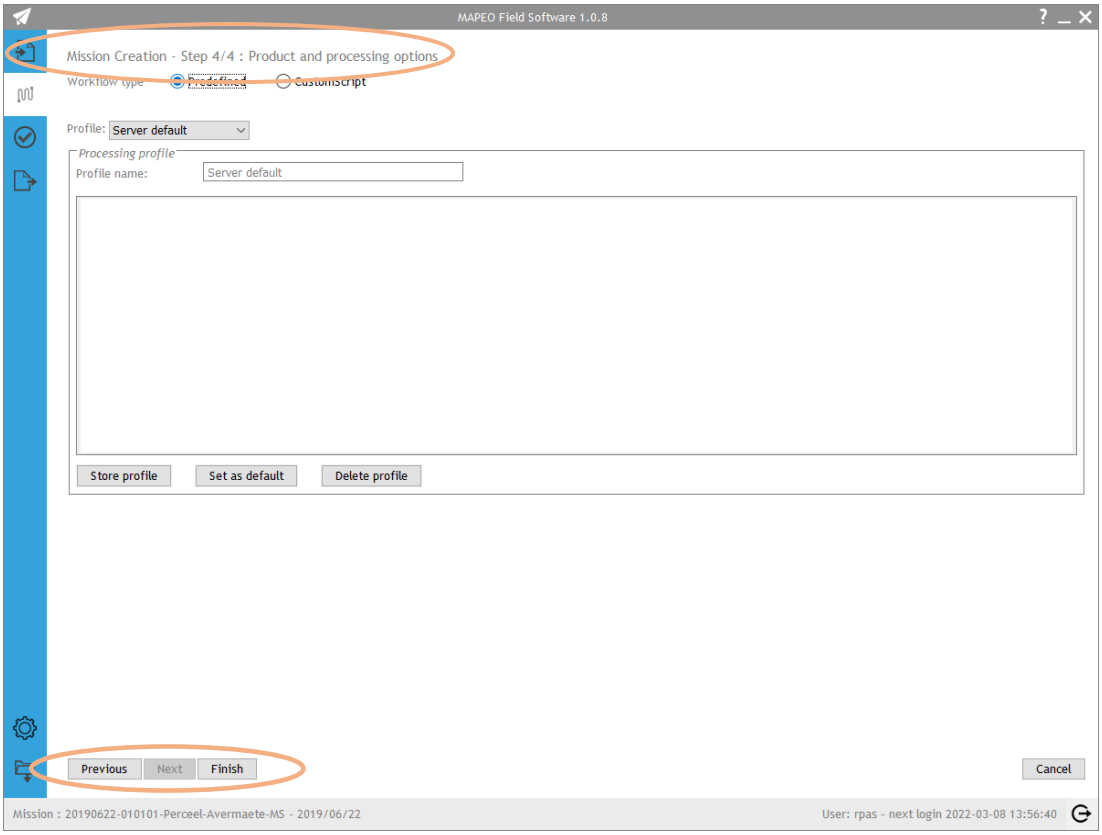


Figure 11: Mission data processing options GUI (selected users only)

2.4.5.3 Mission validation

The mission validation page shows the results of the quality checks that have been applied to the mission data (Figure 12).
All details related to the mission validation are provided in section 5.2 Validating a new mission

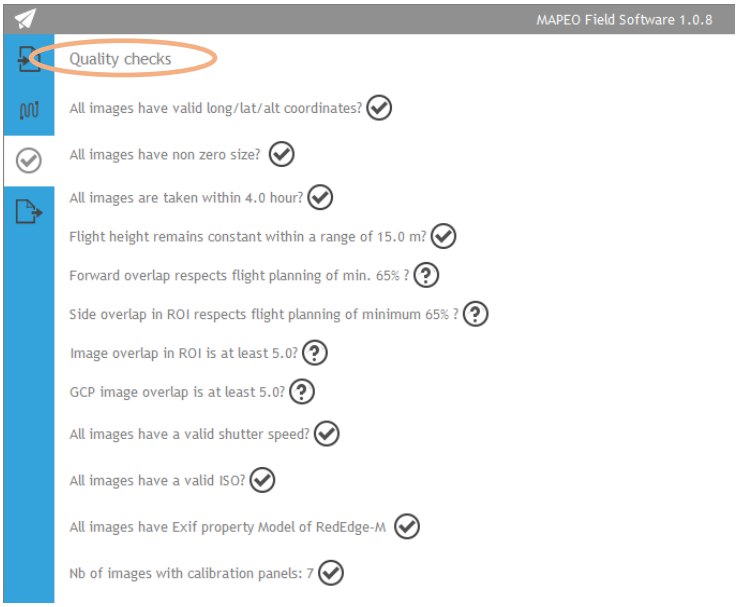


Figure 12: Mission validation GUI

2.4.5.4 Mission upload

The mission upload page allows the user to upload the mission data to the MapEO backend for further processing (Figure 13).
All details related to the mission upload are provided in section 6 Uploading drone data.

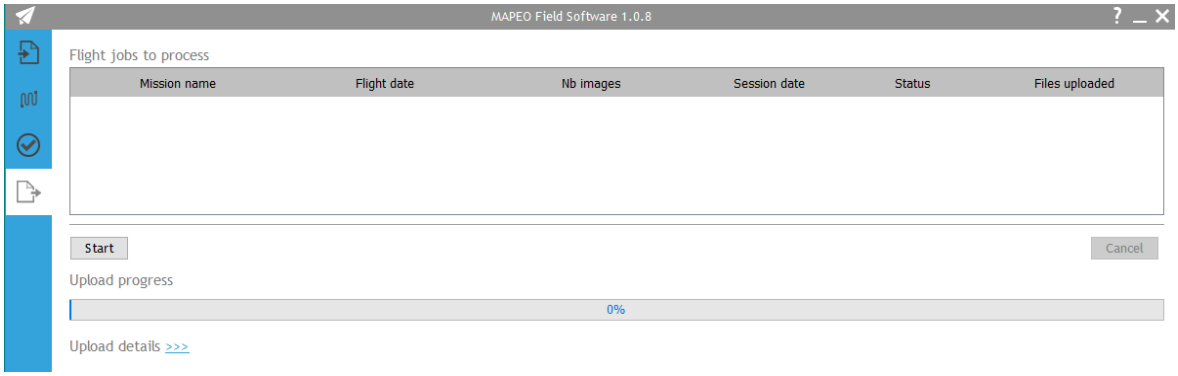


Figure 13: Mission upload GUI

2.4.5.5 Mission profile settings

The mission profile settings page allows the user to modify the mission profile (Figure 14).
All details related to the mission profile are provided in section 5.1.1 Step1: Selecting the flight and mission profile.

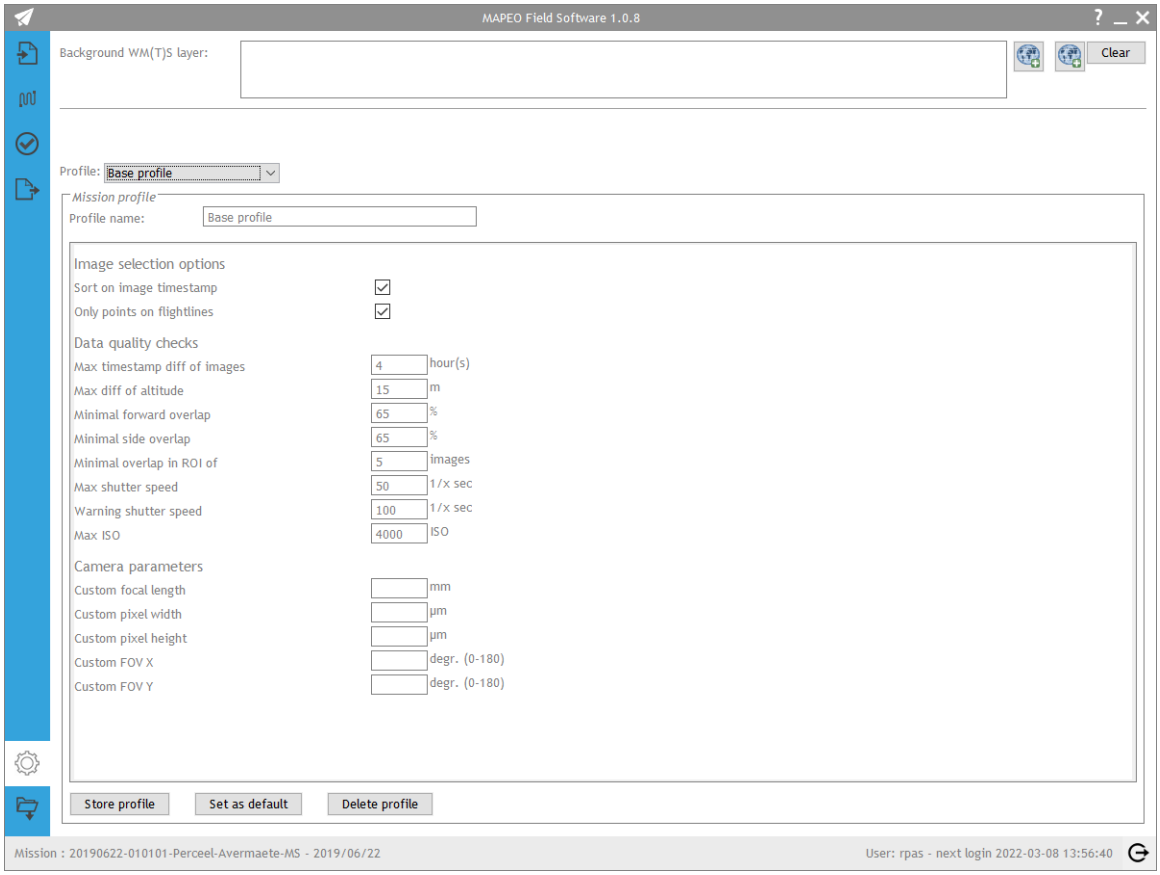


Figure 14: Mission profile settings GUI

2.4.5.6 Mission download

The mission download page allows the user to select processed datasets for download.
All details related to the mission download are provided in section 7 Downloading processed drone data.

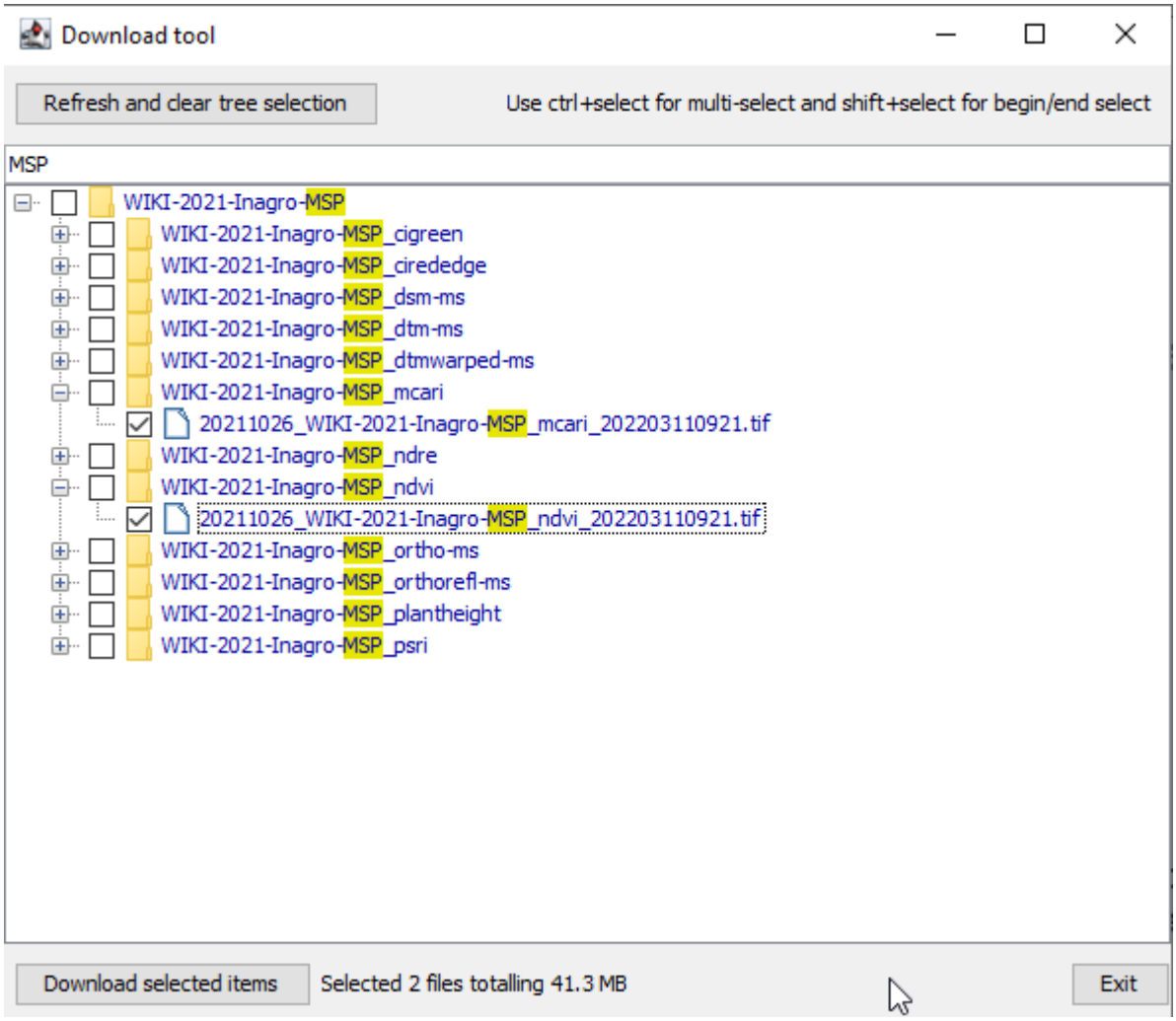


Figure 15: Mission download GUI

2.5 Using the Field Software's GUI

2.5.1 Getting help

When clicking the **'?'** in the Title bar, the **Help/Info** screen pops up (Figure 16), providing the Field Software version, a link to the user manual (this document) and a link to the VITO Remote Sensing website.

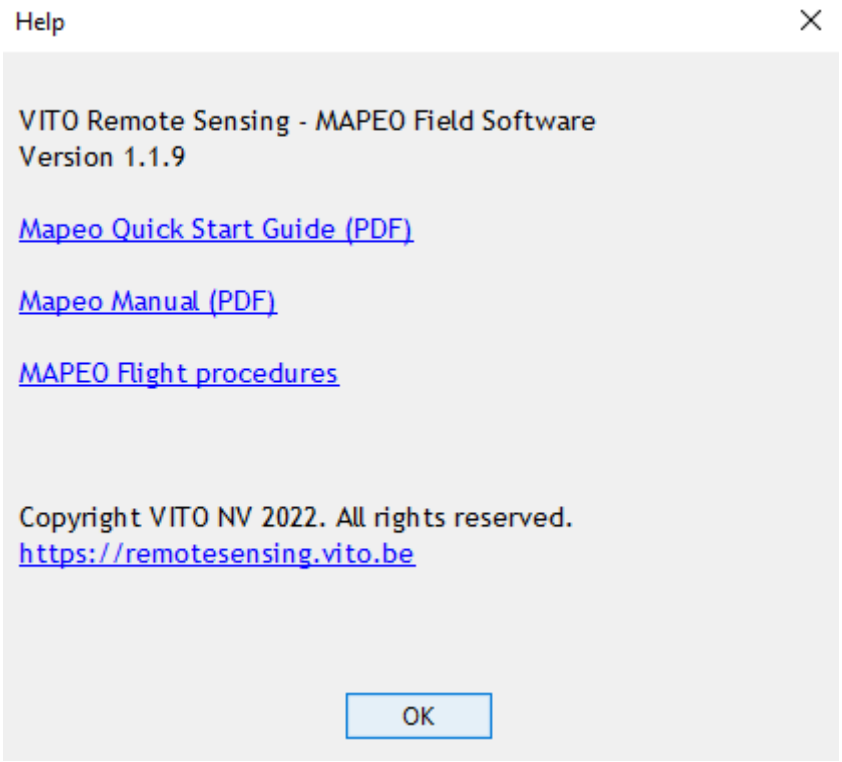


Figure 16: Help/Info screen

2.5.2 Resizing the GUI

When clicking the '_' in the Title bar, the Field Software GUI will be **minimized**.
When clicking the '**X**' in the Title bar, the Field Software GUI will be **closed**.
When double-clicking somewhere in the Title bar, the Field Software GUI will be **maximized**.

Custom resizing is possible by using the arrow/mouse-control on the left/right/lower GUI border (custom aspect ratio), or the lower right corner of the status bar (keep aspect ratio).

2.5.3 Expanding/collapsing GUI panes

Some of the GUI panes can be expanded/collapsed to show additional information.
This is indicated by small arrows at the border of the pane (Figure 17).
Clicking on the small arrows will fully collapse/expand the pane, using the arrow/mouse control allows custom resizing of the pane.

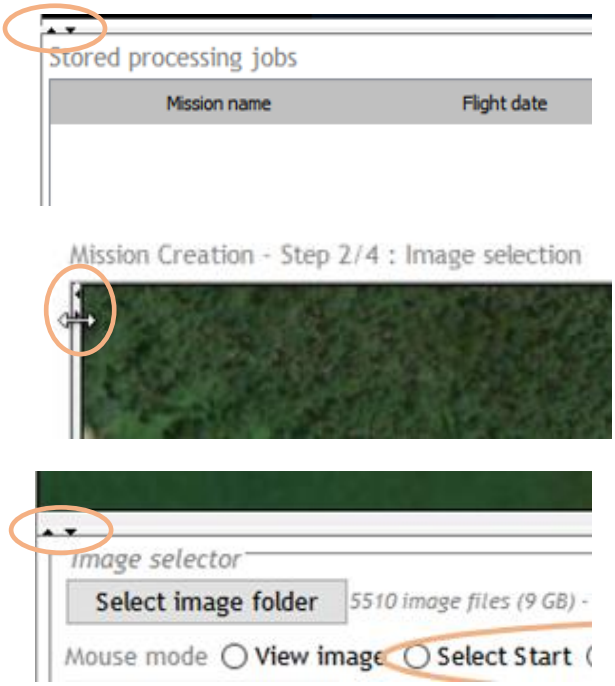


Figure 17: Expanding/Collapsing GUI panes

2.5.4 Map controls

If you have a mission map open in the mission data GUI, following controls are extremely handy:

- **Click anywhere on the map**:
  zoom and centre map so that the mission/ROI/GCPs are best visible
  (images need to have been loaded)

- **Ctrl or Shift + drag mouse**:
  draws a zoom box

- **Scroll mouse:**
  zooms in or out one level

- **Right click** (Figure 18):

  - Copy Lat Lon:
  copies Lat Lon coordinate of current mouse position to system clipboard

  - Open Google maps:
  opens the system browser with Google maps on current mouse position

  - Reset visualization:
  in case something went wrong during rendering (white screen),
  rebuilds the visualization

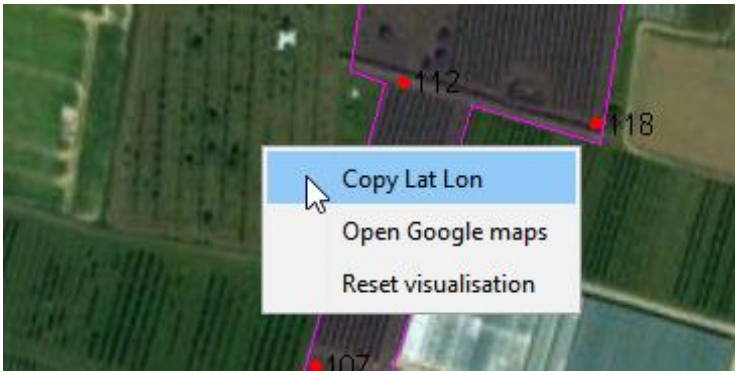


Figure 18: Mission data GUI - map controls

2.5.5 Exporting image coordinates

Once the image data of a new mission has been loaded, and they are displayed in the mission data GUI (Figure 19), you can export the image coordinates.
Click an entry, select “CTRL-A” and copy “CTRL-C” and you can paste the coordinates in for example Excel.

Note that this table selection also selects the images for processing so click anywhere to revert that.

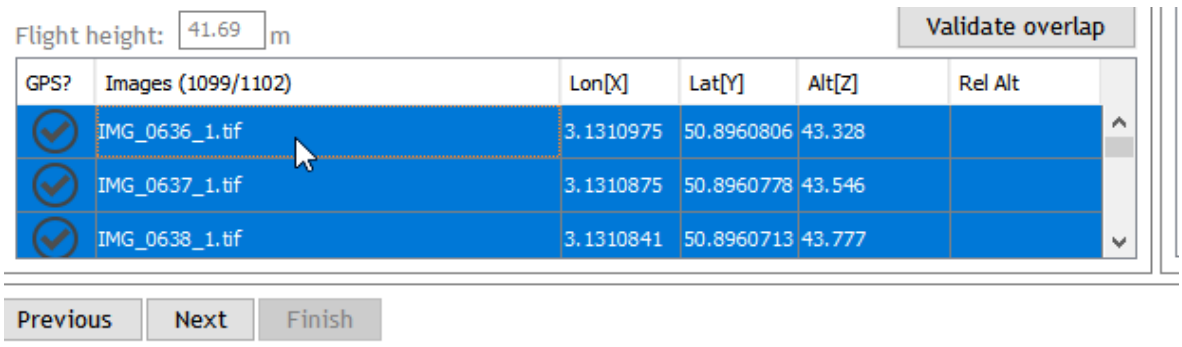


Figure 19: Mission data GUI – list of images

3. DOWNLOADING PREDEFINED ROI AND GCP FILES

Note that this functionality is **only available when working in the "Remote configuration mode"**, and thus depends on the user account (cfr section 5.1.2).

Before flying a particular drone mission, you can use the Field Software to download any files containing predefined information w.r.t. the Region Of Interest (ROI) and the Ground Control Points (GCPs) for that particular mission.

These files are managed by VITO and stored remotely (in the cloud).
Upon starting the Field Software, a local copy of these files is made, which can be accessed by the user.

To download a predefined ROI file (Figure 20):

- Go to the "Mission Profile settings" page
- Select the "Open remote ROIs cached folder" button
- Select the ROI file to download

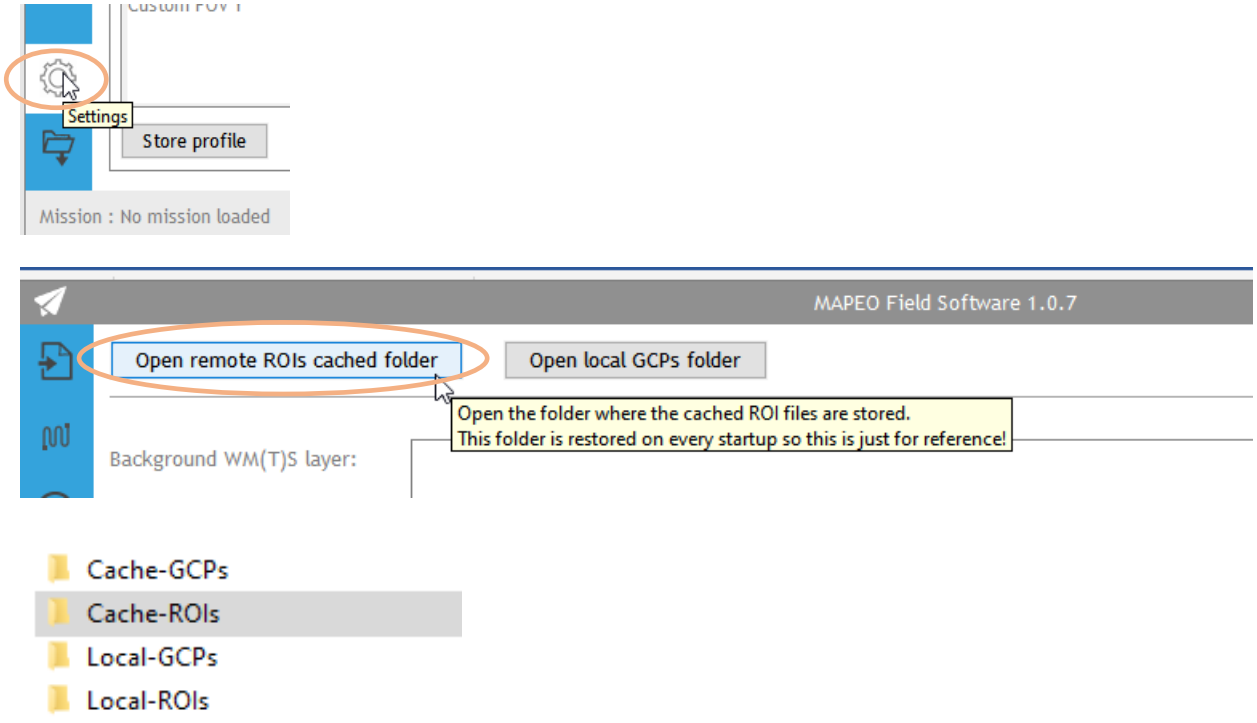


Figure 20: Downloading a predefined ROI file

4. COPYING DRONE DATA

4.1 File naming convention

We advise to copy the information of the SD-card to a local disk once the drone mission has ended, using the following naming structure:

xxxx_yyyymmdd_zzz/img/

With:

xxxx	field name
yyyymmdd	acquisition date
zzz	camera ID, e.g. RGB or MSP (multispectral sensor)

Example:
Field1_20191229_RGB/img

Notes:

- In case a particular field/region of interest is flown at the same day with different camera types, e.g. RGB and MSP, these flights are considered part of different missions. This should clearly be indicated in the folder name.

- In case several drone flights are required to cover 1 large region of interest, data of all these flights are considered as one mission.

4.2 Handling duplicate filenames

In case your mission contains duplicate filenames, you do not need to rename them as the tool offers this functionality.
The images just need to be located in a common root folder, and can be in different subfolders, the tool will then rename the files using the subfolder names (confirmation will be asked via a popup).

Note however that for data originating from a **MicaSense Dual Camera Imaging System**, duplicate image names between the 2 Camera systems are not allowed and should be removed manually.

4.3 Supported file types

Image data files must be provided in one of the following formats:
jpg/jpeg, tif/tiff, png, bmp or dng.

5. VALIDATING DRONE DATA

The following sections describe the different steps in the validation process of new drone data.

The functionality offered depends on the user account. Before you create a new mission, double-check whether you are logged in with the proper account (displayed in the status bar) and if not logoff/login with another account (cfr status bar in Figure 21).

5.1 Creating a new mission

You can add a new mission by clicking the “New” button on the “Mission overview” page (Figure 21).

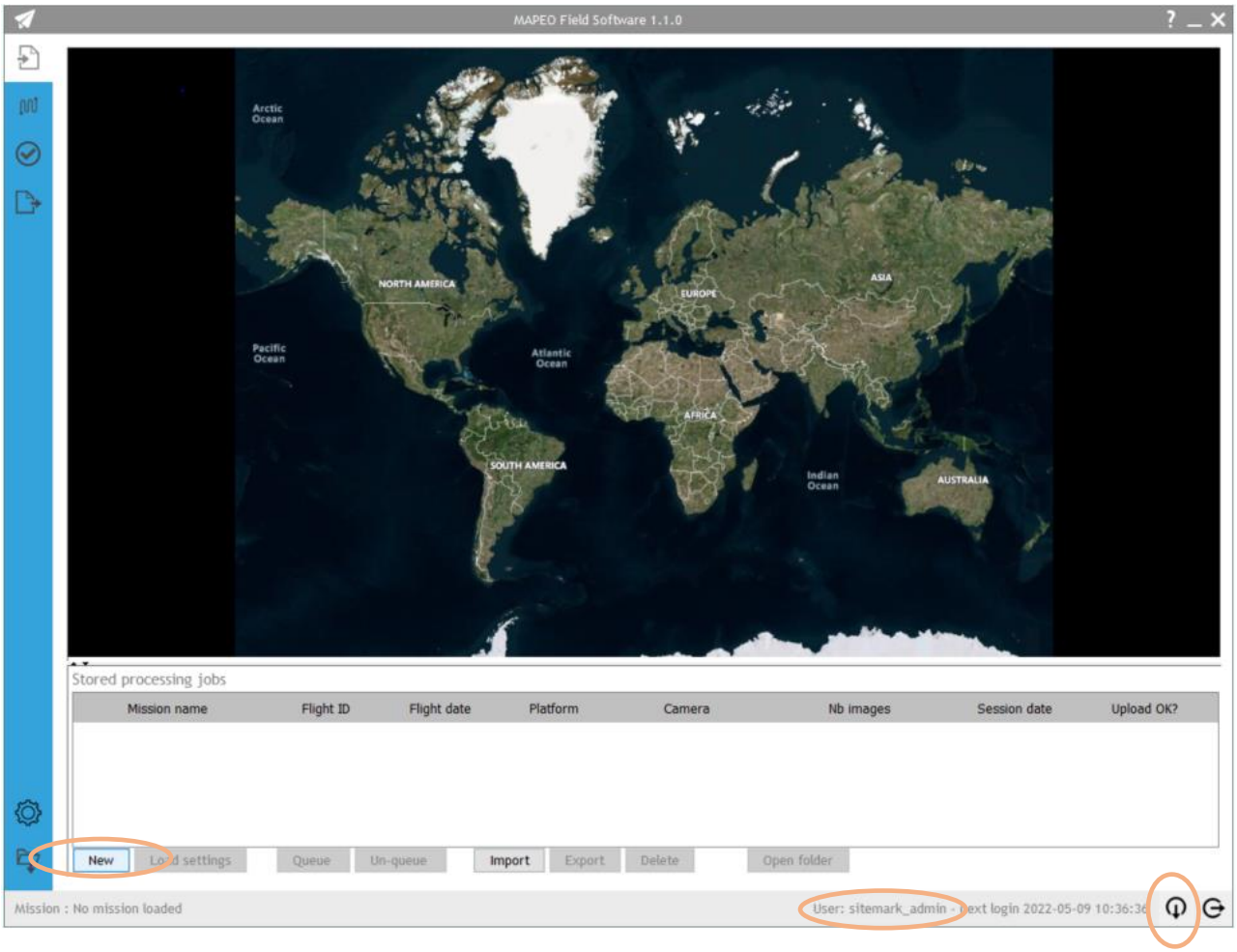


Figure 21: Creating a new mission

5.1.1 Step1: Selecting the flight and mission profile

Clicking the “New” button on the “Mission overview” page will take you to the “Flight and mission profile selection” page (Figure 22).

In the case where the drone flights have been pre-ordered through the MapEO website, the list of flights will be available to the user. In case of no pre-ordering, only the mission profile can be selected in this step (Figure 23).

A mission profile defines the parameters to be used for the validation of a specific type of missions, it is closely linked to the sensor type.
You can choose a predefined profile (managed in the cloud by VITO) or one that you created locally (cfr section 9.1 Creating and using custom mission profiles).

Once the drone flight has been selected and the mission profile parameters have been properly set, you can continue to the next step of the mission creation, by clicking the “Next” button.

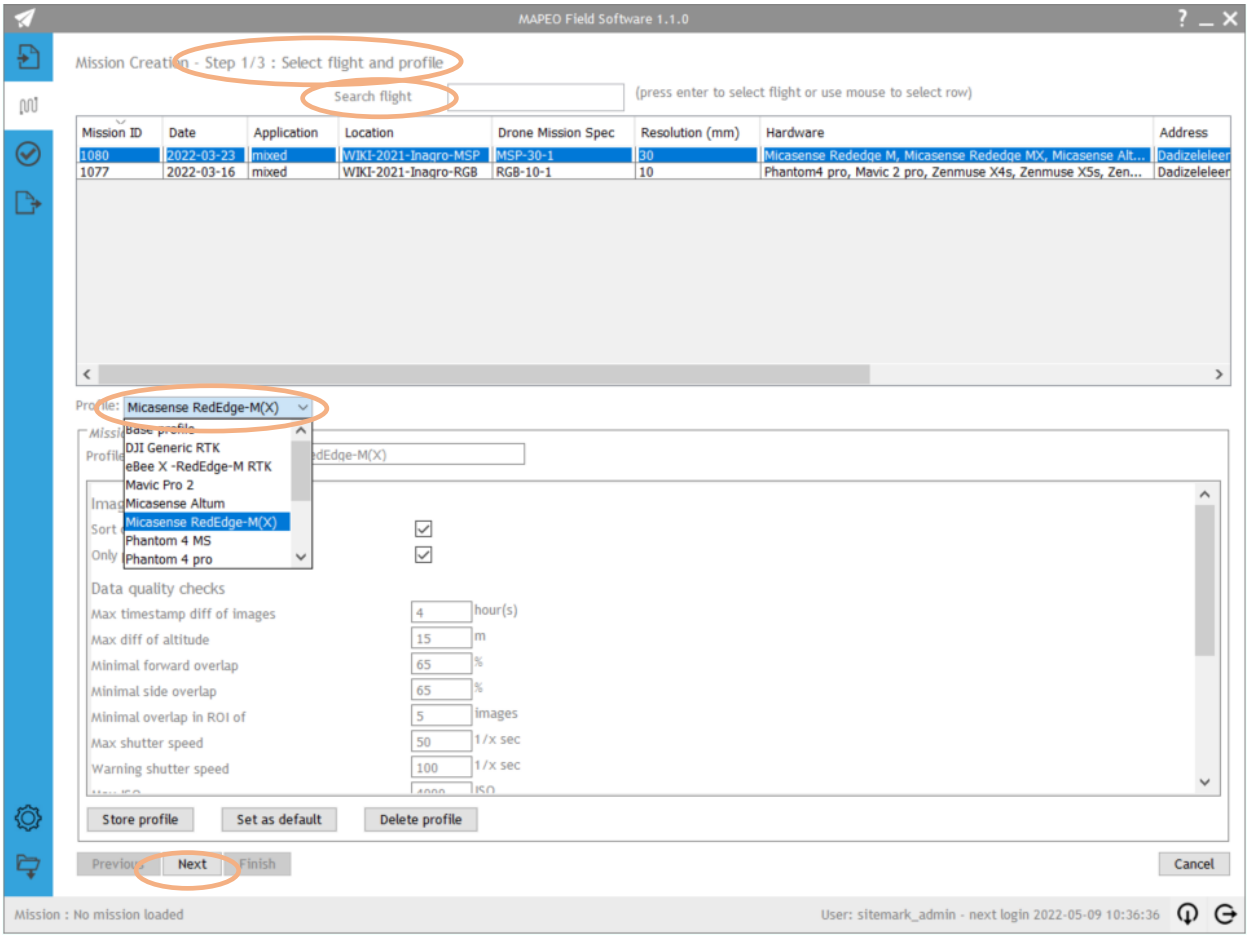


Figure 22: Selecting the flight and mission profile (flight pre-ordering)

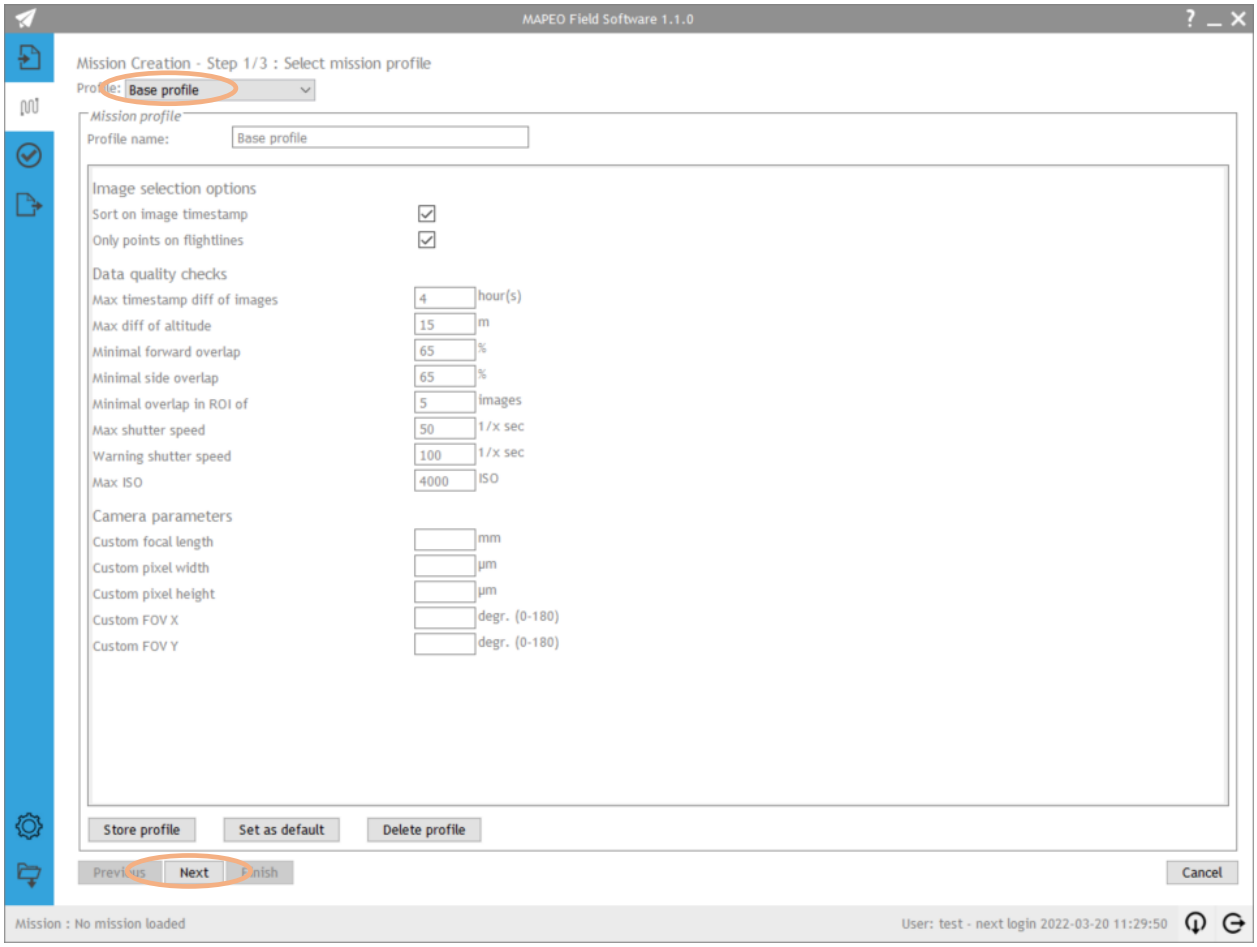


Figure 23: Selecting the mission profile (no flight pre-ordering)

5.1.1.1 Selecting the drone flight

When drone flights have been pre-ordered through the MapEO website, an overview of these flights will be available for selection in the Field Software.
Sort the flights on Mission ID, Date, Application, Location etc by clicking on the corresponding field in the header row.
Use the ‘Search flight’ text box to filter the flight list, e.g. to list all flights of a particular date.

5.1.1.2 Selecting the mission profile

The selected profile will be used to prepopulate the mission specific profile, as shown in Figure 22.
The next sections provide a description of the profile parameters that can be configured by the user.
Only if you want to reuse the created mission specific profile later, you need to click the “Store profile” button. You can also set the selected Profile as a default by using the “Set as default” button.

The following parameters can be set in the mission profile:

A) Profile name:

you only need to change this if you want to store this mission profile to be reused in a later mission.

B) Image selection options:

A detailed description on how to actually select the drone images for processing is given in section 5.1.2.4 Selecting the drone images for processing.
The parameters described in this section are related to this selection.

Sort on image timestamp: If you check this box, the flight lines of a mission will be computed and sequenced, based on the image timestamp. If not checked, the flight lines are sequenced based on the alphabetically sorted image names.

Only points on flight lines: If you check this box, only images which are located on the detected flight lines will be uploaded and processed. If unchecked, all points between start and end point will be uploaded and processed. It remains possible to manually force processing of any point.

C) Data quality thresholds:

A detailed description on the actual drone images validation is given in section 5.1.2.6 Validating the selected drone images.
The parameters described in this section are used as thresholds in that validation process.

All thresholds that are not respected, will result in a **validation error** on the validation screen**:**

unless explicitly specified with [WARNING only]. Then a **warning** will be given:

For parameters based on camera metadata (exif) information, an additional **red box** will be drawn in the mission overview page to show which images have issues (cfr Figure 33).

Max timestamp diff of images:
Maximum difference in timestamp of individual images, to verify that no old data ends up in a new mission *[WARNING only]*

Max diff of altitude:
Maximal altitude difference in meters for the selected images of the mission, ensuring stable height of the flight and consistent resolution of the drone based products.

Minimal forward overlap:
Minimal forward overlap in % - defined as the overlap of the camera footprints of image n and image n+1 *[WARNING only]*

Minimal side overlap:
Minimal side overlap in % - defined as the overlap between the footprint of the closest images on flight line n and flight line n+1 for any point (in a grid of interspacing 1m) *[WARNING only]*

Max. shutter speed:
Maximal shutter speed in 1/x seconds (Exif based)

Warning shutter speed:
Warning shutter speed (Exif based) *[WARNING only]*

Max ISO:
Maximal iso value (Exif based)

Read-only parameters:

Minimal overlap in ROI:
Minimal overlapping images (coverage) per point in the Region Of Interest

Max GPS XY deviation for quality RTK
What is the maximum XY deviation for a qualitative RTK positioning? The Exif tags GPSXYAccuracy or (rtk std lon + rtk std lat)/2 are compared with this value

Minimal % of quality RTK image to be an RTK mission
The percentage of selected images that have a qualitative RTK positioning (see above) to define the mission as a whole to be of high RTK quality

Minimal number of GCPs for non-RTK mission
Expected number of GCPs defined for this location for a non-RTK mission

Minimal number of GCPs for RTK mission
Expected number of GCPs defined for this location for an RTK mission

Optional parameters (depending on the mission profile):

Number of calibration images (read-only)
Expected minimal number of complete (all bands) Micasense calibration images

Model check:
The camera model name which is expected (Exif based)

DJI Rtk flag min:
Check if RTK is set (stored in drone-dji:RtkFlag param) (Exif based)

Max GPSXYAccuracy:
Max value of Micasense RTK accuracy in the horizontal field Camera:GPSXYAccuracy (Exif based)

Max GPSZAccuracy
Max value of Micasense RTK accuracy in the vertical field Camera:GPSZAccuracy (Exif based)

Additional Exif checks can be added for your camera if required.
Contact the MapEO support team in that case.

D) Advanced camera parameters:

Following camera parameters, if present, are used by the field software to calculate the image footprint, the overlap between images and the GSD. If they are empty, the field software tries to use Exif metadata to do these calculations, like Focal Length, Focal length 35 mm equivalent focus length, Focal Plane X resolution.

Custom focal length:
Focal length of the camera in mm

Custom pixel width:
Pixel width in µm

Custom pixel height:
Pixel height in µm

In case previous values are not known and the Exif 35mm eq. focal length is not present in the Exif meta, you can set the FOV for the overlap validation.

Custom FOV X:
Field of View in X-direction (in degrees)

Custom FOV Y:
Field of View in Y-direction (in degrees)

Manually entered values will overrule values that have been extracted from the Exif metadata!

5.1.2 Step 2: Selecting the mission data

Clicking the “Next” button on the “Flight and mission profile selection ” page will take you to the “Mission data selection” page (Figure 24).
Selection of the mission data implies selecting the actual image data, data concerning the Region Of Interest (ROI), the Ground Control point (GCP) data and any relevant metadata.

Image data selection implies:

- locating the folder containing the imagery
- specifying the image coordinate system

ROI data selection implies:

- specifying the Region Of Interest (ROI)

GCP data selection implies:

- specifying the position data corresponding to the imagery
- specifying the GCP coordinate system

The **default coordinate system** used for Image/ROI and GCP data is **EPSG:4326**, i.e. the geographic coordinate system, using latitude/longitude coordinates and heights referenced to the WGS-84 ellipsoid.

Depending on the user account, the Mission name/Application type and the ROI/GCP/Coordinate system info can be fetched from predefined files (“**Remote configuration**” **mode**) or can be entered manually (“**Local configuration**” **mode**), as listed in Table 2.

It is also depending on the user account whether the Field Software will provide the functionality to upload the drone data to the MapEO backend for further processing or not.

	Remote configuration	**Local configuration**
ROIs and GCPs	Predefined on server level, downloaded upon connection with Field Software	Self-defined by local user.
Mission name	Synchronised	Self-defined or from list of mission names
Application type	Synchronised	Self-defined or from list of application types

Table 2: Remote vs local configuration mode

5.1.2.1 Selecting the ROI and GCP information

In the local configuration mode, you can create/upload ROI/GCP information yourself (cfr section 5.1.2.7.1 Selecting the ROI and GCP information (local config mode)).

In the remote configuration mode, ROI and GCP information selection depends on whether the drone flights have been pre-ordered through the MapEO website or not.
In case drone flights have not been pre-ordered, you need to load the ROI and GCP information yourself (cfr section 5.1.2.8.1 Selecting the ROI and GCP information (remote config mode, no pre-ordering)).

In the (default) case of flight pre-ordering, ROI and GCP information is automatically loaded as soon as a drone flight has been selected, and this selection cannot be modified by the user.
On the mission map, the ROI will be drawn (purple box) and the location of the GCPs (red dots) will be displayed (Figure 24). Also, the GCP metadata will be displayed on the screen.

In case you want to download a predefined ROI or GCP file, refer to section 3 Downloading predefined ROI and GCP files.
In case you want to **define GCP files in addition to remotely configured ones**, see section 9.2 Creating and using custom GCP files.

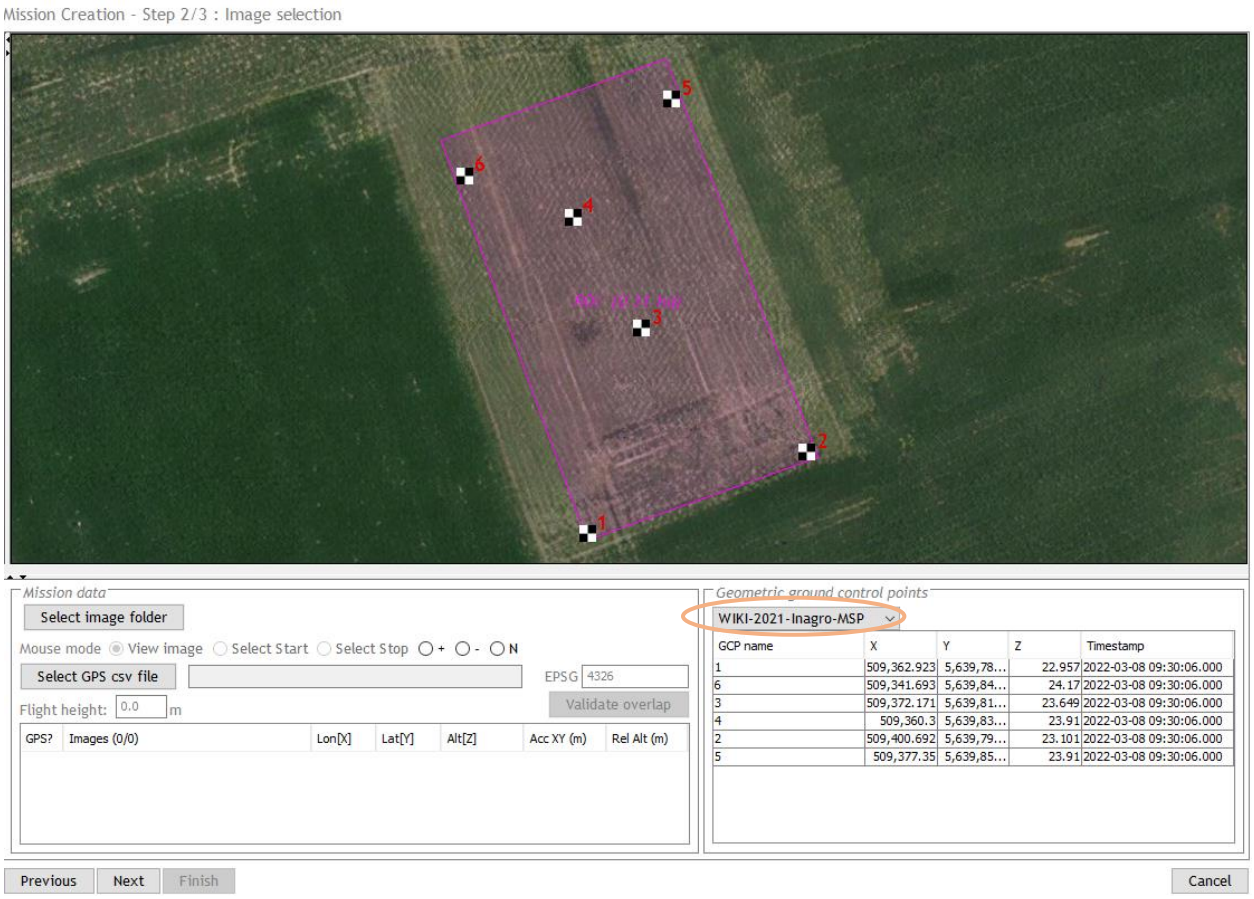


Figure 24: Selecting the ROI and GCP info (remote config mode, flight pre-ordering)

5.1.2.2 Locating the drone images

Once the ROI/GCP information has been loaded, you continue by locating the folder containing the image data.

Before you select the folder, double-check whether the file naming conventions have been followed and possible duplicate filename issues handled (see section 4: Copying drone data).

There are some minor differences between the GUI for the remote configuration mode and for the local configuration mode. When working in the local configuration mode, refer to section 5.1.2.7.2., when working in remote configuration mode, but flights have not been pre-ordered through the MapEO website, refer to section 5.1.2.8.2.

Use the “Select Image folder” button and browse through the folders to locate the image folder in the window that pops up.
Use the “Select folder” button to start the actual loading of the dataset. Note that for large missions, this may take a few minutes.

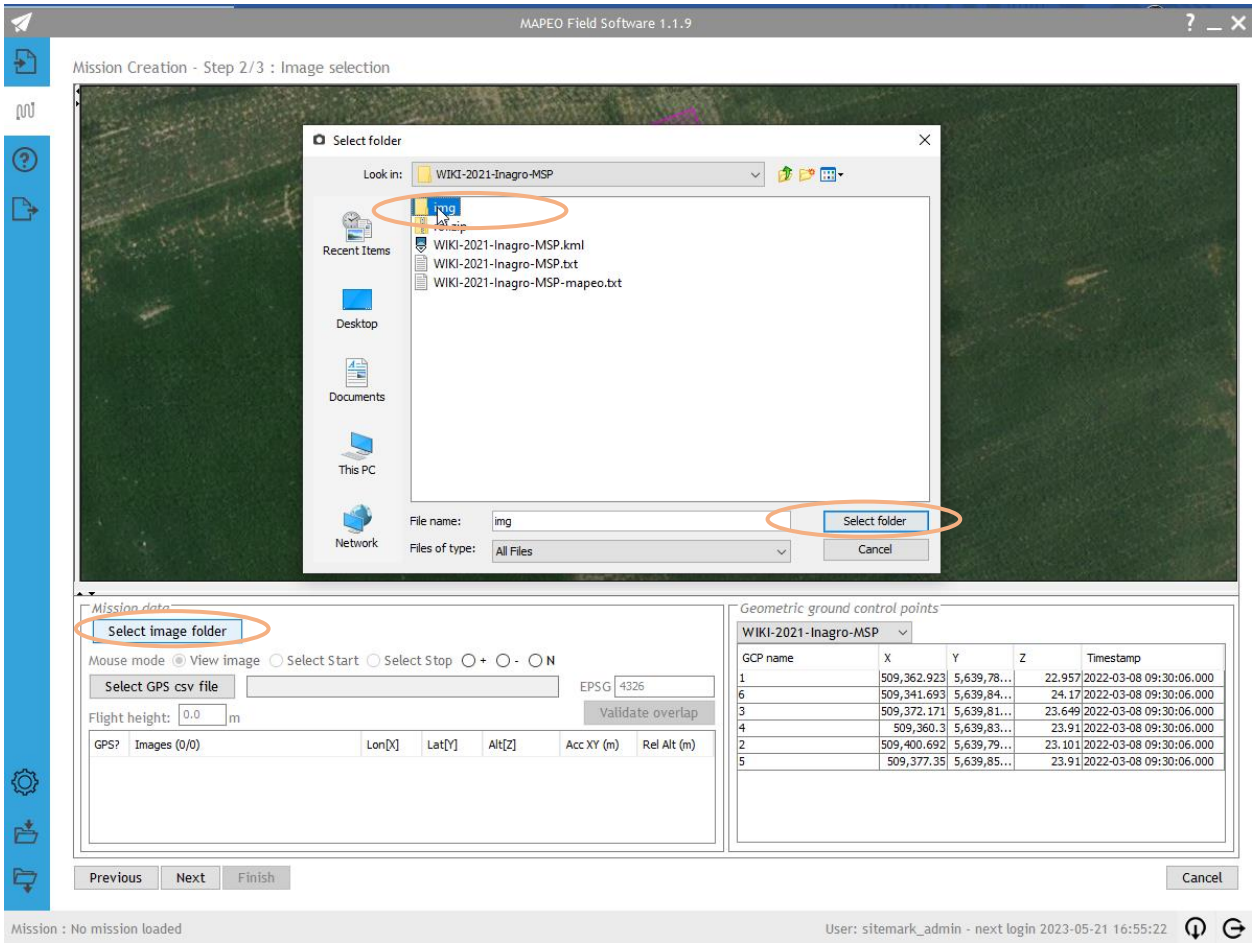


Figure 25: Selecting the image folder (remote config mode, flight pre-ordering)

5.1.2.3 Visualizing the drone images

When the image data has been loaded, the number of images is displayed on the screen and the image names are listed along with their positions, provided that position information could also be loaded (Figure 26).
In that case, you also get a visualisation of all image locations by orange dots, this means no image is selected yet for processing. This is also indicated in the table containing the list of images, where the header row gives you the number of images to be processed, i.e. **2/194**. Note that the '**970** image files' are because this is an example of a multi-spectral mission, i.e. at each location 5 images are taken, 1 for each spectral band. The location of the calibration images is visualized by blue dots and an indication is given for the first and last image of the flight (Figure 27).
A first estimate of the actual flying height (referenced to ground) is given and based on the Exif data, for more details also refer to section 5.1.2.6.2 Validating image overlap.
The list of images together with their accompanying position data can easily be exported, as explained in section 2.5.5 Exporting image coordinates.

In the case where the position info is not included in the image metadata (orange dots are not displayed), or if the user wants to override it, the option is given to upload a file, containing the position data. This is explained in section 9.3 Uploading image position data files.

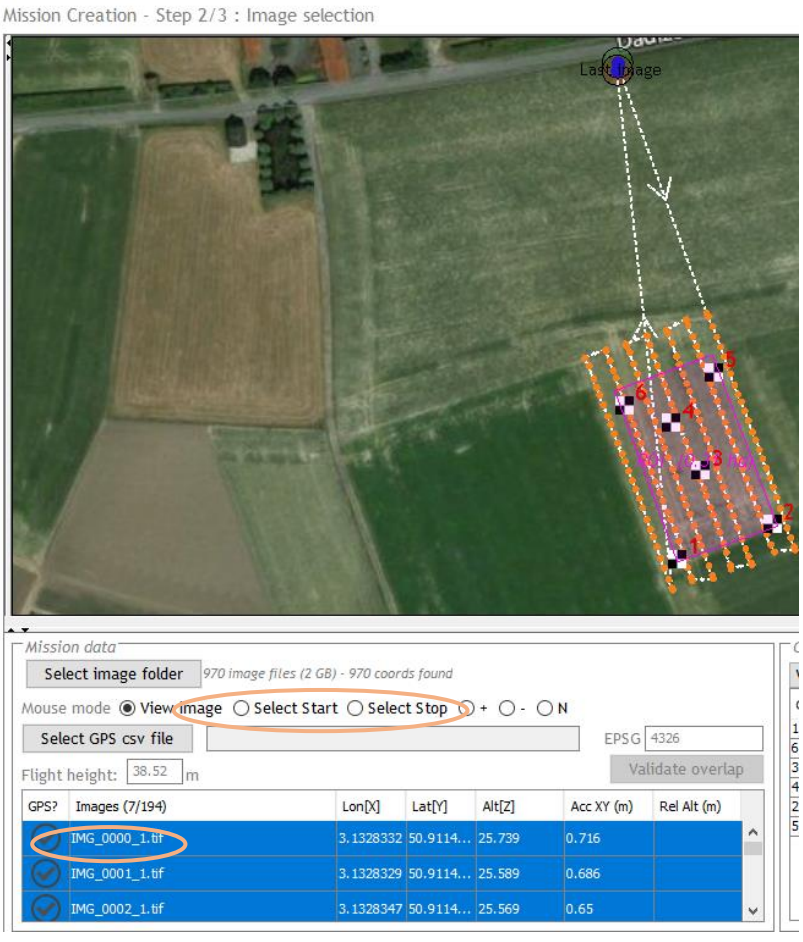


Figure 26: Visualizing the images and their position

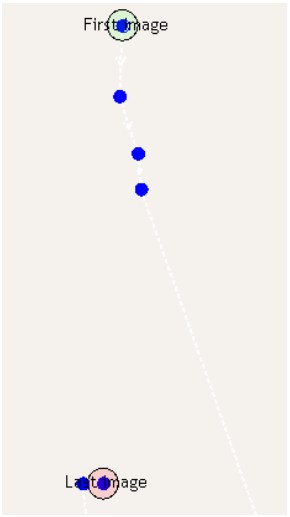


Figure 27: Visualizing the calibration images

Individual drone images can be opened and visualized by clicking the corresponding image position (orange dot) in the map window (Figure 28), provided that the current mouse mode is set to “View image”.
Zooming functionality is provided as described in section 2.5.4 Map controls.

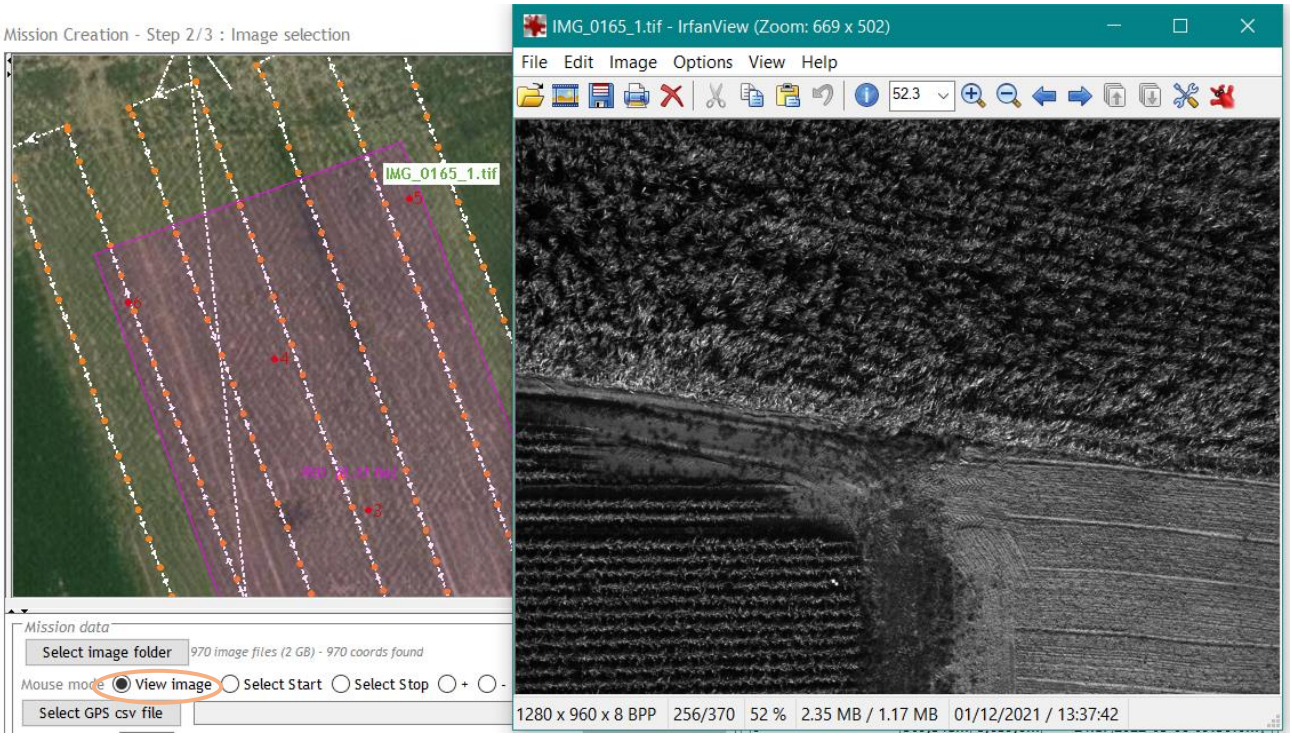


Figure 28:Visualizing individual drone images

5.1.2.4 Selecting the drone images for processing

You can select the drone images to process, by selecting the start and end point of the mission. This usually corresponds to the first and last waypoint of your drone mission. Images taken on the ground or during take-off and landing should not be selected. After selection of the stop point, the software will automatically calculate the different flight lines and the images to include for processing in between the start and stop position. Images before the start position and after the end position will not be considered for upload nor processing. In case the “Only points on flight line” option is selected in the mission profile (cfr section 5.1.1 Step1: Selecting the flight and mission profile), any images taken in between the flight lines will not be uploaded neither.

Selecting a correct start point is important to get the flight lines right!
The start point should be the first point of the first flight line (Figure 29).
This implies that the next image is at the average interspacing in the direction of the flight line.

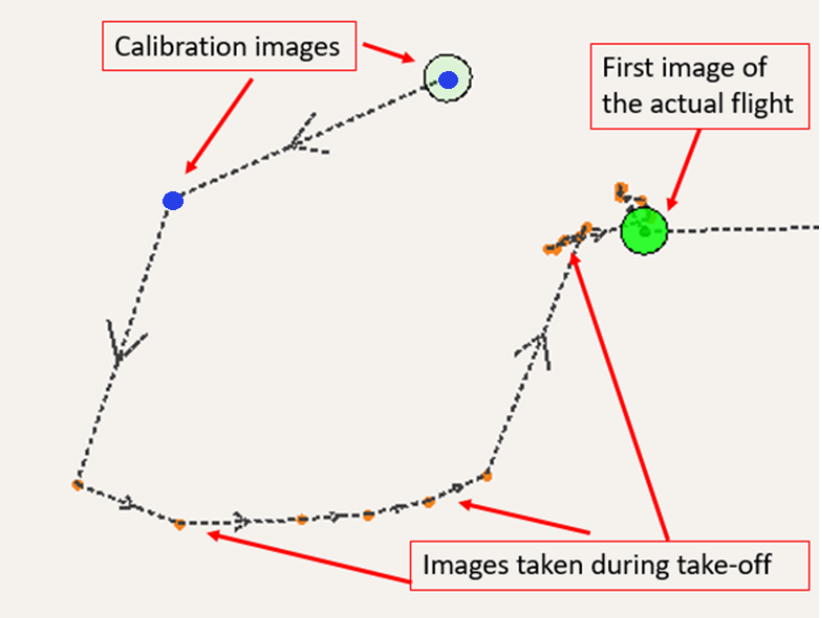


Figure 29: Determining the starting point of a mission

These are the steps in the actual selection (Figure 30):
Set the mouse mode to **“Select Start”**, click on the orange dot representing the position of the first image. This start point will now be marked on the screen with a green dot.
Set the mouse mode to **“Select Stop”**, click on the orange dot representing the position of the last image. This stop point will now be marked on the screen with a red dot.

Manual (de)selection of images is also provided:
Set the mouse mode to **“+”** and drag a box around one or more orange dots to add the corresponding images to the selection.
Set the mouse mode to **“-”** and drag a box around one or more orange dots to remove the corresponding images from the selection.
Set the mouse mode to **“N”** to neglect any selection box drawn by the user.

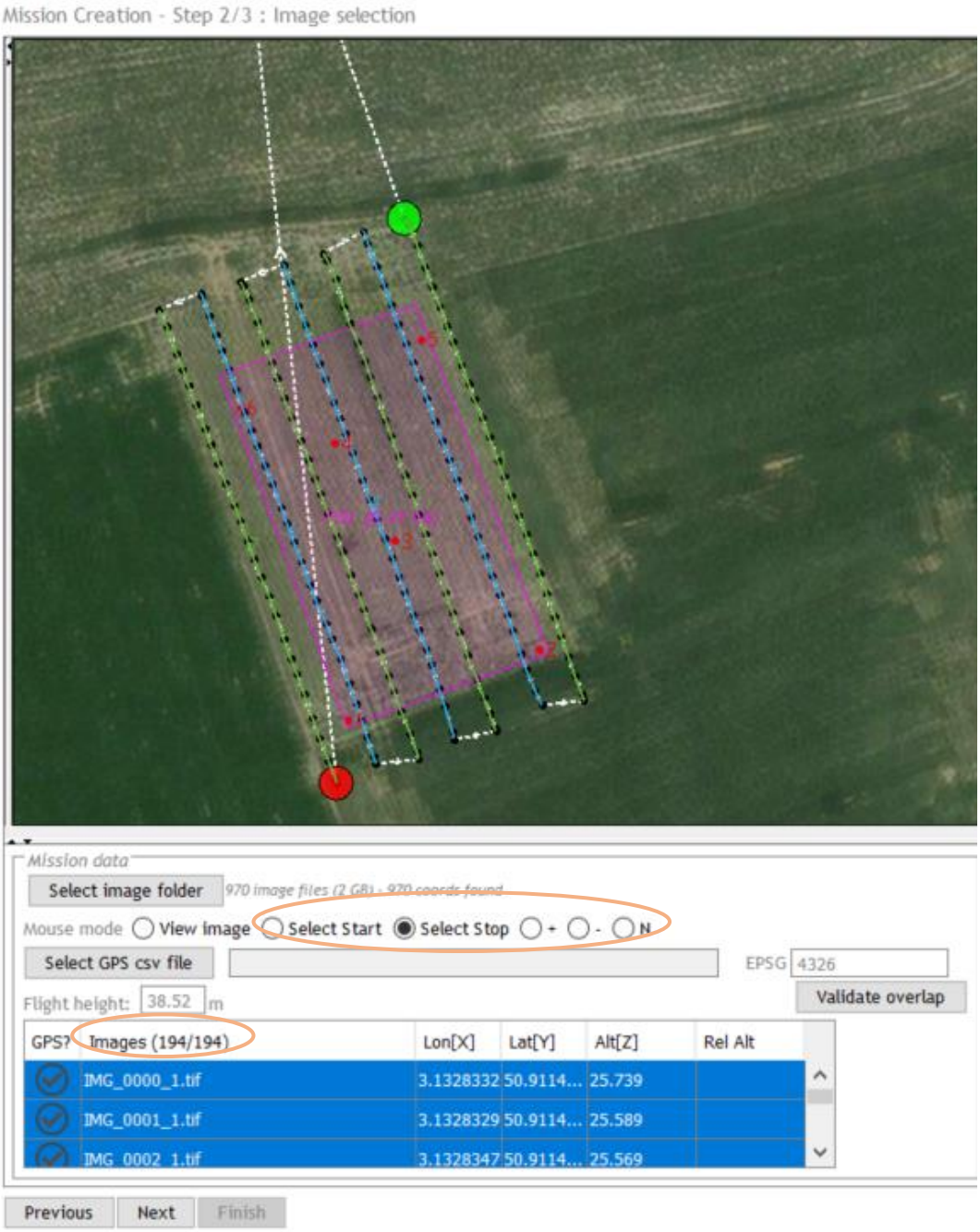


Figure 30: Selecting drone images for processing

After the stop point is selected:

- the flight lines are calculated and drawn. They are labelled, and coloured (green/blue), depending on the flight direction
- images that are excluded from the selection, are still represented by orange dots
- the number of images included in the selection is displayed, i.e. **194** out of the 194 images

- Check whether the flight lines are drawn parallel and whether their numbering is consistent (Figure 31). If they have not been identified properly by the flight line detection algorithm in the software, refer to section 9.4 Changing flight line detection parameters.
- Verify that all the **relevant images** are having a **black dot** and **not an orange one**.
  If the flight line detection skips too many relevant images for some reason, disable the “Only points on flight lines” parameter in the mission profile tab (cfr section 5.1.1 Step1: Selecting the flight and mission profile).
  If only a few relevant images are missing, add them using the “**+**” functionality.

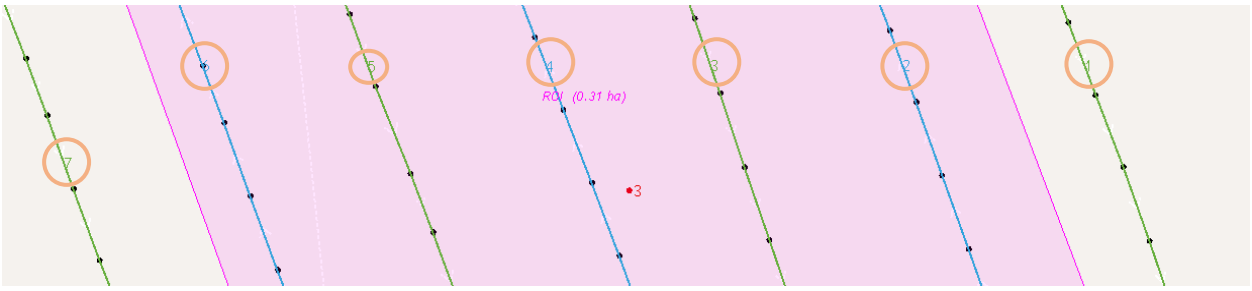


Figure 31: Flight line numbering

5.1.2.5 Selecting the calibration images

For drone flights performed with (MicaSense) multispectral cameras, images of the calibration targets should be taken on the ground and included in the mission data.

In the case where these calibration images are available in the dataset and their (exif) metadata has been properly filled, they are automatically detected by the Field Software and selected for further processing.
They are represented by blue dots on the mission screen (cfr Figure 29) and can be inspected by clicking in the view image mode (Figure 32).

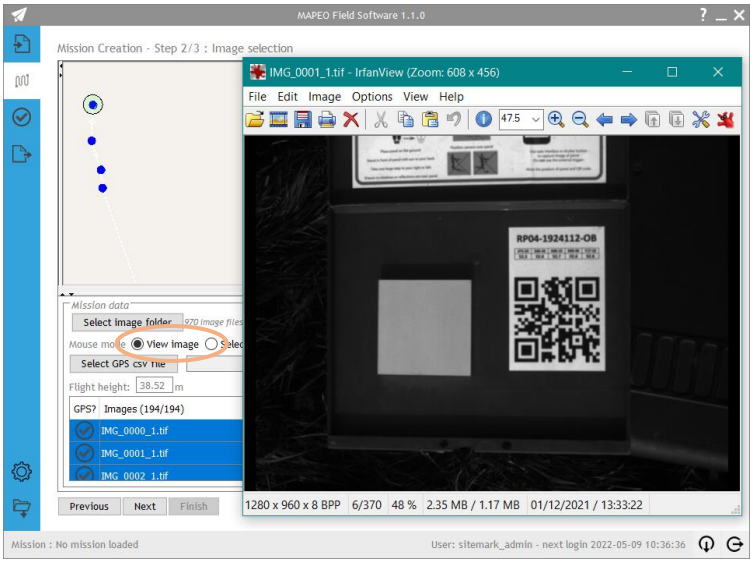


Figure 32: Image of calibration target

5.1.2.6 Validating the selected drone images

5.1.2.6.1 Validating image metadata

Once the images on the actual flight lines have been selected, every single image will be validated using the quality parameters that have been set in the mission profile (cfr section 5.1.1 Step1: Selecting the flight and mission profile).

If a particular image does not comply to one or more of the metadata validation rules defined inside the profile, it will be highlighted by a red box (Figure 33).
Using the shift+mouse drag combination, you can zoom in on the red box to see which parameter(s) caused the validation to fail for that image. In the example, the max ISO value is exceeded.
When you have one or multiple images not passing the validation, you can:

- Exclude the image(s) from the selection, using the "**-**" button, as explained in the previous section
- Return to Step1: Selecting the flight and mission profile, using the "Previous" button, and use less stringent validation thresholds
- Tolerate the exception(s)

Note that all the images which are represented by an orange dot, will be discarded during validation, upload and processing.

Figure 33: Validating individual drone images

5.1.2.6.2 Validating image overlap and coverage

Once the images have been selected, the user should validate the image overlap for the mission.
For this, the **flight height** should contain the correct value, namely the actual median height above ground.
If the estimated flight height by the tool (based on Exif data) **is not correct, enter the correct height manually** (Figure 34**)**.
Then **click** on the **"Validate overlap"** button. The colours used indicate the number of images per location within the region of interest. If locations with <5 images are present, product quality is likely to be affected and one should consider reflying the mission.

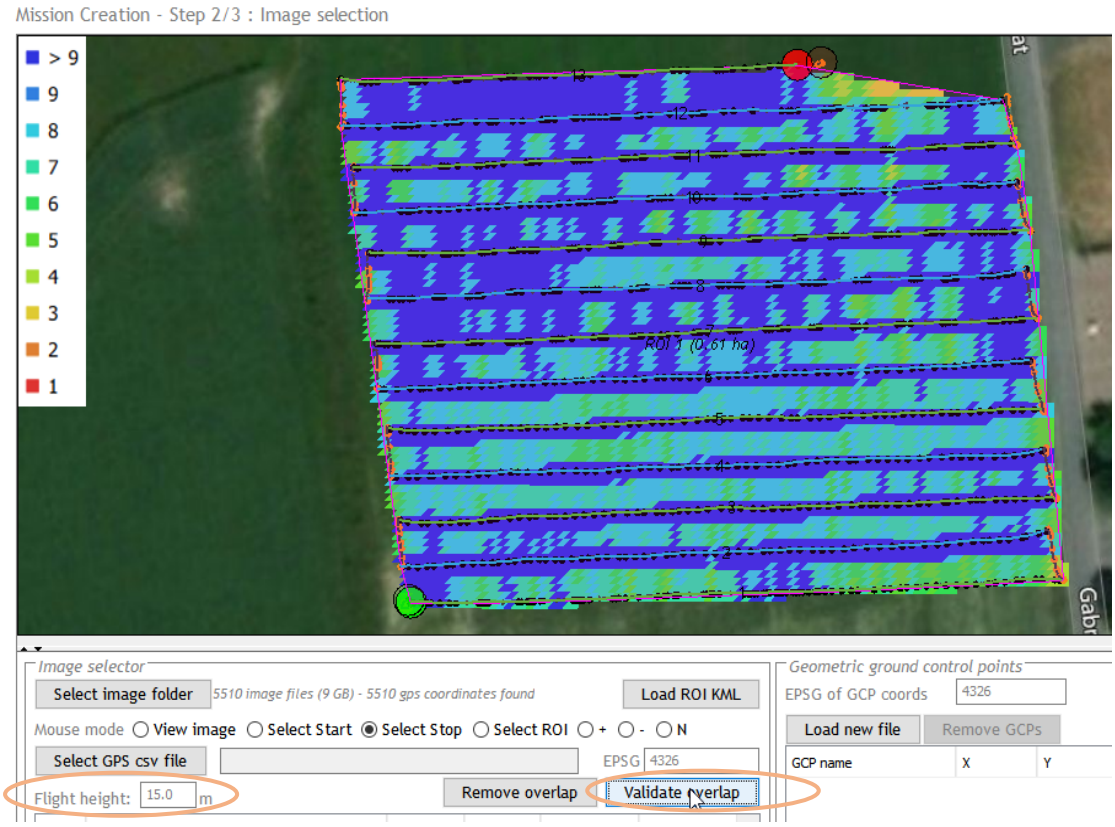


Figure 34: Image overlap not acceptable

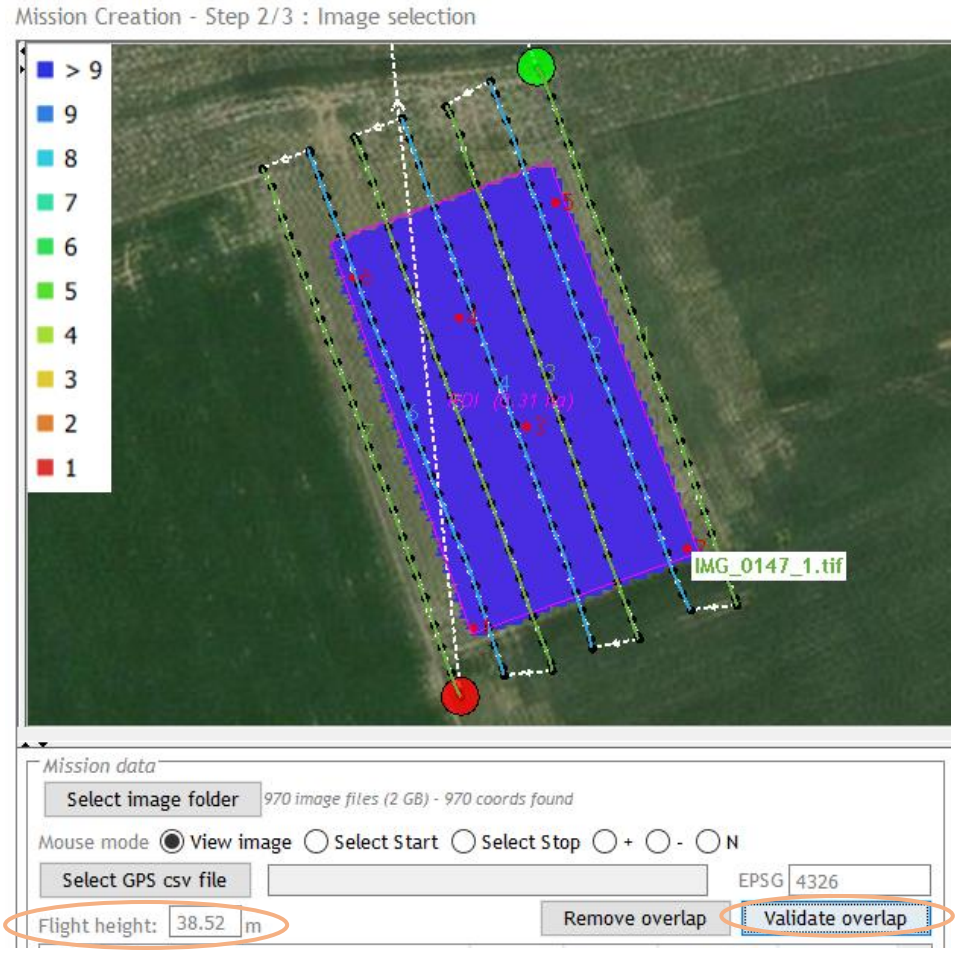
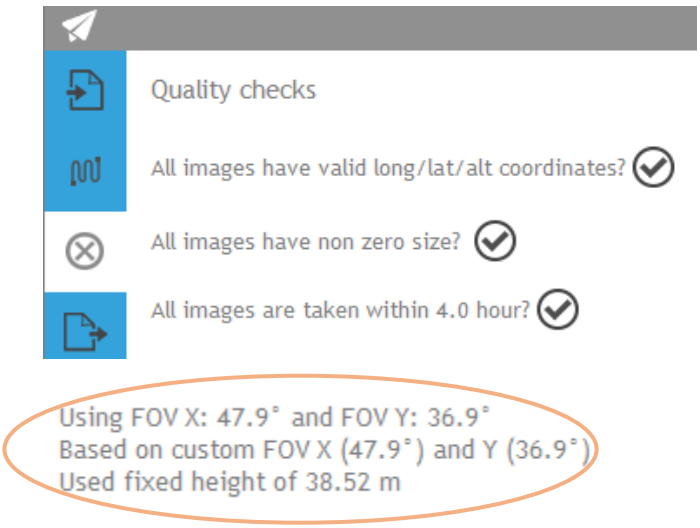


Figure 35: Image overlap ok

Note that you can see which parameters are used for the overlap calculation on the bottom of the validation screen (based on profile settings, Exif data & height).



5.1.2.7 Selection process in “local config” mode

5.1.2.7.1 Selecting the ROI and GCP information (local config mode)

In this case the user account is configured to work with manually/locally defined ROI and GCP information (Figure 36).

On the mission map the **Region Of Interest (ROI)** is visualized as a purple polygon. During processing the final image products will be clipped based on this polygon.

You can first select the images for processing (cfr section 5.1.2.7.2), and then a default ROI is drawn automatically by the Field Software.
You can also start by specifying the ROI, before selecting the images.
This ROI can either be drawn manually or be uploaded from a file.
To draw it manually, select the mouse mode **“Draw ROI”** and use the mouse controls to draw a box on the mission map.

To load it from file, select the **“Load ROI KML”** button and specify the KML file to be used.

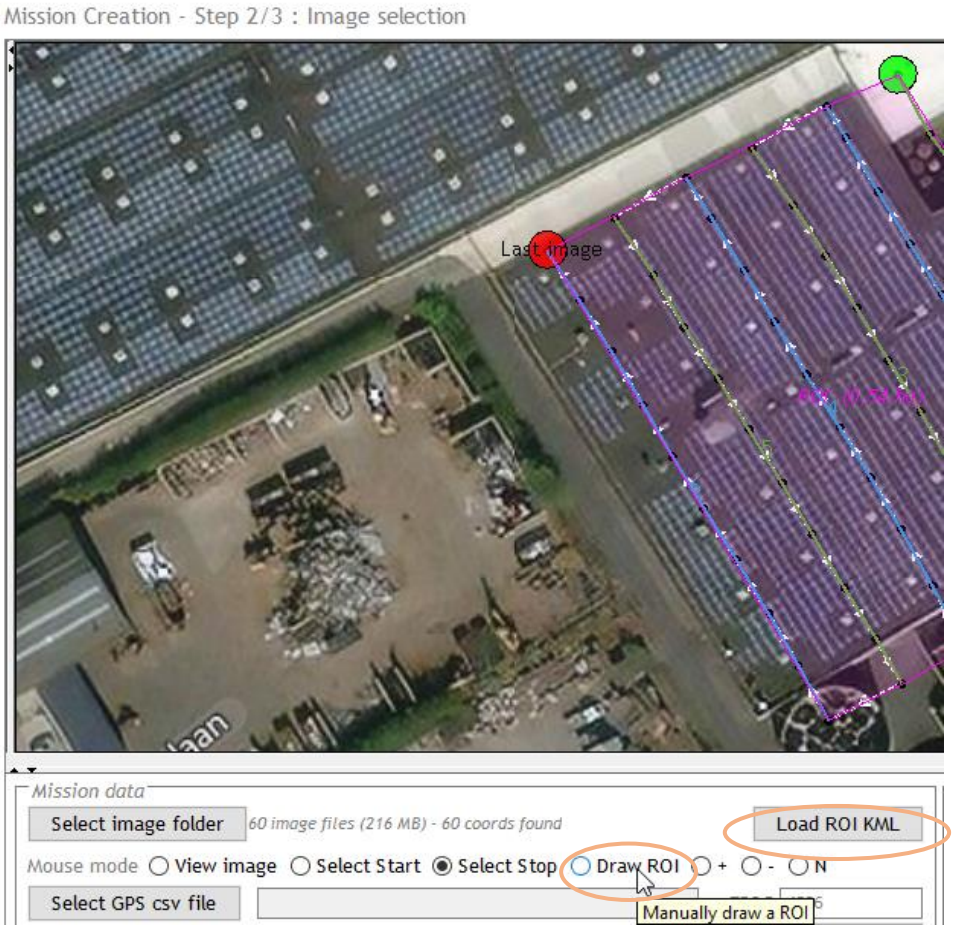


Figure 36: Selecting the ROI info (local config mode)

Next to the ROI, also **Ground Control Point (GCP)** information needs to be provided to the Field Software, through the "Geometric Ground Control Points pane" (Figure 37).

Before uploading the GCP file, the EPSG code, denoting the coordinate system used to reference the GCP coordinates, must be specified in the "**EPSG**" text box (unless the GCP file contains the EPSG code in the header line).

Note that:

- compound EPSG codes can be used, for example **32631+5773** for UTM 31N (32631) with EGM96 height reference (5773)
- in the case where a **kml**-file with placemarks is selected, the EPSG code is automatically set to **4326**, i.e. geographic coordinates

- **the coordinate system used for the GCPs is by default also the output coordinate system of all the calculated maps and products**
- **for all missions on one particular site, the output coordinate system should be consistent**

After the EPSG code is set, you can use the "**Load new file**" button to upload the kml- or csv-file containing the GCP data. **Hover the mouse cursor over the button to see the popup window with the expected file format.**
At this point, the locations of the ground control points are visualized as red dots on the mission map (Figure 38), and they are listed together with their position data and the time the measurements have been performed.
You can use the "**Remove GCPs**" button to remove the currently loaded GCP info, and load any new info.
Once the ROI and GCP data has been properly selected, you can continue with the image data selection (cfr section 5.1.2.7.2).

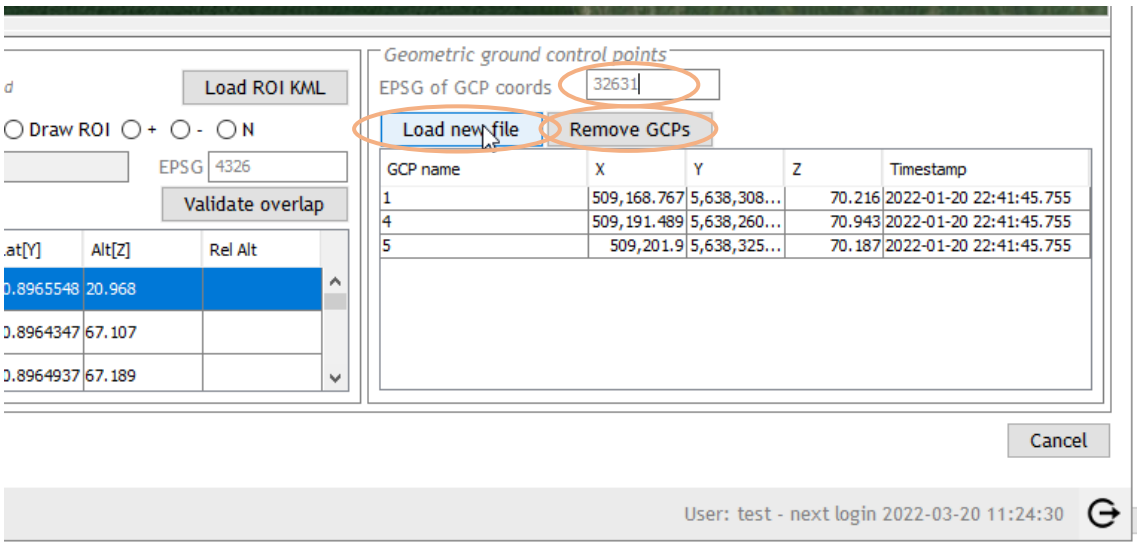


Figure 37: Selecting the GCP info (local config mode)

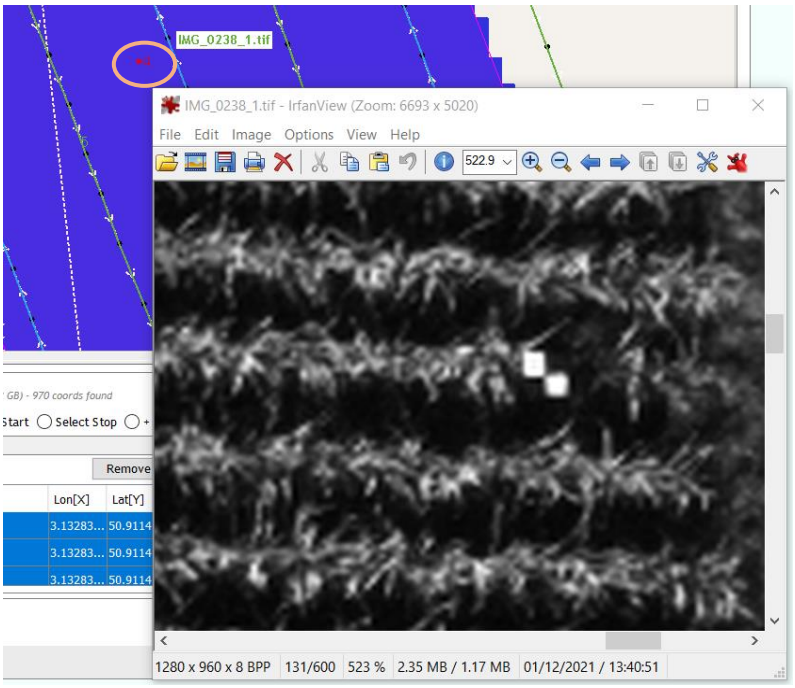


Figure 38: Visualizing the GCP location

In the case where a **csv-file** is used to specify the **GCP locations**, this file needs to be comma- or tab-delimited and contain a dedicated header row and the name, x, y and z for all GCPs (timestamp is optional):

name	**x[lon]**	**y[lat]**	**z[height]**	***timestamp***
1	3.13195451126421	50.8963306621461	26.4890	2019-04-12 13:39:49
2	3.13168315443852	50.8963541103481	26.4143	2019-04-12 13:39:49
3	3.13105959372052	50.8966664482733	25.5026	2019-04-12 13:39:49
4	3.13115919583648	50.8960658752498	26.2080	2019-04-12 13:39:49
5	3.13228895101044	50.8960519477528	26.3394	2019-04-12 13:39:49
6	3.13220229880877	50.8966487232788	26.4506	2019-04-12 13:39:49

Table 3: GCP position data – csv file format (local config mode)

You can also choose to specify the EPSG code directly in the header row, in this case it will be set automatically, e.g.:

```
Name, x, y, z, #EPSG=31370#
```

5.1.2.7.2 Locating the drone images (local config mode)

Use the “Select Image folder” button and browse through the folders to locate the image folder in the window that pops up.
Use the “Select folder” button to start the actual loading of the dataset. Note that for large missions, this may take a few minutes.

Once the image data has been loaded, you continue with a visual inspection (cfr section 5.1.2.3 Visualizing the drone images).

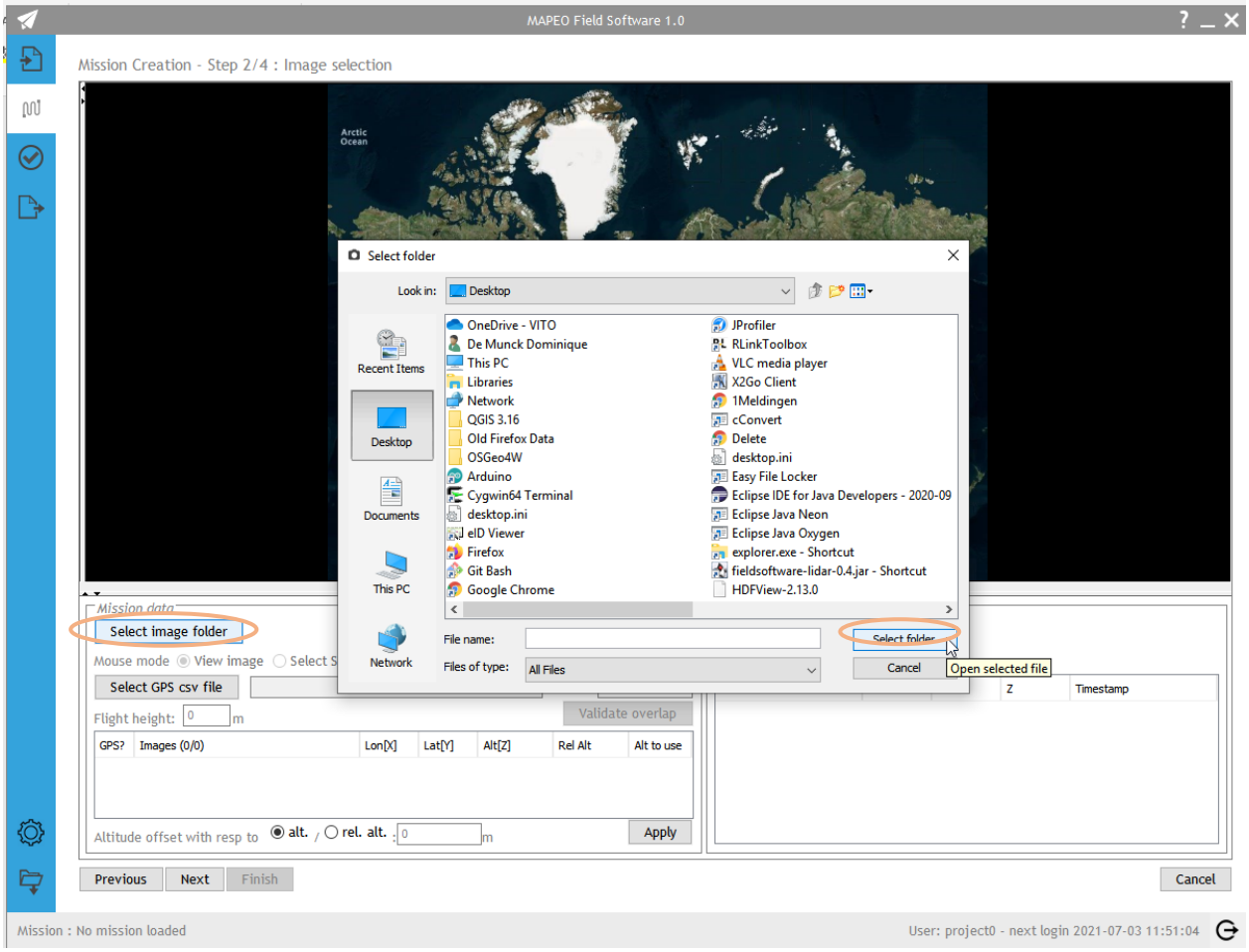


Figure 39: Selecting the image folder (local config mode)

5.1.2.8 Selection process in “remote config” mode without pre-ordered flights

5.1.2.8.1 Selecting the ROI and GCP information (remote config mode, no pre-ordering)

In case you are working in the remote configuration mode, but the drone flights have not been pre-ordered through the MapEO website, you need to load the ROI and GCP information yourself.
You can select a predefined and centrally stored mission profile/ROI by using the “**Fetch mission / clear**” dropdown box (Figure 40).

After mission selection, the corresponding ROI will be drawn (purple box) on the mission map (Figure 41).
If a GCP file with the same name is available, it will also be loaded automatically and the location of the GCPs will be displayed on the mission map (red dots), and their metadata will be listed.
Otherwise you will have to select the GCP file manually from the dropdown list “**Fetch GCPs**”.

In case you want to **download** a predefined ROI or GCP file, refer to section 3 Downloading predefined ROI and GCP files.
In case you want to **define local ROI and GCP files in addition to remotely configured ones**, see section 9.2 Creating and using custom GCP files.

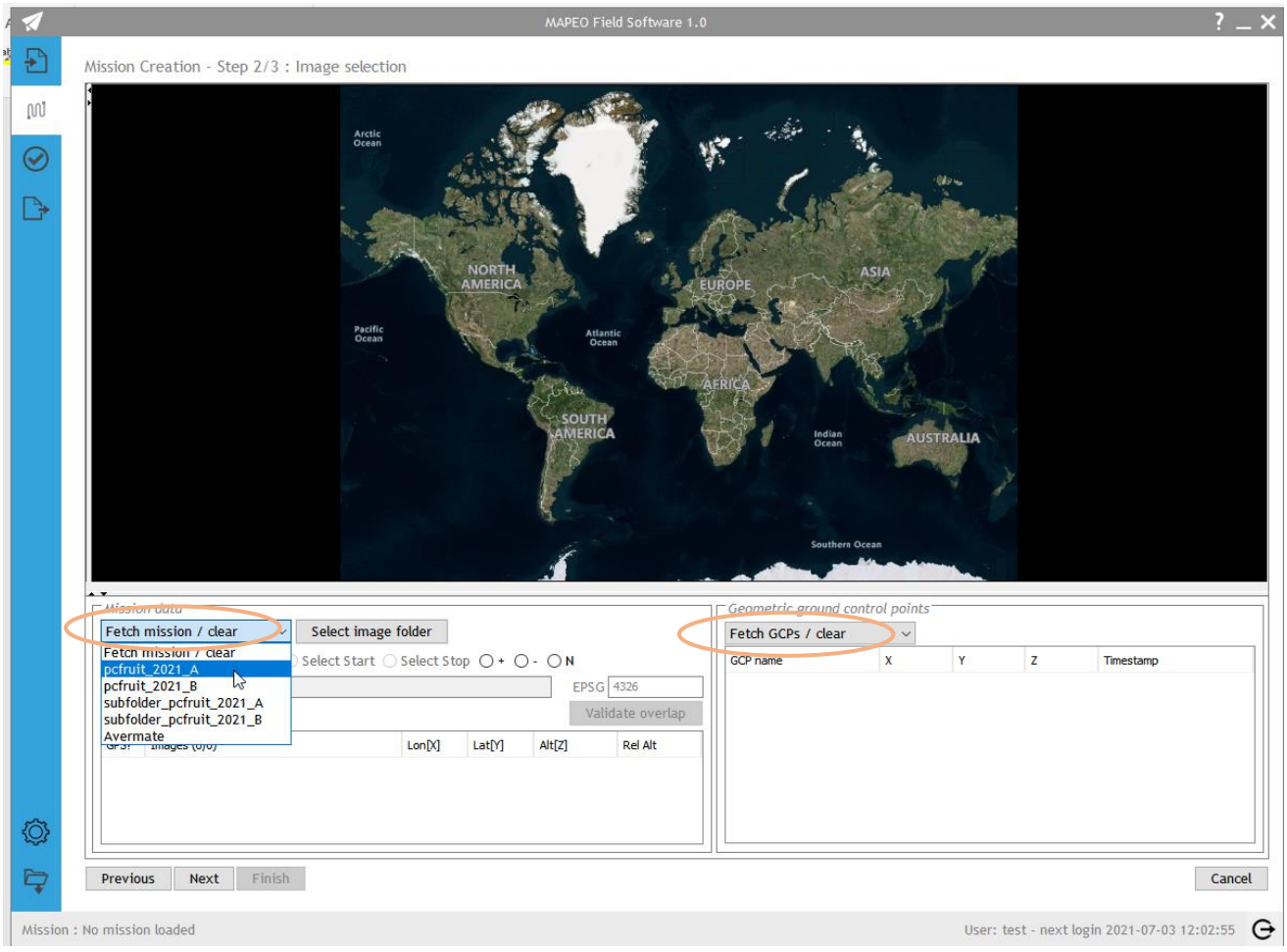


Figure 40: Selecting the ROI info (remote config mode, no flight pre-ordering)

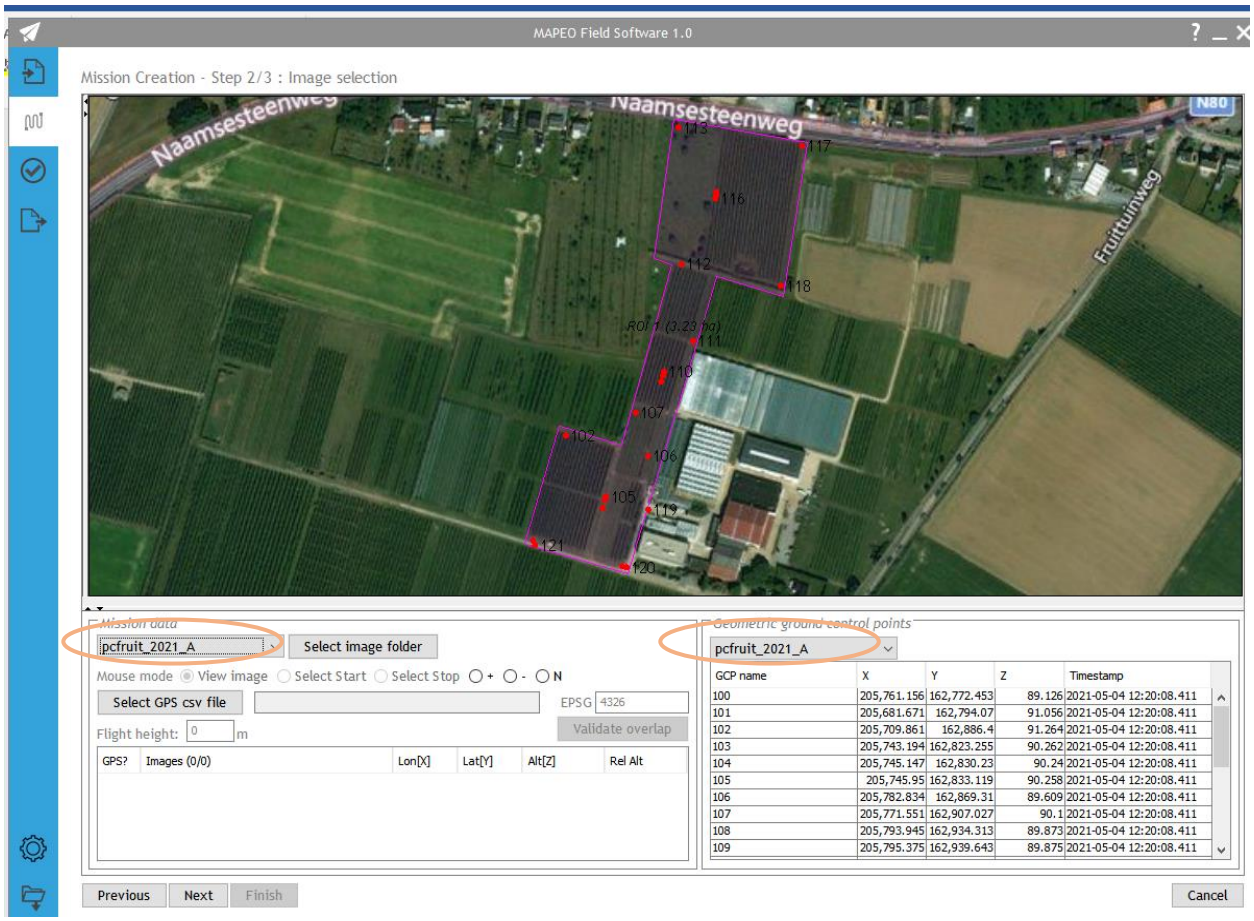


Figure 41: Selecting the GCP info (remote config mode, no flight pre-ordering)

5.1.2.8.2 Locating the drone images (remote config mode, no flight pre-ordering)

Use the “Select Image folder” button and browse through the folders to locate the image folder in the window that pops up.
Use the “Select folder” button to start the actual loading of the dataset. Note that for large missions, this may take a few minutes.

Once the image data has been loaded, you continue with a visual inspection (cfr section 5.1.2.3 Visualizing the drone images).

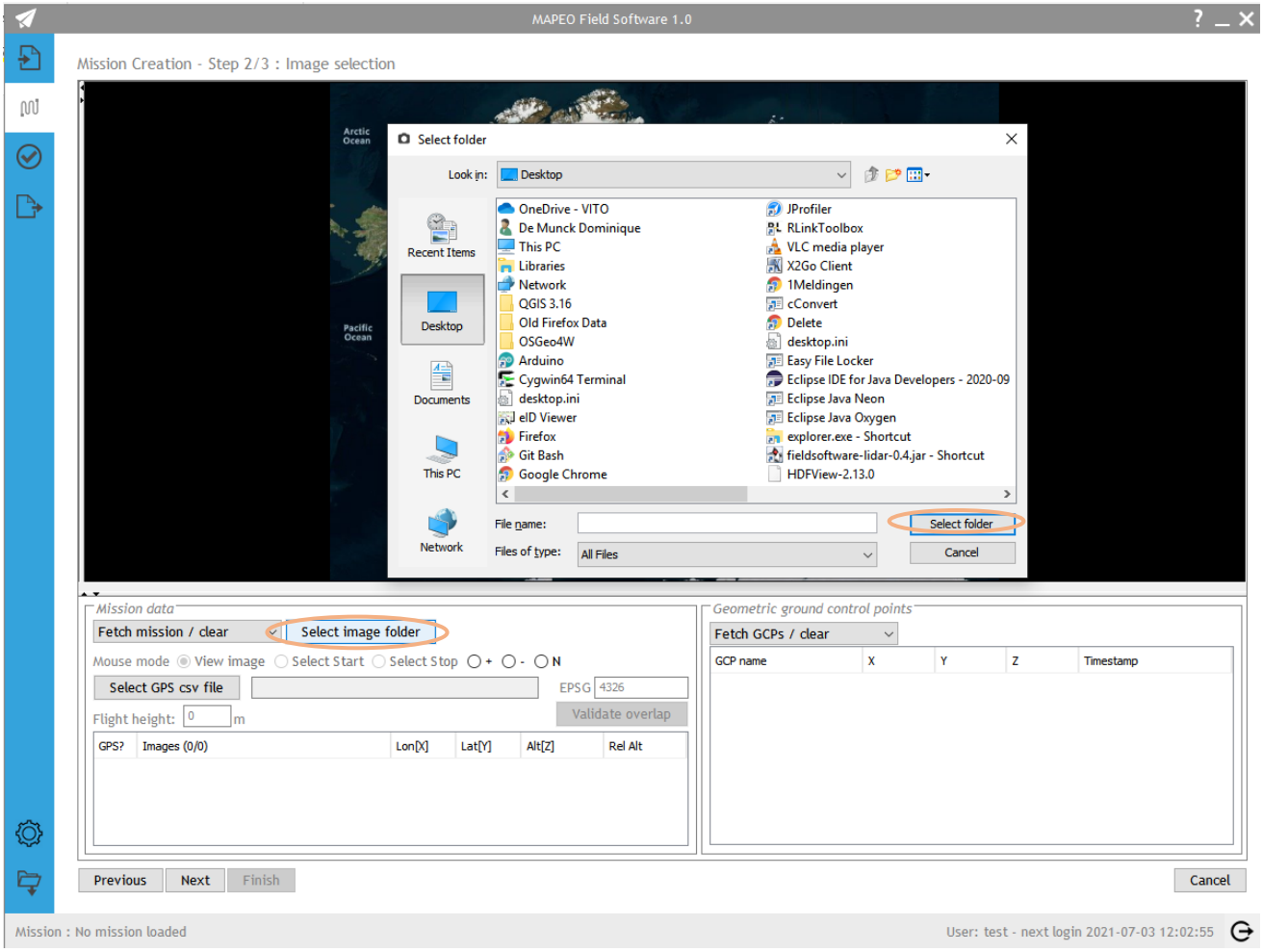


Figure 42: Selecting the image folder (remote config mode, no flight pre-ordering)

5.1.3 Step 3: Editing the mission flight description

Upon completion of step 2, clicking the “Next” button on the “Mission data selection” page will trigger a validation of the current flight with the current settings. If there is a blocking issue, the user will get a pop-up warning and should fix the issue or he will not be able to save or upload the mission. For all the details of the validation, the user can check the validation tab, as described in section 5.2 Validating a new mission
take you to the “Mission flight description” page (Figure 43).

Most of the mission parameters are prefilled by the Field Software, it is still possible to change some of these parameters manually.

5.1.3.1 Setting mission name and application type

In case you are working in the “Remote configuration” mode and the drone flights have been pre-ordered through the MapEO website, the mission name and application type will be prefilled and cannot be changed by the user. In case the flights have not been pre-ordered, the user will be able to select the content of these fields from a dropdown list (multiple application types) or the content will be fixed (single application type).
When working in the “Local config” mode, the mission name and application type can be entered manually.

The mission name and application type are important parameters, they determine which processing will be applied on the drone data and which products will be generated. In case you have selection options, make sure to select the correct ones.

5.1.3.2 Setting flight info and platform/sensor type

Most of the mission parameters are extracted from the image metadata and set automatically. These are indicated by a (*) and updated as soon as the image folder has been selected.
The serial numbers of the platform and the camera are not relevant for the processing, they can be added for information completeness.

The forward/side overlap and the number of flight lines are calculated by the flight line detection algorithm in the Field Software.

By clicking on the “**Finish**” button, all mission data is stored and the mission will appear in the “Mission list” on the “Mission overview” (starting) page. The user can continue with the final validation/quality check before uploading the mission data.

The “**New Session**” button can be used to create a new entry point for the same mission in the Mission list. This button is intended for advanced users and should only be used if the MapEO support team asked you to do so or in case a re-flight / reprocessing has to be performed (cfr section 8 Loading a previously stored mission).

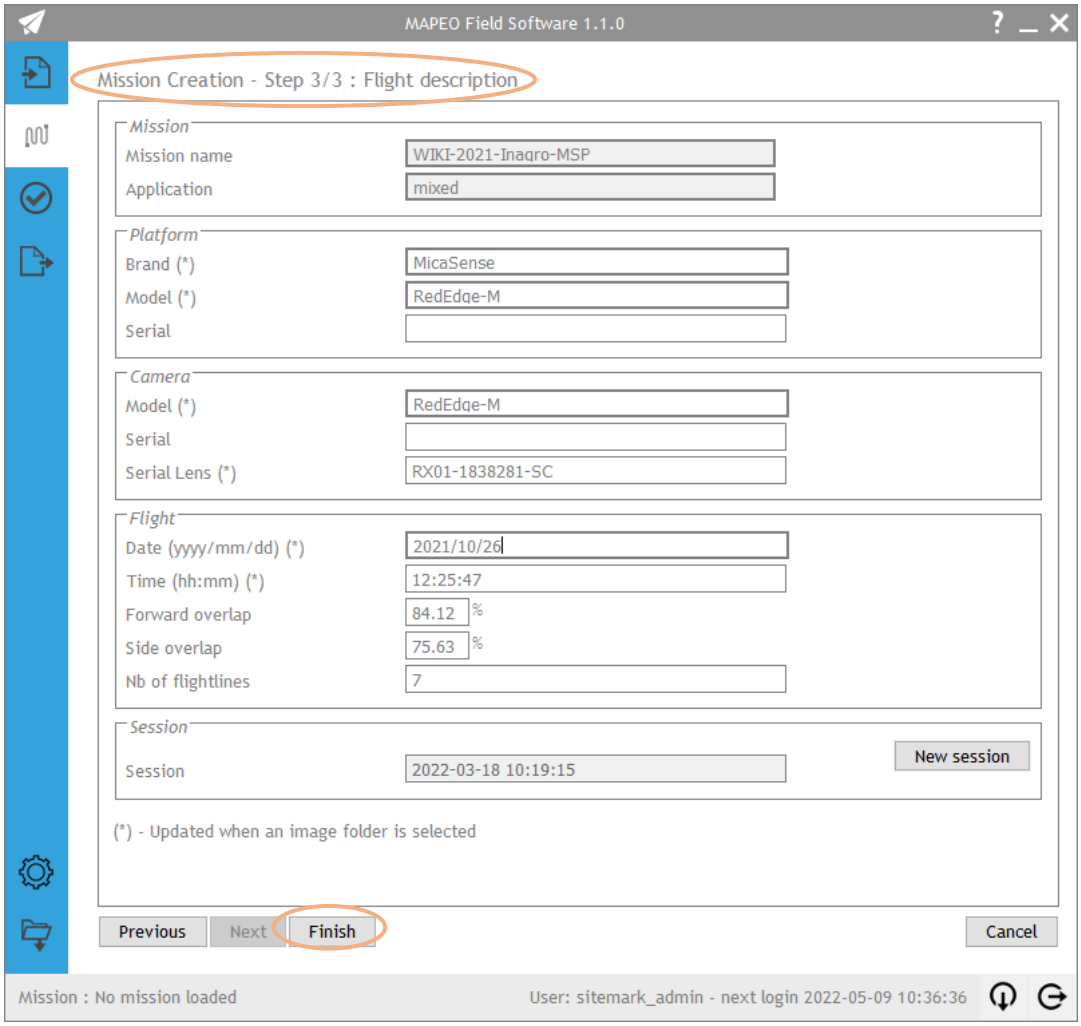


Figure 43: Editing the mission flight description

5.2 Validating a new mission

After proper selection of the mission profile and the mission data and completing the mission flight description, you should review in detail the result of the different validation checks that have been performed on the mission data.
These results are displayed on the mission validation page. Ideally, all validation checks are successful (Figure 44) and you can continue with the data upload. In case the validation is not successful (Figure 45), results must be carefully analysed.

The icon used for the mission validation tabbed page gives the result of the 'worst performing' check and can either be:

OK, all checks passed without warning

At least one check has insufficient data to perform check, or error executing check, proceed with caution

Warning, a check was not fully passed or could not be executed, proceed with upload only after verification that the cause will not impact badly the data quality

Error, severe issue detected, the tool will prevent upload

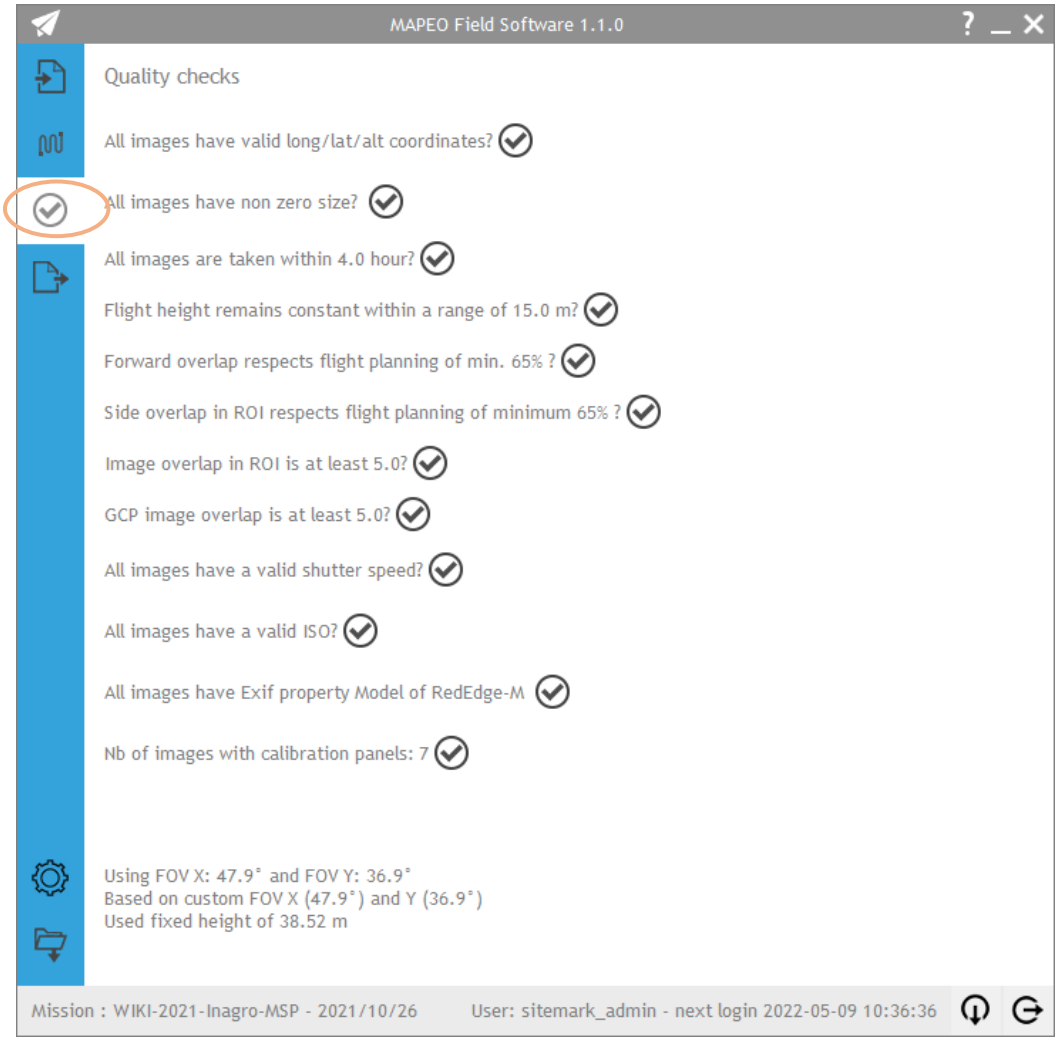


Figure 44: Mission validation results ok

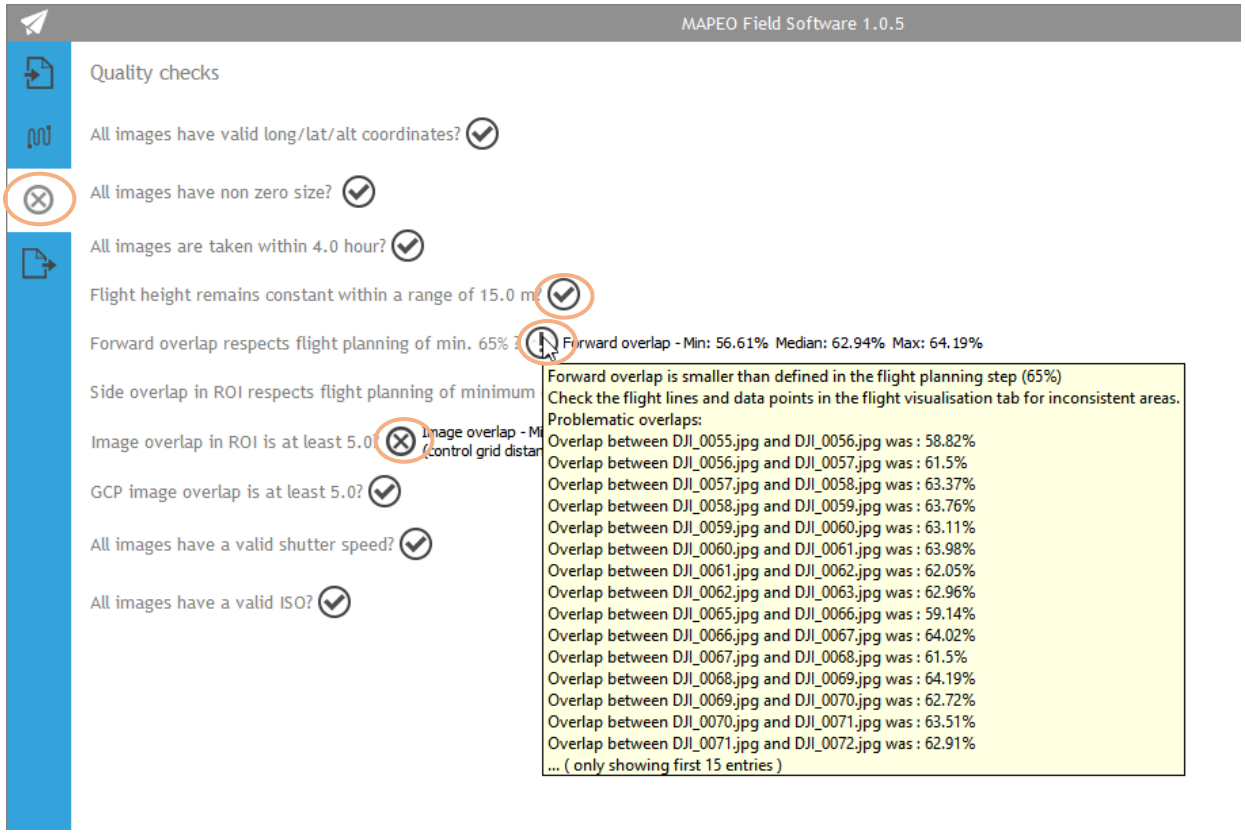


Figure 45: Mission validation results not ok

The icon used to reflect the result of an individual quality check can either be:

OK, check passed

Warning, check not fully passed

Error, severe issue detected, check not passed

Insufficient data to perform check, or error executing check

Warnings are not blocking, but can result in lower quality products if you continue with the data upload, so always check the cause/severity of the issue.

Errors are blocking issues, which will result in no or bad quality products if you continue with the data upload.

Always look for the cause of detected errors:

- check results of the flight line detection (cfr section 5.1.2.4)
- check individual images (cfr section 5.1.2.6)
- check the (availability of) calibration images (cfr section 5.1.2.5)

When you hover over the icon, you will see more info about the error, for example a list of images giving issues.
In case of issues with individual images, you may need to delete or move corrupt image files and re-read the image folder.
In case of issues with all images, you might even need to refly (part of) the mission.

In case of multispectral (**Micasense**) missions, there is an additional quality check on the availability of calibration images. If this important check fails, data cannot be processed and should not be uploaded!

6. UPLOADING DRONE DATA

Provided that the mission data validation was successful, you can continue to the mission data upload page by clicking the "**Mission upload**" tab (Figure 46).

You can select one or multiple missions for upload and initiate the data upload using the "**Start**" button. It can take some seconds before the actual upload is starting, the progress can be followed on the screen (Figure 47).

Leave the application open and do not shut down the pc before upload is finished!

When data of a particular mission has been successfully uploaded, this will be indicated in the "Mission list" on the "Mission overview" page (Figure 48).

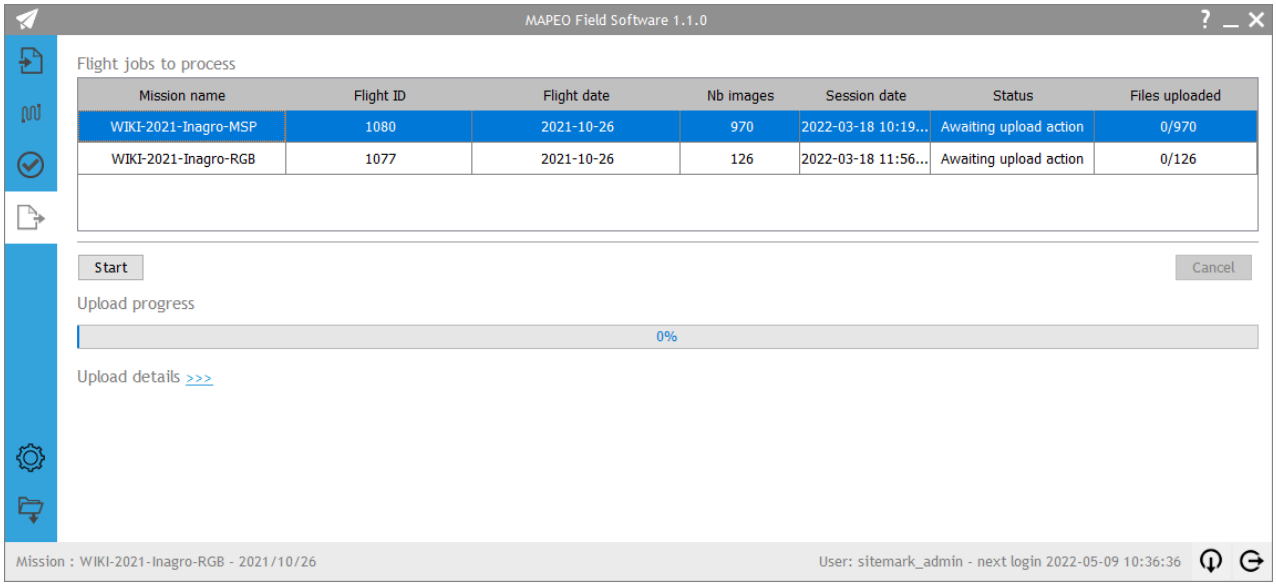


Figure 46: Uploading mission data

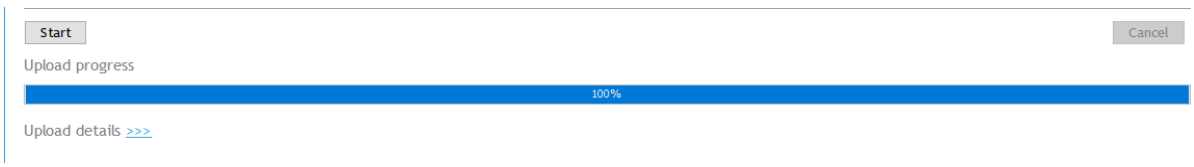
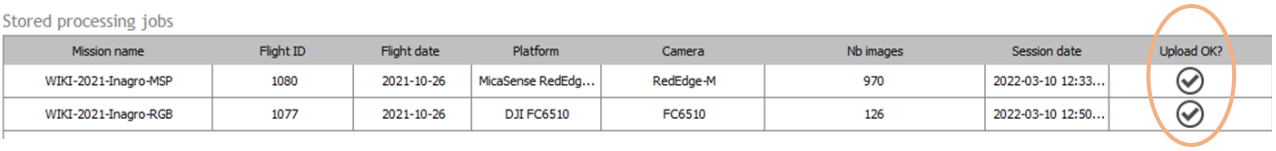


Figure 47: Upload progress


Stored processing jobs

Mission name	Flight ID	Flight date	Platform	Camera	Nb images	Session date	Upload OK?
WIKI-2021-Inagro-MSP	1080	2021-10-26	MicaSense RedEdg...	RedEdge-M	970	2022-03-10 12:33...	✓
WIKI-2021-Inagro-RGB	1077	2021-10-26	DJI FC6510	FC6510	126	2022-03-10 12:50...	✓

Figure 48: Mission list

7. DOWNLOADING PROCESSED DRONE DATA

When you want to download the data of a particular mission, first select the "**Mission download**" tab (Figure 49).
A file explorer window will open (Figure 51).

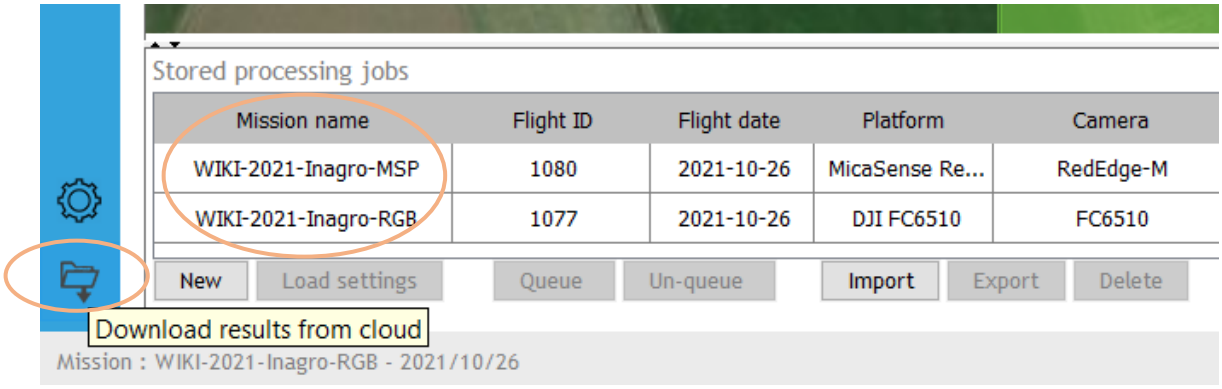


Figure 49: Selecting the mission download tab page

7.1 Selecting files and folders for download

Within the file explorer window, browse through the folders (clicking on the + signs will expand the folder list) or use the text filter to immediately jump to the proper folder.

If you want to select a file or folder for download, you select the checkbox.
Multiple selection is done by combining the ctrl/shift keyboard buttons with your selection clicks.

Selecting a folder will recursively select all child files, be careful!

Pressing "Refresh All" will refresh the whole folder tree (clearing any selection).
Pressing "Download Selected Items" will start the actual data download.

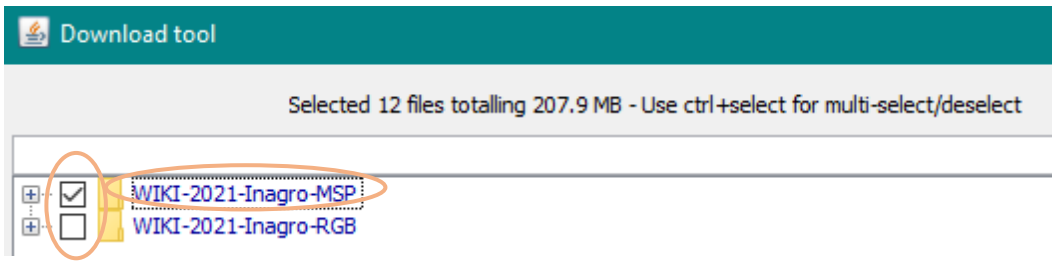


Figure 50: Selecting folders for download

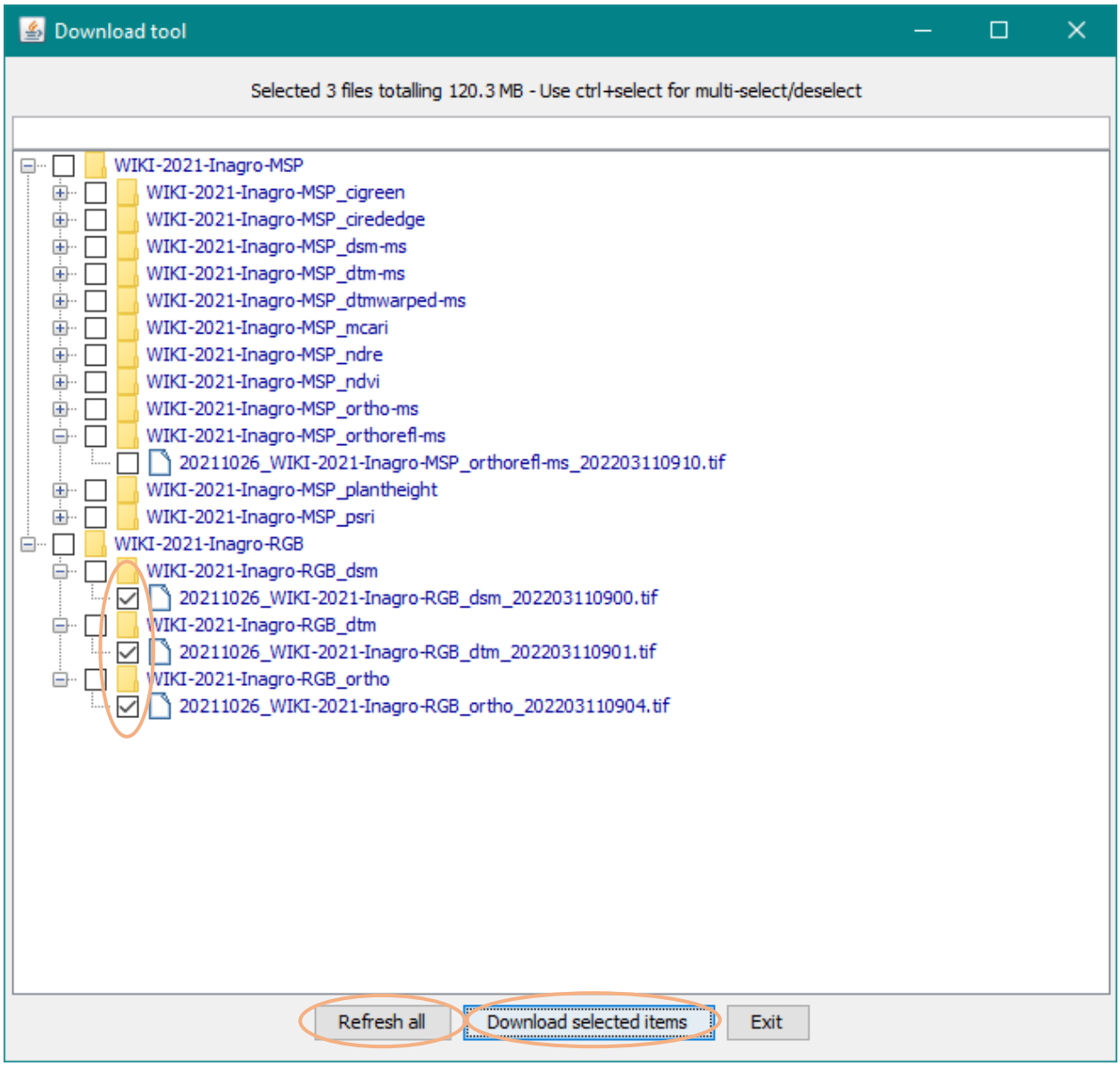


Figure 51: Selecting files for download

7.2 Drone data products file type and naming

The folder and file naming is standardized.

The name of the folder at the highest level corresponds to the mission name, the folder names at the next level include the product type.

The processed products depend on the sensor type and are different for RGB and multispectral sensors.

The file format used for the products is **"tif"**.

The file name is composed of the mission name, mission date, the type of product and the product processing date, the mission name is used as a prefix:

MissionDate_MissionName_ProductType_ProcessingDate.tif

Example:
20211026_WIKI-2021-Inagro-RGB_ortho_202203110904.tif

20211026	Mission date
WIKI-2021-Inagro-RGB	Mission Name
ortho	Product type
202203110904	Processing Date/Time, i.e. date when the data has been uploaded to the MapEO system

In case a particular product has been reprocessed, multiple files will be listed. Pay attention to the processing date/time when selecting the products for download!

8. LOADING A PREVIOUSLY STORED MISSION

Loading a previously stored drone mission can be required when:

- You want to reprocess an existing mission, using the existing images but different processing settings
- You want to process a mission after a re-flight, using new images

You can load a previously stored mission, by using the “Load settings” functionality on the “Mission overview” (starting) page (Figure 52):

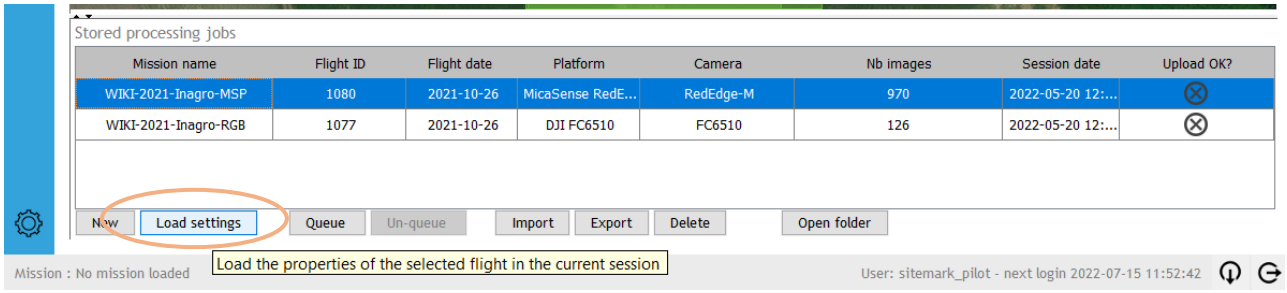


Figure 52: Loading a previously stored mission

In case your mission is not listed, e.g. because you are using a different PC, export the mission properties to an archive file, and import this archive file on the new PC.

Pressing the “Load Settings” button will take you to the “Flight and mission profile selection” page. In case data has already been uploaded before for this drone mission, the flight details of that mission will not be displayed anymore (Figure 53). Nevertheless, the mission profile will be restored (Figure 54) and pressing the “Next” button will take you to step 2 of the mission creation.

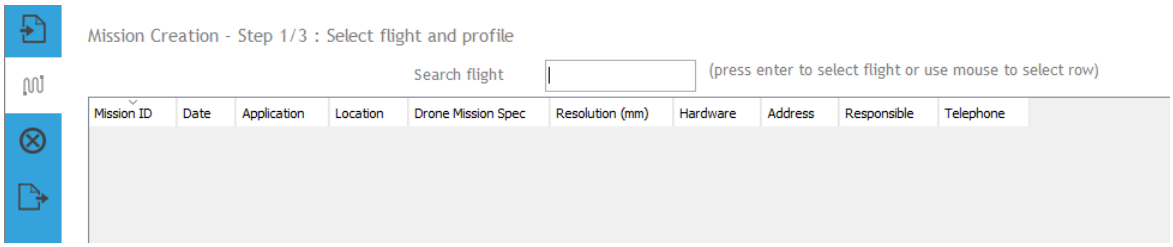


Figure 53: Flight details removed after data upload

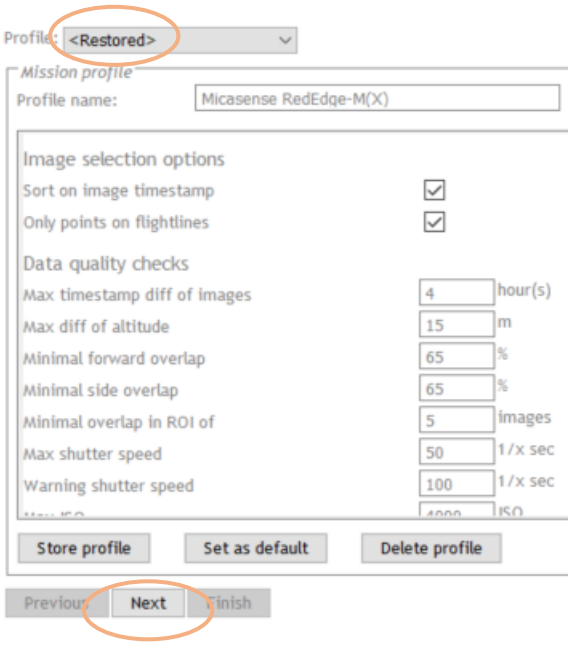


Figure 54: Mission profile restored

Step 2 is about selecting the data for processing (cfr section 5.1.2 Step 2: Selecting the mission data)
Note that in this step, the previously selected images are loaded as “force selected images” (**+**), and the non-selected images as “force unselected” (**-**). This is to make sure that the same selection of images is done, regardless of any flight line selection parameter or Field Software version (Figure 55).

If you want to reprocess existing data and redo the selection (e.g. by selecting another start or stop point), you can click once inside the selection table to deforce or use the “N” mouse mode and draw a box around all points on the mission map that you want to exclude.

If you want to import new drone data, press “Select image folder” and follow the different steps to select the mission data. If the new drone data is acquired on a different date than before (in case of re-flights), a new entry is automatically created in the mission list, to have a clear distinction between data of the different drone flights.

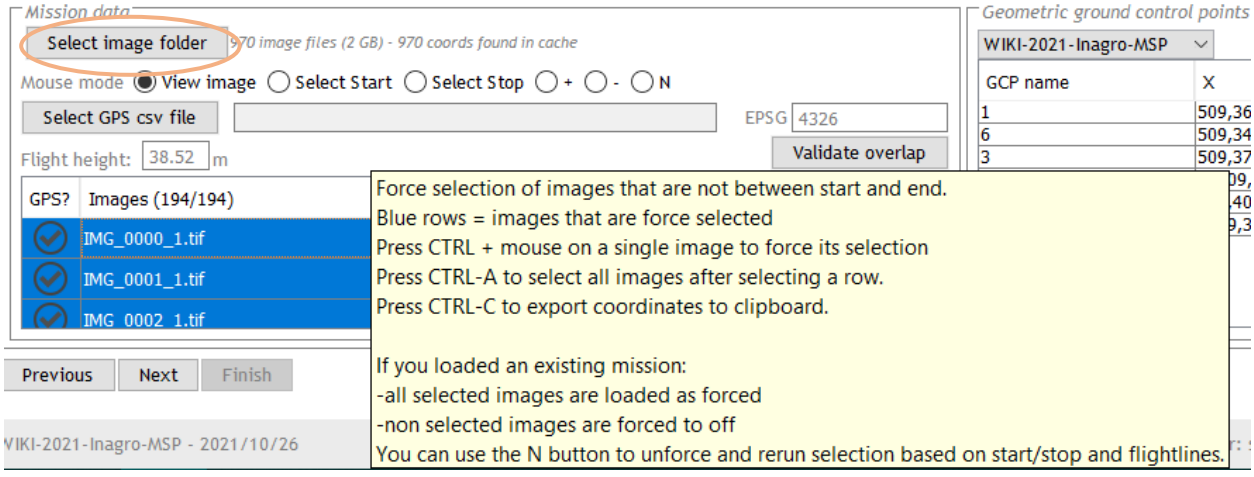
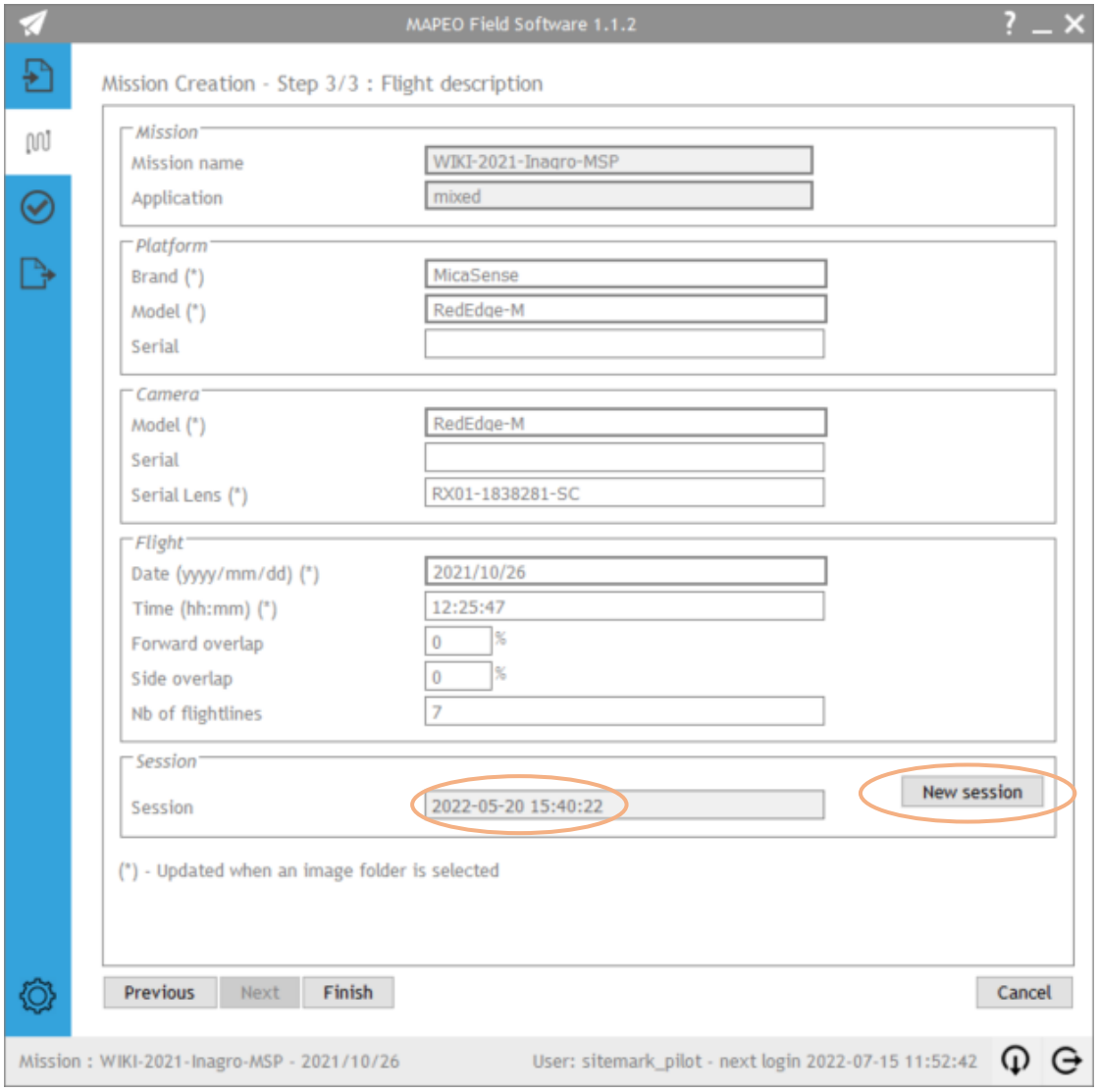


Figure 55: Selecting images after reloading a mission

Upon completion of the mission data selection, pressing “Next” will take you to step 3 “Mission flight description”. (cfr section 5.1.3 Step 3: Editing the mission flight description)

If you want to reprocess data that has been uploaded before, and you want to upload the data and mission data from scratch, make sure to press the “New session” button. This will create a new entry in the mission list (Figure 56), providing a clear distinction between datasets using different processing settings.



Mission name	Flight ID	Flight date	Platform	Camera	Nb images	Session date
WIKI-2021-Inagro-MSP	1080	2021-10-26	MicaSense RedEdge-M	RedEdge-M	970	2022-05-20 12:00:33
WIKI-2021-Inagro-RGB	1077	2021-10-26	DJI FC6510	FC6510	126	2022-05-20 12:50:10
WIKI-2021-Inagro-MSP	1080	2021-10-26	MicaSense RedEdge-M	RedEdge-M	970	2022-05-20 15:40:22

Figure 56: Using session date to distinguish different flights/processing cycles

9. CONFIGURING THE SOFTWARE

The next sections provide an explanation on how to customize mission profiles, customize ROI/GCP data and modifying the parameters for the flight line detection algorithm in the software.
Note that some of this functionality is restricted to dedicated user accounts.

9.1 Creating and using custom mission profiles

You can define custom mission profiles:

- during mission creation (cfr section 5.1.1 Step1: Selecting the flight and mission profile) or
- through the mission profile settings page (Figure 57).

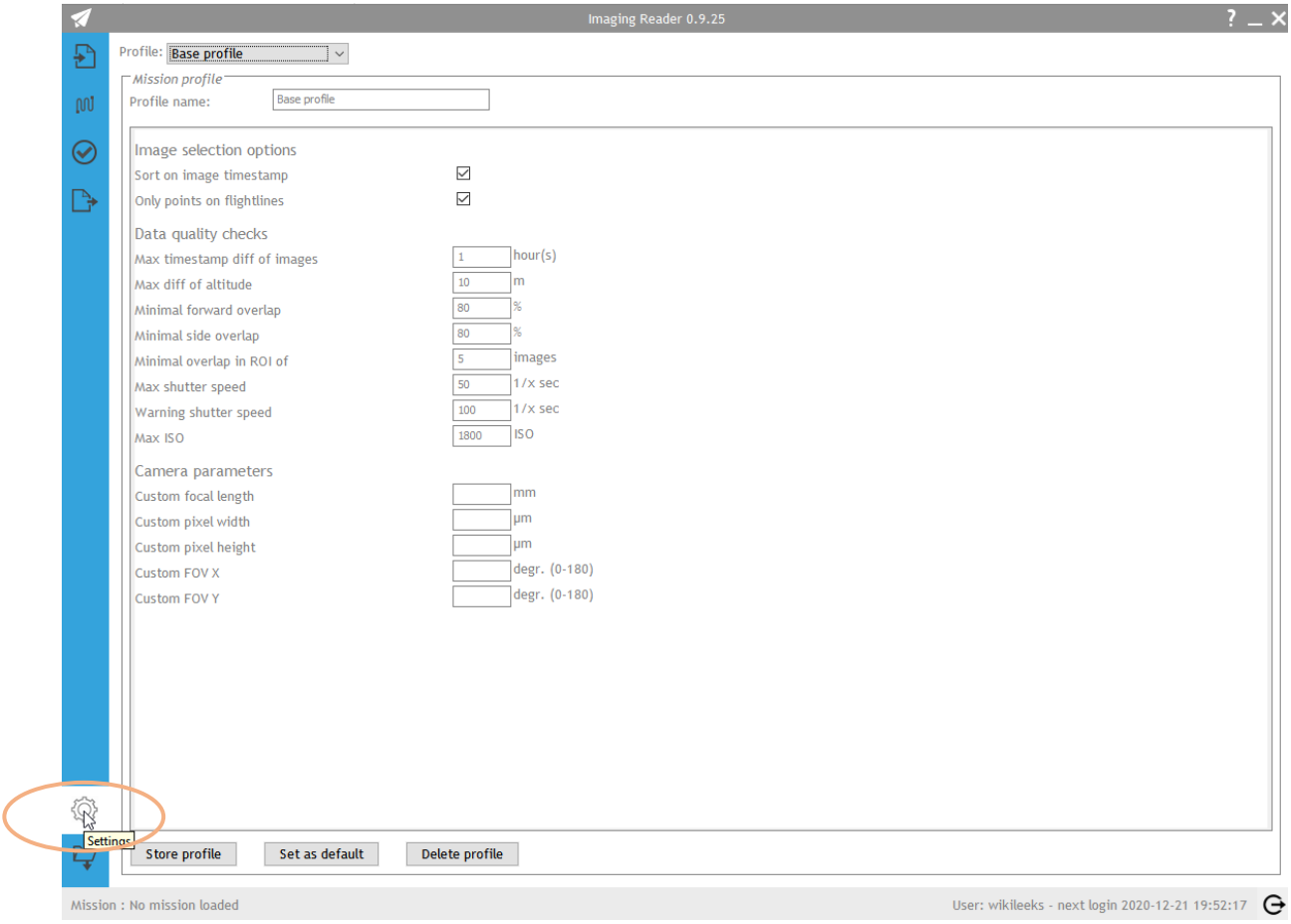


Figure 57: Entering the mission profile settings page

You should start by selecting the existing mission profile that corresponds the most to the custom profile you want to create (Figure 58).

Suppose you want to create a Phantom 4 RTK profile with an allowed ISO value of 600 instead of 1200.
First select the existing “Phantom 4 RTK” profile from the “Profile” dropdown list.
Then enter a custom name in the “Profile name” text box and set the properties you want in the respective text boxes.
For the text-based properties, e.g. “Model Check”, you can use Java regular expressions.
Once you have finished editing the profile parameters, you press the “Store profile” button. The “Profile stored” window pops up and the created profile is being saved to disk (locally).

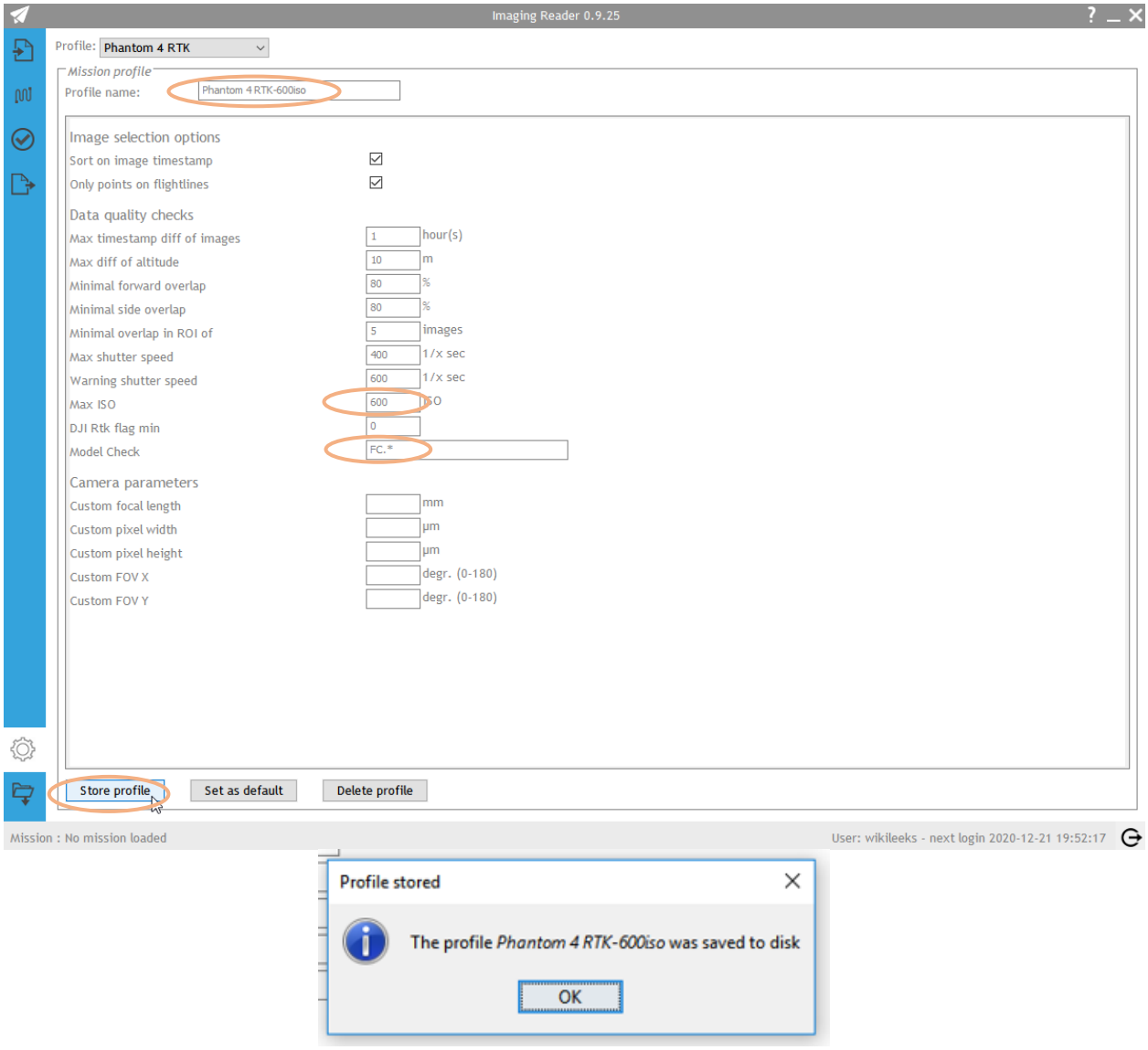


Figure 58: Creating and storing a custom mission profile

If you want to make this profile the new default profile which will be selected when creating a new mission, select the “Set as default” button (Figure 59).

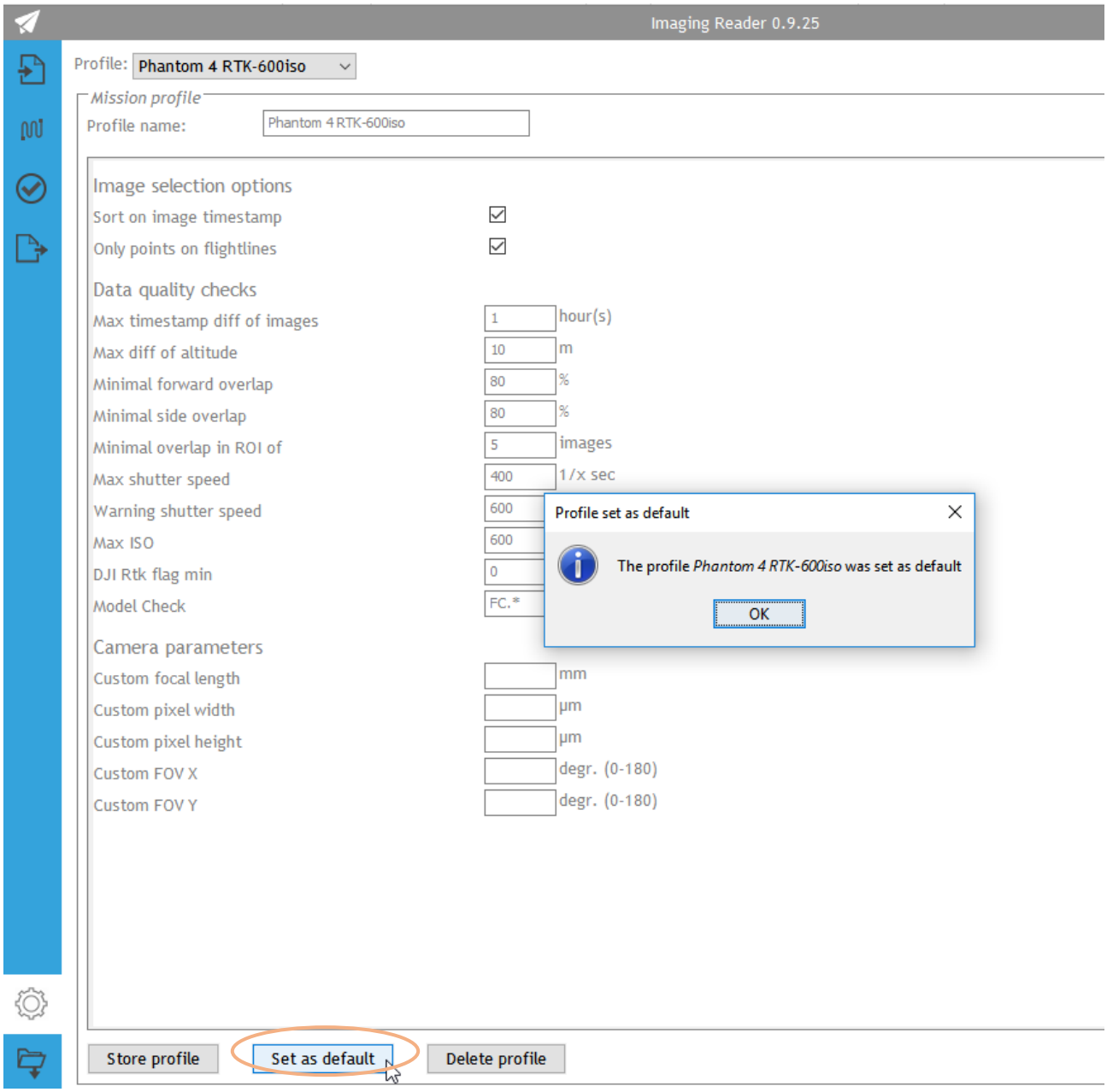


Figure 59: Setting a default mission profile

The “**Delete profile**” button allows to delete custom (locally saved) profiles.

9.2 Creating and using custom GCP files

If you are working in the “Remote configuration” mode and, for some reason, the correct GCP file is not available remotely, you can edit and add the correct GCP file to your local GCP folder.

First, edit the GCP file. It should be a tab or comma delimited file with the EPSG encoded in the header line like this:

```
Name,x,y,z,#EPSG=31370#

112,205810.7147,163037.2997,89.25390835
113,205806.8614,163157.1013,88.76678252
```

Table 4: GCP position data – csv file format (remote config mode)

Use the “**Open local GCPs folder**” button to browse to the Local-GCPs folder, add the custom GCP file and press the “**Reload configuration**” button for the GCP file to become available for selection in the dropdown box (Figure 60):

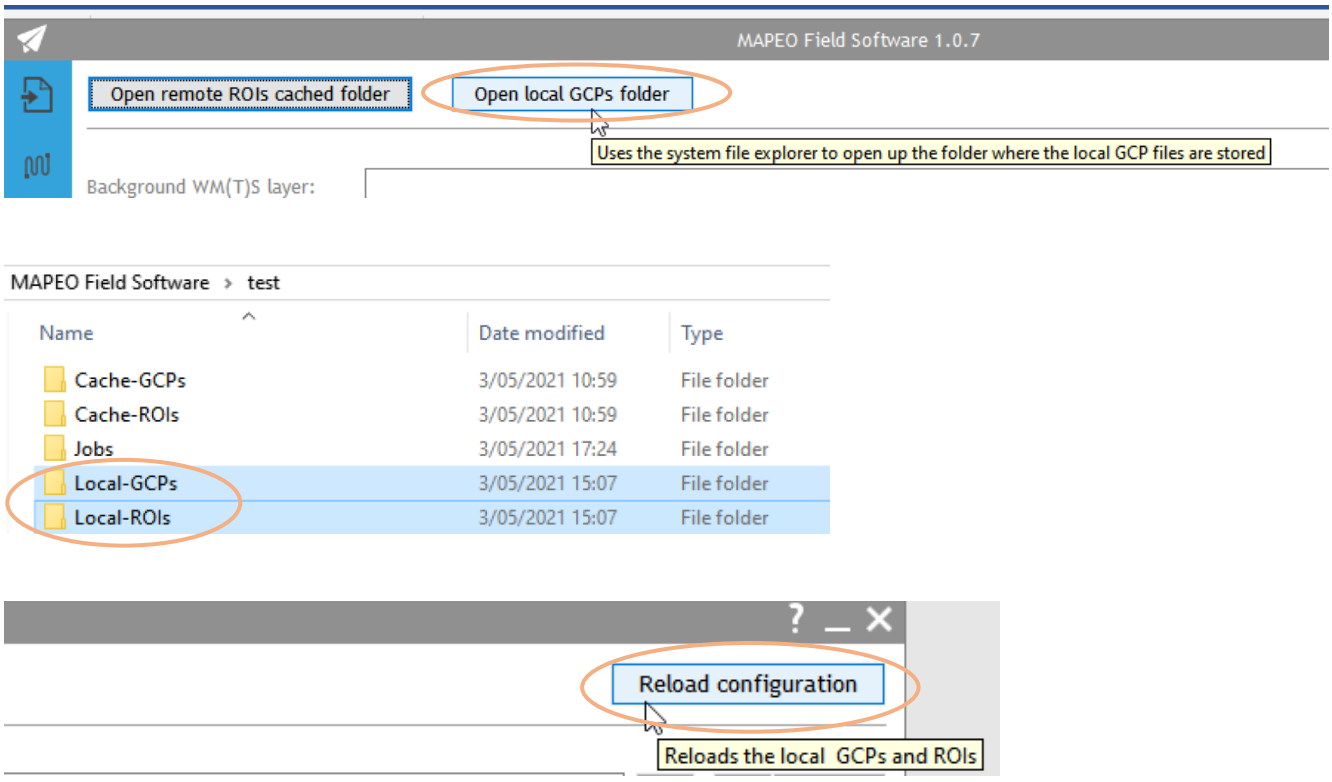


Figure 60: Adding local GCP/ROI files

Note that:

The **Cache**-* folders replicate the remotely stored ROI/GCP files
The **Local**-* folders contain the local/custom created ROI/GCP files (if any)

9.3 Uploading image position data files

The image position information is read from the (Exif) metadata.
If the position info is not included in the image metadata (no orange dots are displayed), or if the user wants to override it, the option is given to upload a file, containing the position data.
This file needs to be in .csv format, tab delimited and contain the following parameters for all images in the dataset:

Image name	longitude	latitude	altitude
DSC08193.jpg	4.523612792575348	51.07481401664812	28.726

Table 5: Image position data – csv file format

Before uploading this file, the EPSG code, denoting the coordinate system used to reference the position coordinates, must be specified in the “EPSG” text box (Figure 61).
Note that also compound EPSG codes can be used, for example **32631+5773** for UTM 31N with EGM96 height reference.

After the EPSG code is set, you can use the “Select GPS csv file” button to upload the csv file containing the position data.
At this point, the map with the orange dots will appear, as well as the list of images together with their position data.

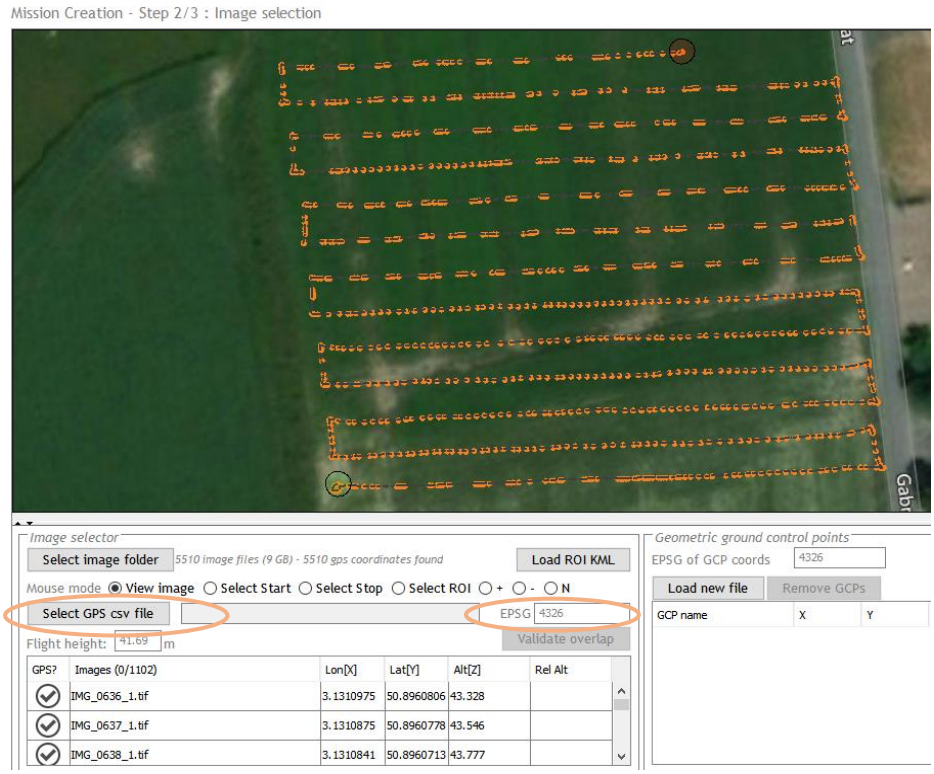


Figure 61: Uploading image position data file

9.4 Changing flight line detection parameters

Flight lines are automatically calculated by the flight line detection algorithm in the Field Software. In case the flight lines have not been identified properly, you can set some parameters to modify the behaviour of this algorithm. The tooltip above the parameters gives more info.

Max. azimuth dev:
When following a straight line between the images, the maximum deviation in degrees allowed before the algorithm assumes a turn for the next flight line. The deviation is relative to the current direction or to one of the 5 directions most frequently found in the entire mission. The most frequent directions are determined by making a histogram of all azimuths between all subsequent image in blocks of 5°. We define slots of -180° to 180°, the 5 most popular slots (azimuths), if they have a count > 40% of the most populated slot, will be the reference azimuths, next to the azimuth of the first flight line.

Min % of flight line:
The algorithm will only try to detect a new flight line, after this min % of distance since the start of the current flight line.
E.g. if the estimated length of a flight line is 100 m and this value is set to 2%, at least a distance of 2m has to be flown before the algorithm will check for a turn.

Ahead count:
The number of images the algorithm will look ahead to determine the current azimuth. If images are very close to each other, this value will allow to provide a better azimuth determination.

Figure 62 shows a mission during which the pilot returned multiple times to the take-off location. The direction of the return flights was not so much different of the direction of the actual flight lines. That's why with the default settings, the images captured during these return flights were considered being on a flight line.

Figure 62: Improper flight line detection

By using the slider to the left of the visualisation pane, you can expand it and display the panel containing the configuration options of the flight line detection algorithm (Figure 63).

Since in this mission, the return flights had an azimuth angle which was close to the azimuth angle of the actual flight lines, the allowed deviation in azimuth angle to detect the actual flight lines must be lowered (e.g. to 10°).
This can be done by using the up/down arrows or the numeric keyboard.
Pressing “enter” will apply this value:
the detection algorithm will be re-run, the detected flight lines redrawn and the return flight lines will be skipped (indicated by the orange dots, and the consistent numbering of the actual flight lines).

Figure 63: Customizing the flight line detection parameters

10. APPENDIX A: JAVA/JDK SETUP – WINDOWS

Starting April 2019, Oracle Java requires licensing for commercial use. Hence, the download at https://www.java.com/nl/download/ (first result in Google) is **outdated** and also limited to personal or demonstration use.

If you intend to use the application commercially, and you don't have a Java license, we recommend installing OpenJDK, for which Adoptium (Eclipse foundation, used to be AdoptOpenJDK) provides a distributable at

https://adoptium.net/

An alternative complete JDK can also be download at https://jdk.java.net/

10.1 Removing old Java versions

If you do not require a specific Java version for other applications, it's recommended to remove older version(s) of Java if any are present.
Administrator permission will be required, refer to this guide how to proceed:
https://www.java.com/en/download/help/uninstall_java.html

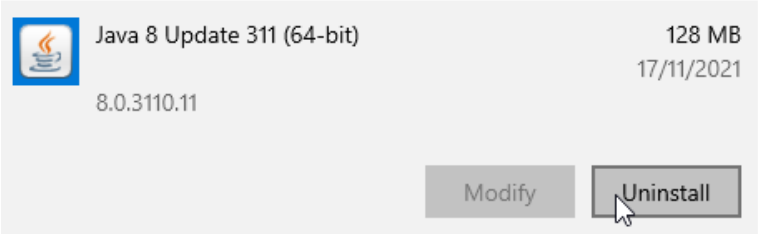


Figure 64: Uninstalling Java

10.2 Installing a compatible Java version

You can download OpenJDK from the Eclipse foundation OpenJDK distribution site:
https://adoptium.net/

Either you download the proposed most recent version (160 MB):

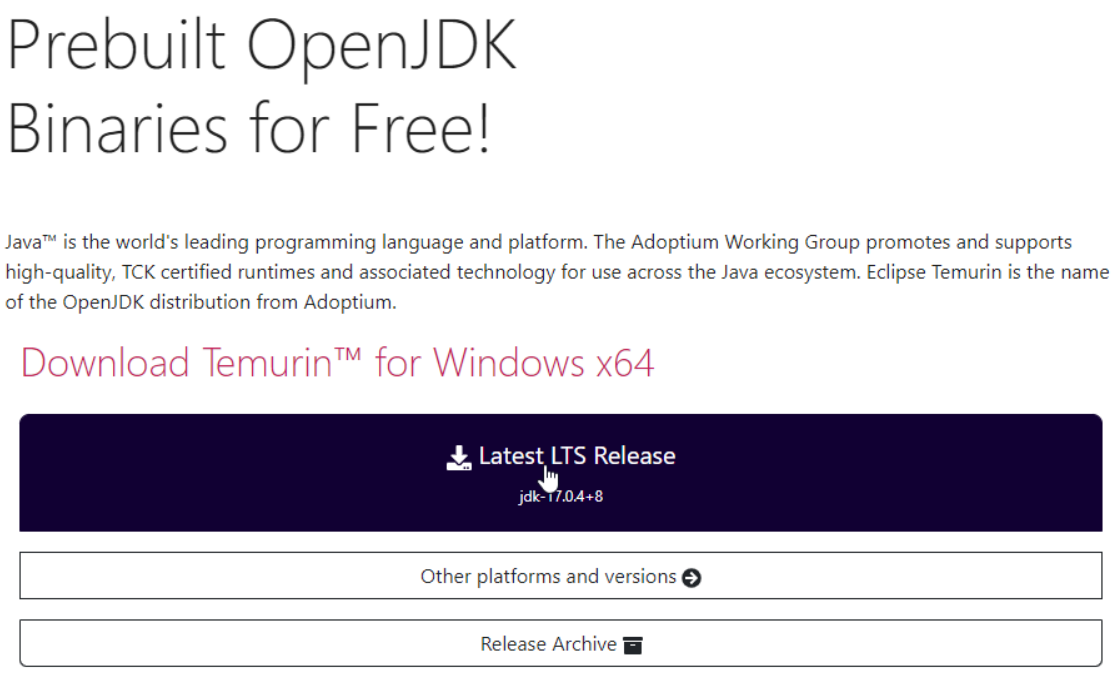


Figure 65 Default Java JDK option

Or you can download a smaller JRE installer (32 MB):

Figure 66: Browse OpenJDK distribution site for installer (windows)

Select your Operating System and architecture. If you have Administrator privileges, select the **JRE msi**, otherwise if no administrator can perform the install, download the JRE zip:

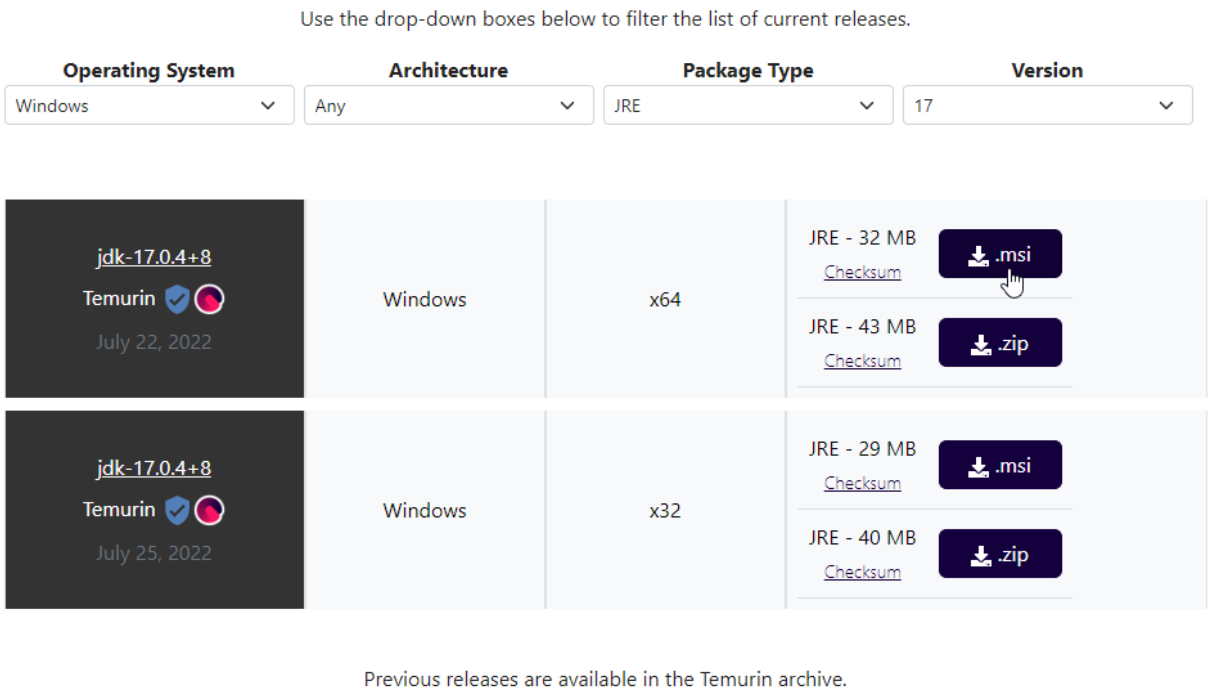


Figure 67: Download JRE installer package (windows)

Run the downloaded installer:

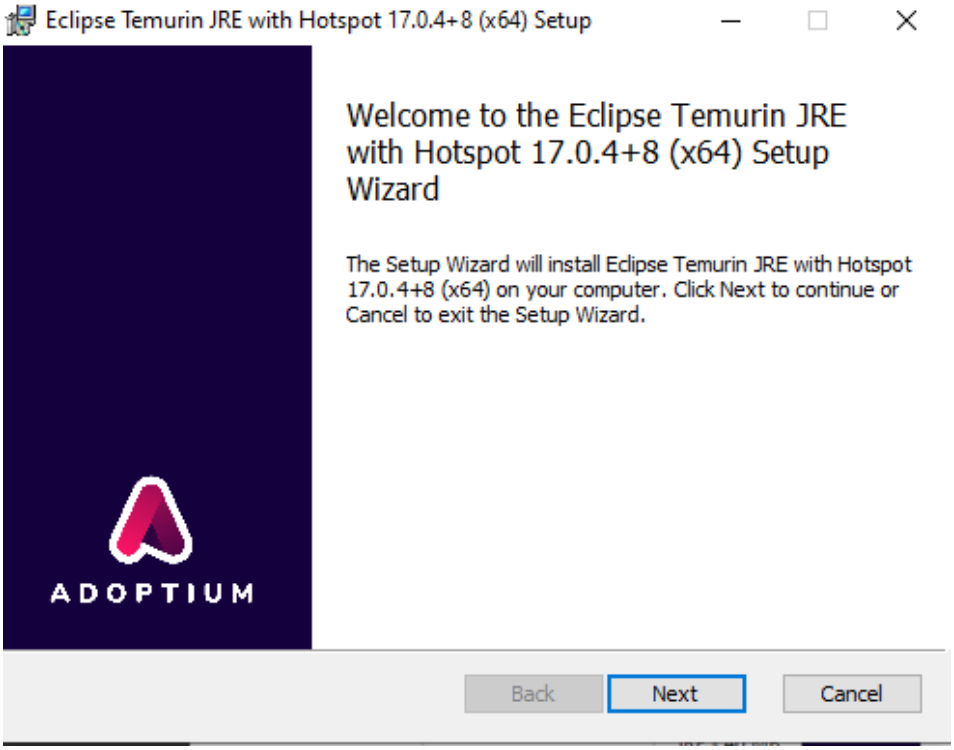


Figure 68: Run JRE installer (windows)

Accept license and select “set JAVA_HOME” & “Javasoft (Oracle)”:

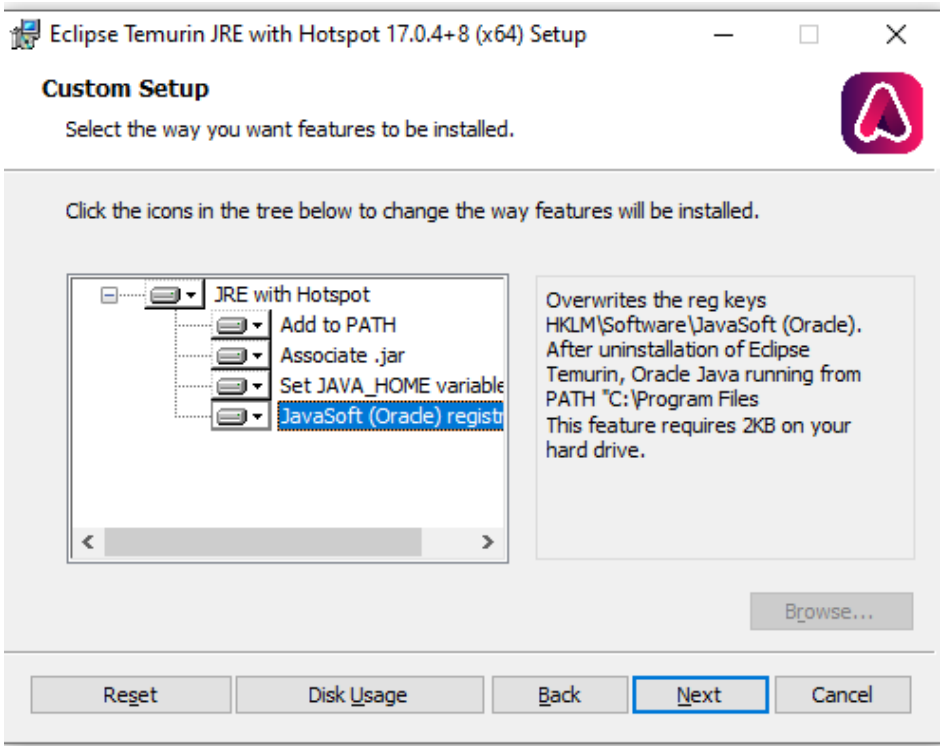


Figure 69: Select JRE installation features (windows)

Click Next until you reach the end of the installation, and press Finish.

You should now be able to double click on the jar file to open it.

In case you have issues installing, refer to https://adoptium.net/installation.html for platform specific setup guides.

10.3 Creating a bat file for starting the application (Optional)

If Java is installed on your system, you can run the jar file with the “<path-to-correct-java> -jar <path_to_jar>” command.

In Windows, you could for example make a “**fieldsoftware.bat**” file with a text editor in the same folder where the jar file is located. It should contain a line like this:

```
cmd /K "<optional-path-where-java-is-installed>java -Xmx1024m -jar MAPEO-Field-Software.jar"
```

Table 6: Fieldsoftware.bat file content (windows)

Renaming the MapEO-Field-Software**-<version>**.jar to MAPEO-Field-Software.jar avoids having to edit this batch file each time there is an update of the software. However, this is not recommended.

Double-clicking on this bat file will leave a “cmd.exe window” open, so you can see any output error message.
After closing the application, you will still need to close this window separately.

10.4 Solving a Java Heapspace warning or OutOfMemory issue

You might get one of the warning messages displayed below. This can occur when the application is started on a machine with low memory, or if you are using an older version of Java.

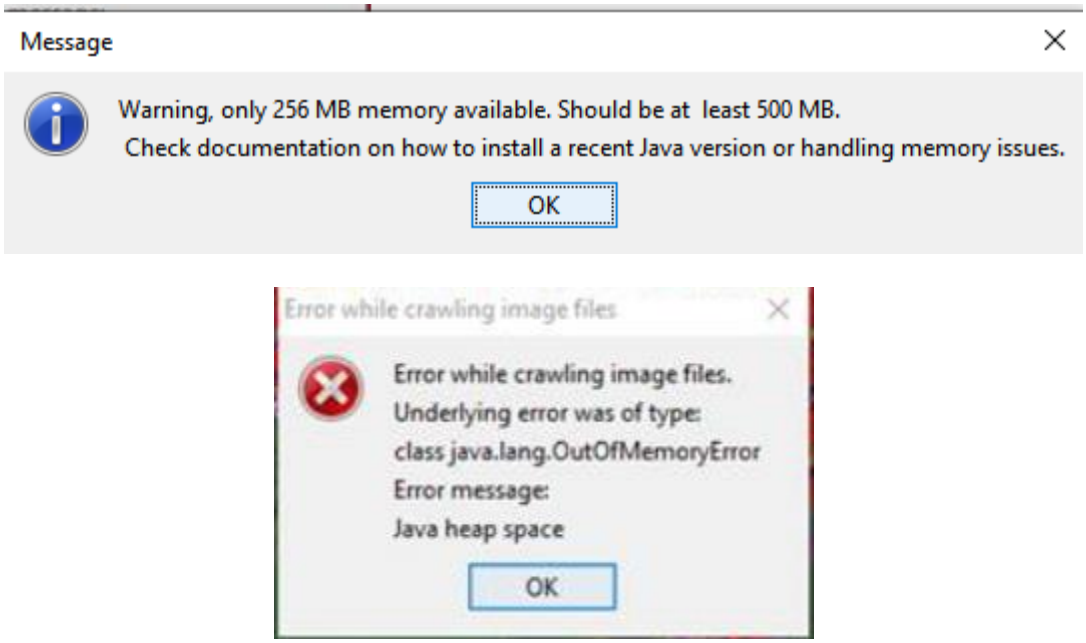


Figure 70: (Out of) memory warnings

Make sure to shut down the application and save your files.

Once the application is closed down, please install the minimum Java version specified in this manual.

If this does not solve the issue, try creating a bat file as described in the previous section.
Should the problem persist, try with the “-Xmx2048m” memory setting if your system has more than 2GB of memory.

11. APPENDIX B: JAVA/JDK SETUP - MACOS

Some Java distributions for MacOS are incompatible with the tool.
If you get a fatal error after login, this is most likely due to an incompatible Java version.

Starting April 2019, Oracle Java requires licensing for commercial use. Hence, the download at https://www.java.com/nl/download/ (first hit of Google) is outdated and also limited to personal or demonstration use.
If you intend to use the application commercially, and you don't have a Java license, we recommend installing OpenJDK, for which Adoptium (Eclipse foundation, used to be AdoptOpenJDK) provides a distributable at

https://adoptium.net/

A complete JDK can also be download at https://jdk.java.net/.

11.1 Removing other versions of Java/JDK (if applicable)

If a specific version of Java is not required for other applications, we recommend removing any previous installs of Java.
Otherwise you will have to specify which Java runtime to use, see section 11.3 Create a command script to use the correct Java version (Optional)

Please refer to the documentation of your specific MacOS version on how to uninstall apps.

Advanced users might find inspiration here:

https://explainjava.com/uninstall-java-macos/

11.2 Installing a compatible version of Java

You can download OpenJDK from the Eclipse foundation OpenJDK distribution site:
https://adoptium.net/

Either you download the proposed most recent version (160 MB) on the first page

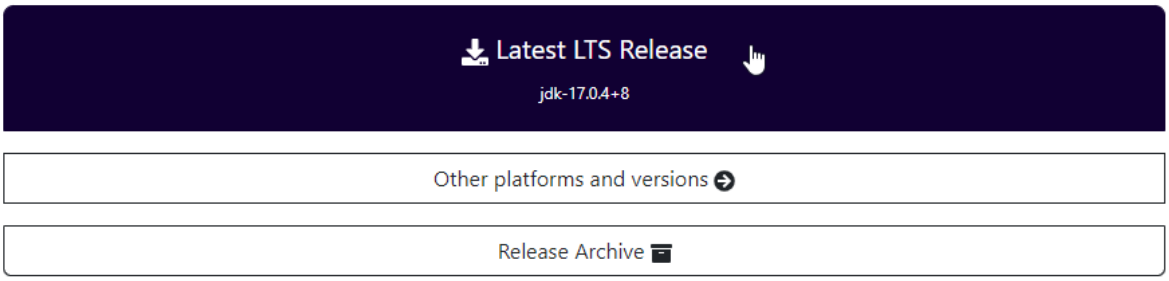


Figure 71 Default latest Java install

or you can manually select a more compact JRE distributable (36 MB):

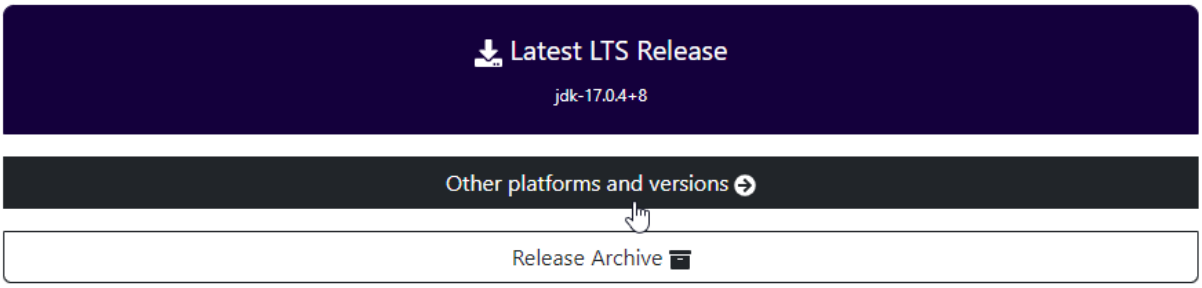


Figure 72: Browse OpenJDK distribution site for installer (macOS)

Select macOS as operating system, the correct architecture and then either choose the package .pkg file (recommended) or the tar.gz file for manual installation (not further explained in this document):

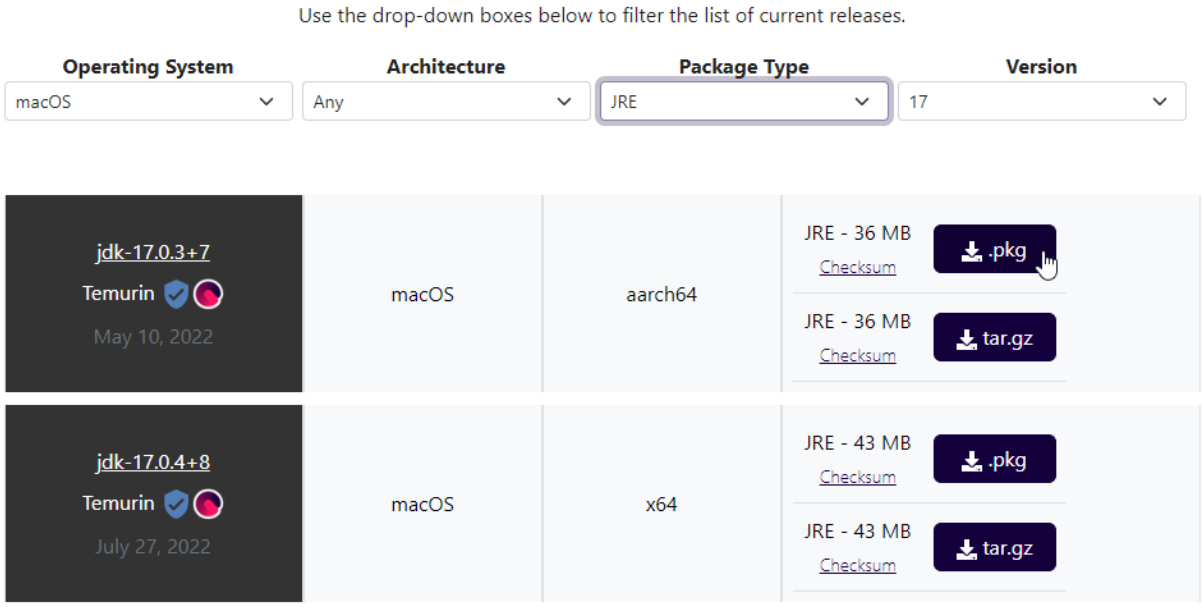


Figure 73: Download JRE installer package (macOS)

For the .pkg file, run it and follow the suggested instructions. Run “java -version” in a terminal to make sure the correct version of java is now the default.

Instructions for installing the tar.gz can be found here:
https://adoptium.net/installation/archives/#_macos

We recommend using the folder /Library/Java/JavaVirtualMachines for any JDK install.

11.3 Create a command script to use the correct Java version (Optional)

If you want to keep other Java versions, or if you need specific options to avoid memory issues, you must create a command script.

Open a text editor, create a "**fieldsoftware.command**" file, in the same folder where you placed the jar file, and add the following to the file:

```
<path-to-installed-jre-java> -jar <path-to-MAPEO-Field-Software.jar>
```

Table 7: Fieldsoftware.command file content (macOS)

Renaming the MapEO-Field-Software**-<version>**.jar to MAPEO-Field-Software.jar avoids having to edit this batch file each time there is an update of the software. However, this is not recommended.

An example of a macOS cmd line is given below:

```
/Library/Java/JavaVirtualMachines/temurin-11.jre/Contents/Home/bin/java   -jar
/Users/johndoe/Desktop/MAPEO-field-software.jar
```

Table 8: Fieldsoftware.command file example (macOS)

Before the cmd file can be executed, you need to set the permission rights for the file, using the "chmod" command in a terminal window:

```
chmod 755 <path-tofieldsoftware.command>
```

Table 9: Fieldsoftware.command file permission rights (macOS)

Double-clicking on the command file will start the application.

If the application fails to start:

- Right click on the command file.
- Scroll down to the "Open With" section and set it to "Terminal".

- If “Terminal” is not listed as an option, select "Other..." from the menu and browse to Terminal (which can be found in Applications - Utilities).
- Next, click the "Change All" button, and as of now each ".command" file will be opened with Terminal and the script will be executed.

If you experience memory issues (heap space warnings):

- Make sure to shut down the application and save your files.
- Try using “java -Xmx1024m” or “java -Xmx2048m” in the command line if your system has more than 1GB or 2GB of memory respectively.

11.4 Solving a crash of the tool after login

If you have previously tried opening the Field Software with an incompatible java version on macOS, you may see this error:

```
Application Specific Information:
/usr/lib/libcrypto.dylib
abort() called
Invalid dylib load. Clients should not load the unversioned libcrypto dylib as it does not have a stable ABI.

Thread 0:: Dispatch queue: com.apple.main-thread
0   libsystem_kernel.dylib          0x00007fff6cb19dfa mach_msg_trap + 10
1   libsystem_kernel.dylib          0x00007fff6cb1a170 mach_msg + 60
2   com.apple.CoreFoundation        0x00007fff327da785 __CFRunLoopServiceMachPort + 247
3   com.apple.CoreFoundation        0x00007fff327d9252 __CFRunLoopRun + 1319
4   com.apple.CoreFoundation        0x00007fff327d86ce CFRunLoopRunSpecific + 462
5   com.apple.HIToolbox             0x00007fff31404aad RunCurrentEventLoopInMode + 292
6   com.apple.HIToolbox             0x00007fff314047c5 ReceiveNextEventCommon + 584
7   com.apple.HIToolbox             0x00007fff31404569 _BlockUntilNextEventMatchingListInModeWithFilter + 64
8   com.apple.AppKit                0x00007fff2fa4d659 _DPSNextEvent + 883
9           com.apple.AppKit                                        0x00007fff2fa4bea0    -[NSApplication(NSEvent)
_nextEventMatchingEventMask:untilDate:inMode:dequeue:] + 1352
10        libosxapp.dylib                                           0x000000011bf1d96a    -[NSApplicationAWT
nextEventMatchingMask:untilDate:inMode:dequeue:] + 122
11  com.apple.AppKit                0x00007fff2fa3dbae -[NSApplication run] + 658
12  libosxapp.dylib                 0x000000011bf1d739 +[NSApplicationAWT runAWTLoopWithApp:] + 185
13  libsplashscreen.dylib           0x000000011bf00736 __SplashInitPlatform_block_invoke + 70
14  JavaNativeFoundation            0x00007fff370f8ff9 +[JNFRunLoop _performCopiedBlock:] + 15
15  com.apple.Foundation            0x00007fff34eb1b4d __NSThreadPerformPerform + 204
16              com.apple.CoreFoundation                                0x00007fff327da5e2
__CFRUNLOOP_IS_CALLING_OUT_TO_A_SOURCE0_PERFORM_FUNCTION__ + 17
17  com.apple.CoreFoundation        0x00007fff327da581 __CFRunLoopDoSource0 + 103
18  com.apple.CoreFoundation        0x00007fff327da39b __CFRunLoopDoSources0 + 209
19  com.apple.CoreFoundation        0x00007fff327d90ca __CFRunLoopRun + 927
20  com.apple.CoreFoundation        0x00007fff327d86ce CFRunLoopRunSpecific + 462
21  libjli.dylib                    0x000000010f4b5d12 CreateExecutionEnvironment + 402
22  libjli.dylib                    0x000000010f4b1745 JLI_Launch + 1493
23  java                            0x000000010f4a1c16 main + 406
24  libdyld.dylib                   0x00007fff6c9d8cc9 start + 1
```

Figure 74: libcrypto dylib error (macOS)

If you experience Field Software configuration problems, you may see this error:

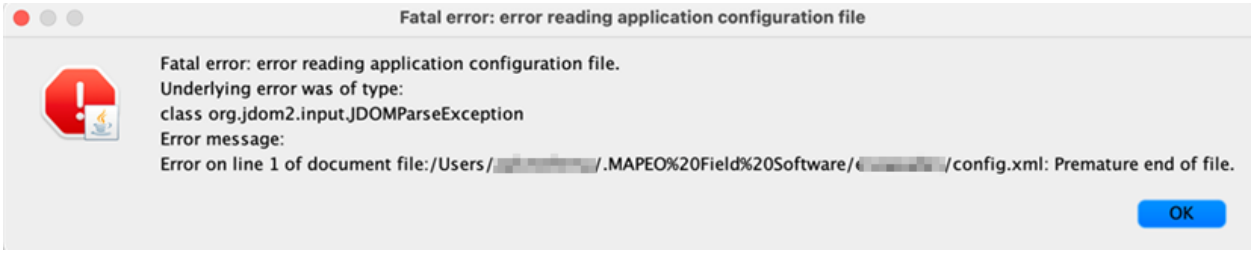


Figure 75: configuration file error (macOS)

To solve the above errors, you need to remove the configuration information of the software.

- If you've only started the application once, you can delete the installation folder completely.
- In case you've used the software before and want to keep your existing missions, only delete the (user-specific) config file!

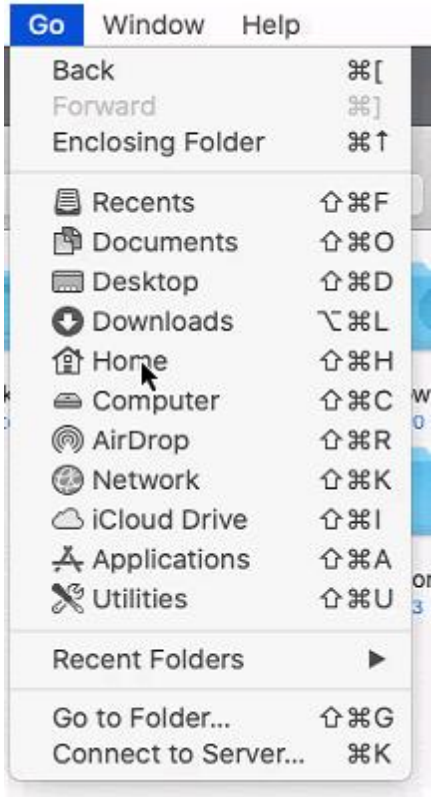
To remove the installation folder, locate the "MapEO Field Software" folder and delete it.
To remove the config file, locate the "**config.xml**" file and delete it.

To locate and remove the installation folder or config file, you can either use the GUI or a terminal, as described in the section below.
After removal, you can retry to start the tool with a compatible java version (see previous sections).

11.4.1 Browsing to the configuration folder using the GUI

Open the MacOS file explorer (Finder):

Go to the home folder:

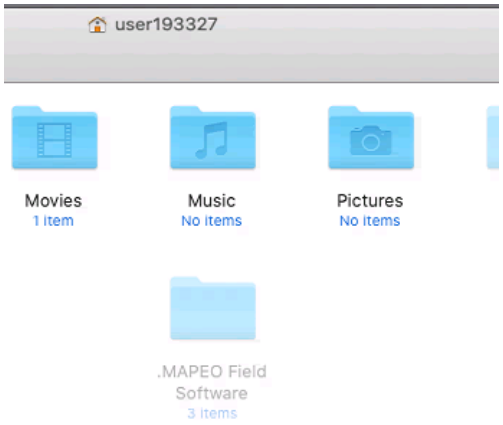


Hold down the Command, Shift and Period keys: **cmd + shift + [.]** to see hidden files.

The ".Mapeo Field Software" folder should appear. If you've only started the application without really using it, you may delete the folder completel. Otherwise only delete the config.xml file to keep old jobs.

11.4.2 Browsing to the configuration folder using the terminal

You can also use a terminal to remove the folder or files, for more details, see for example: https://www.pcmag.com/how-to/how-to-access-your-macs-hidden-files

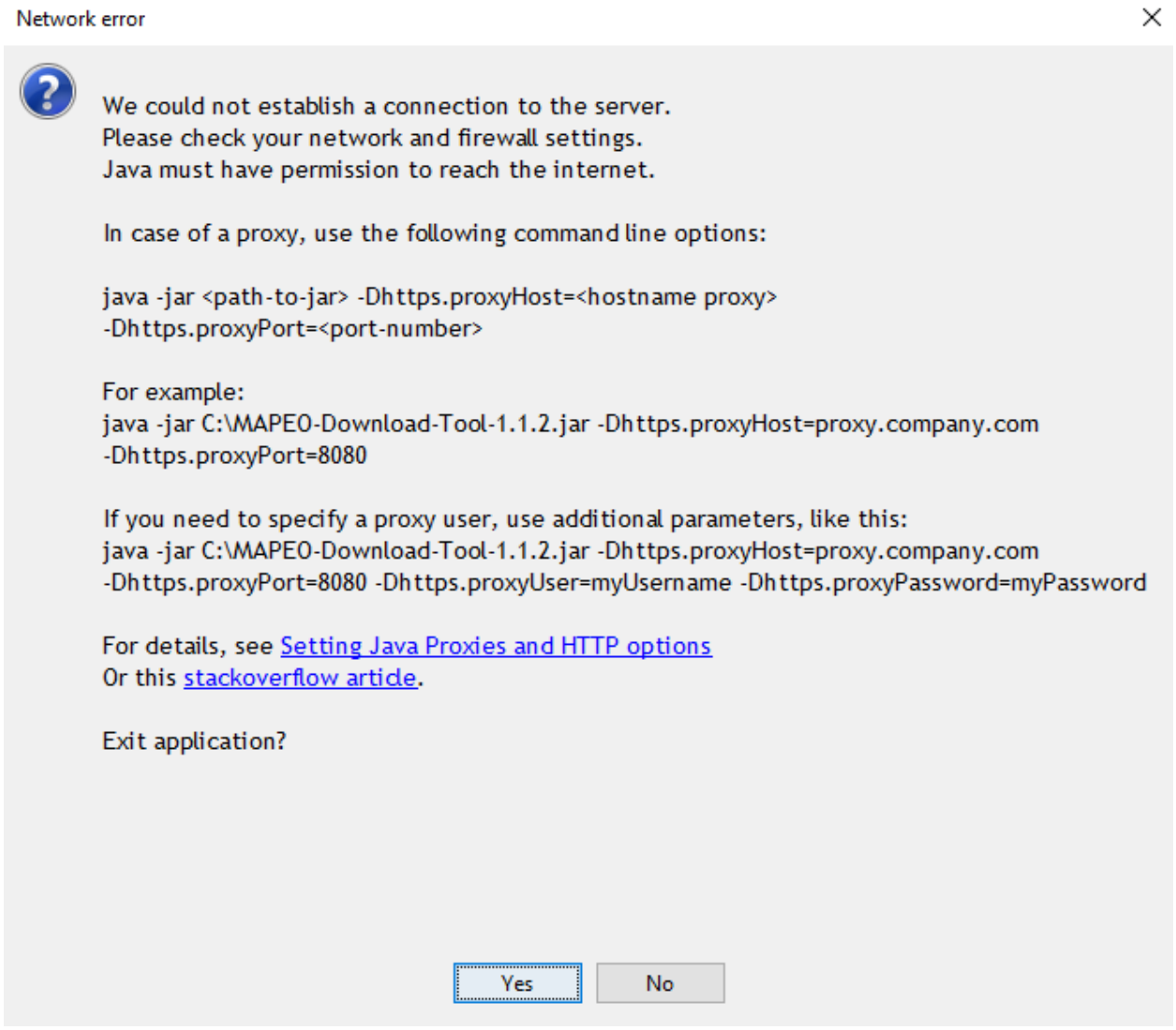


12. APPENDIX C: TROUBLESHOOTING NETWORK ISSUES

You can test if the application can connect to the internet by using the downloader jar which does a connection test on startup (as the Fieldsoftware can work in offline mode, it does not do a connection test):

https://remotesensing.vito.be/software/uav-pc/mapeo-download-tool/MAPEO-Download-Tool.jar

If there is an issue with the connection or the permissions, you will get this message:



In case you are required to use a proxy server, the Fieldsoftware also requires the "**-http.proxy***" params to be set in the bat file or script (see previous chapters), for example:

java -Dhttps.proxyHost=proxy.company.com -Dhttps.proxyPort=80 -Dhttp.proxyHost= proxy.company.com -Dhttp.proxyPort=80 -jar MAPEO-Field-Software-.jar

More info on proxy and network parameters can be found here:

https://docs.oracle.com/en/java/javase/11/docs/api/java.base/java/net/doc-files/net-properties.html

https://stackoverflow.com/questions/30630330/what-java-properties-to-pass-to-a-java-app-to-authenticate-with-a-http-proxy