GEOSYSTEMS
THE GEOSPATIAL EXPERTS

HEXAGON
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GeoApp.UAS

STEP-BY-STEP GUIDE

Introduction

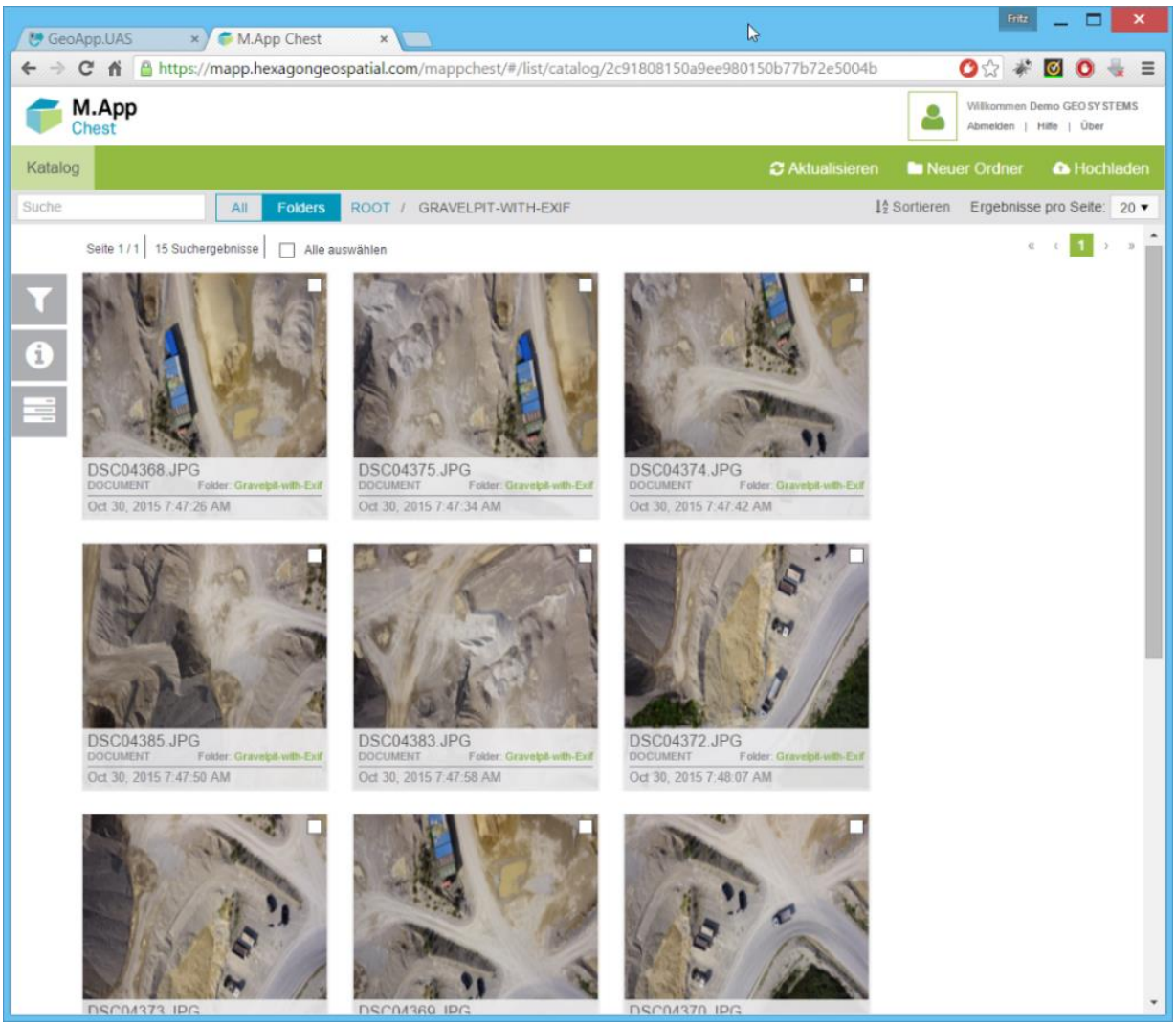
Use GeoApp.UAS to create digital ortho mosaics, digital surface models, and point clouds from overlapping image data captured with small and medium sized frame cameras.

To produce high-quality results, consider the following best practices before starting processing:

- Use a digital camera with reasonably high resolution (5 megapixel or more). Do not mix cameras!
- Avoid ultra-wide angle and fish-eye lenses. The best choice is a lens with 50 mm focal length (35 mm film equivalent) but focal length might vary from 20 to 80 mm.
- Lenses with a fixed focal length are preferred. If you use zoom lenses the focal length should be set either to maximal or minimal value.
- Try to use the RAW data lossless converted to TIFF files. JPG compression adds unwanted noise to the images that could affect the accuracy.
- The ISO-value should be set to the lowest possible value. High ISO values will add additional noise to the images.
- Always use the original images. Do not crop or geometrically transform (for example, resize or rotate) the images.
- Rough rule for image overlap: 60% of side overlap + 80% of forward overlap
- Try to use vertical photos as base information – you might add additional oblique images if needed.

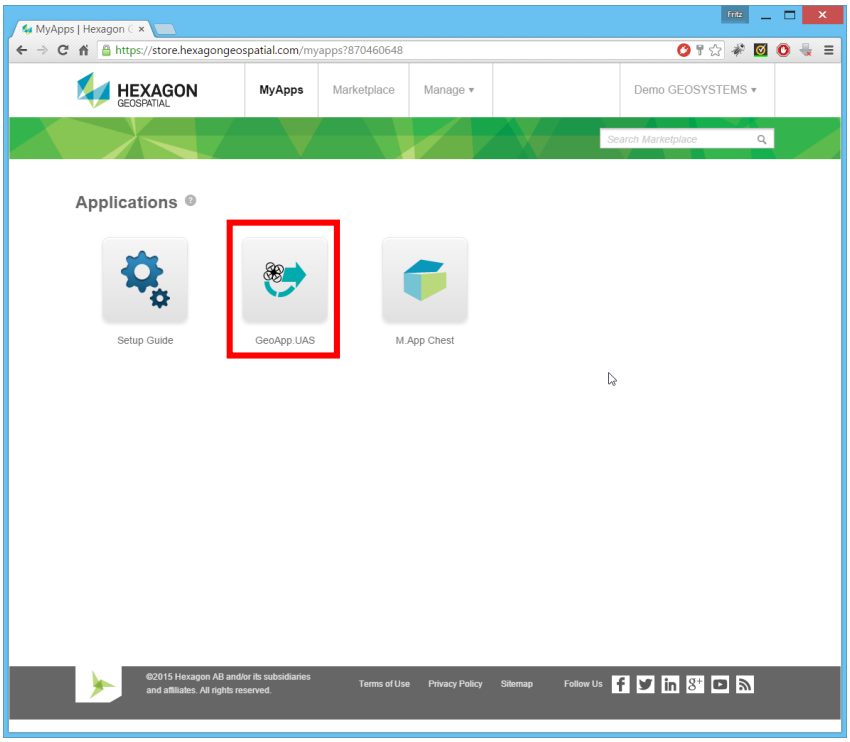
Before You Begin

Before you start processing UAS image data with the GeoApp.UAS workflow you must have already uploaded your datasets into a new folder in M.App Chest.

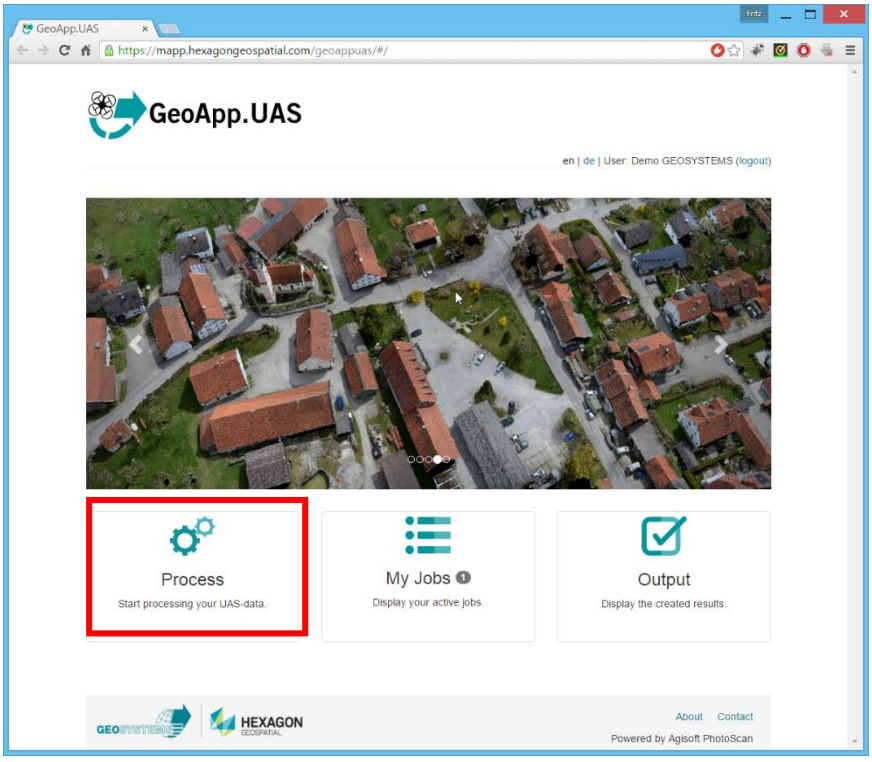


Start the App

1. Start GeoApp.UAS within your “MyApps”.

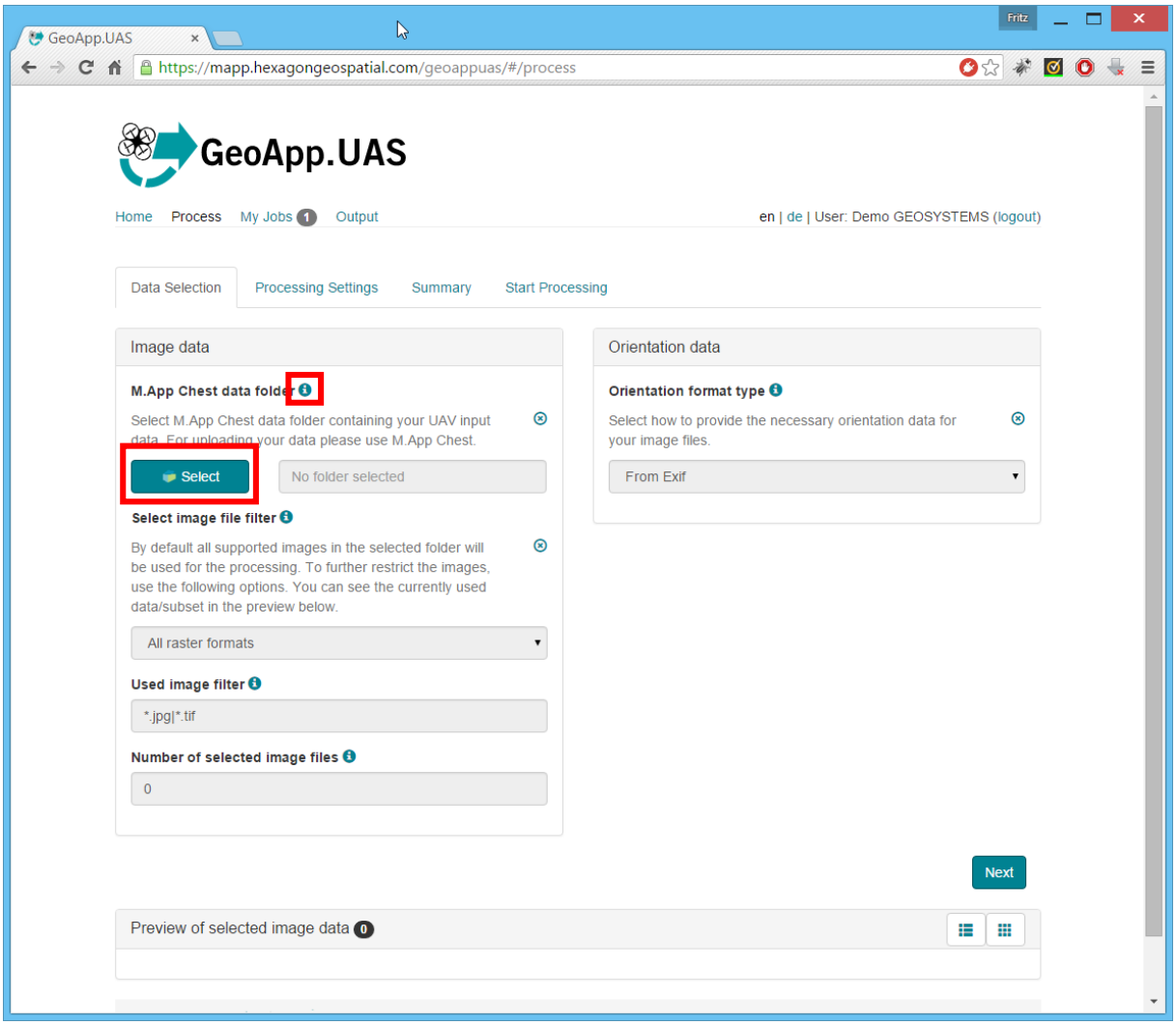


2. A wizard will guide you through the workflow. All you need to do is follow three easy steps.



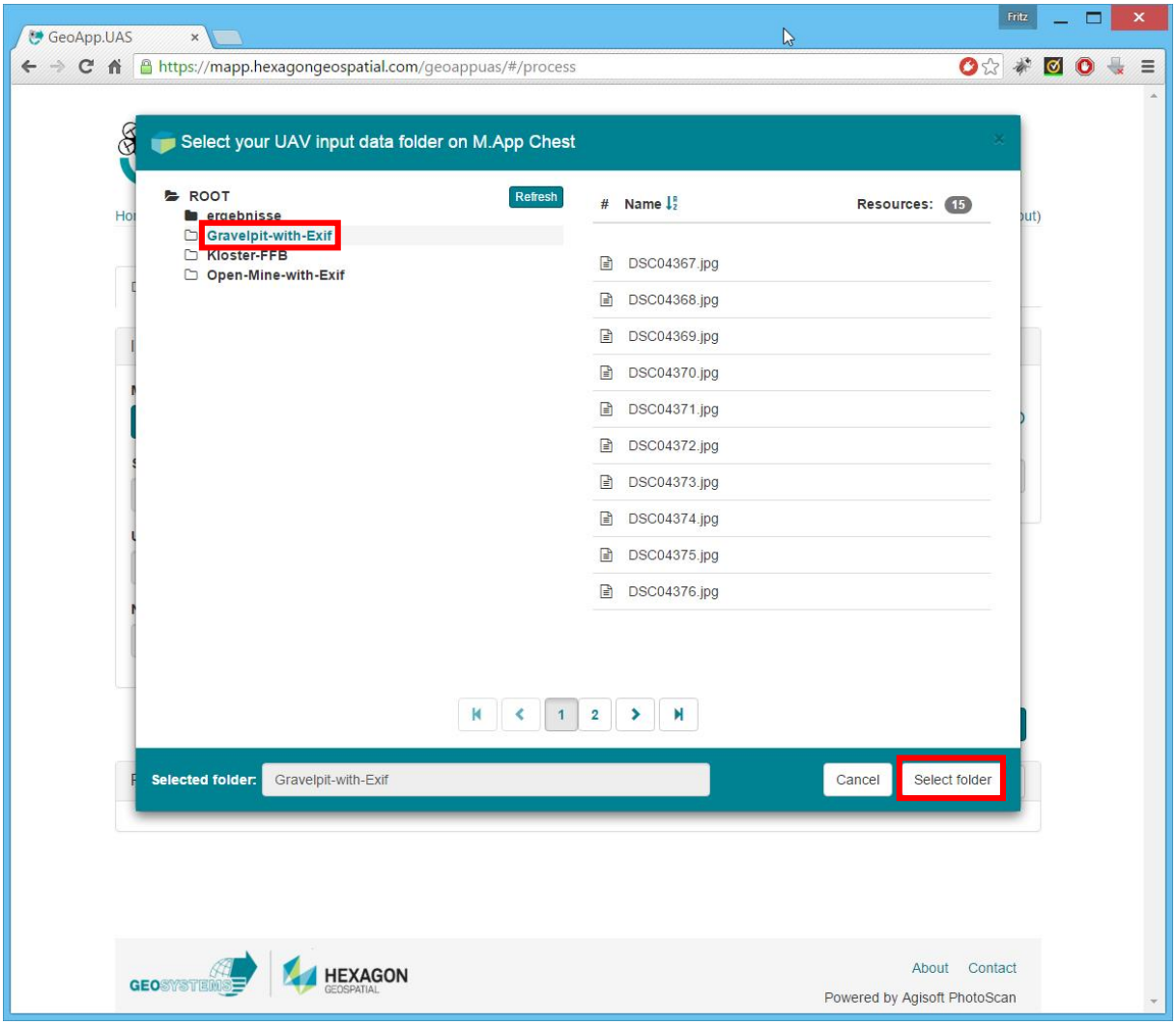
Process Steps

1. Click the **Process** button in the main menu. On the **Data Selection** tab, you find a short description to all input files. Click the Info-Icon to get more information and click again to close.



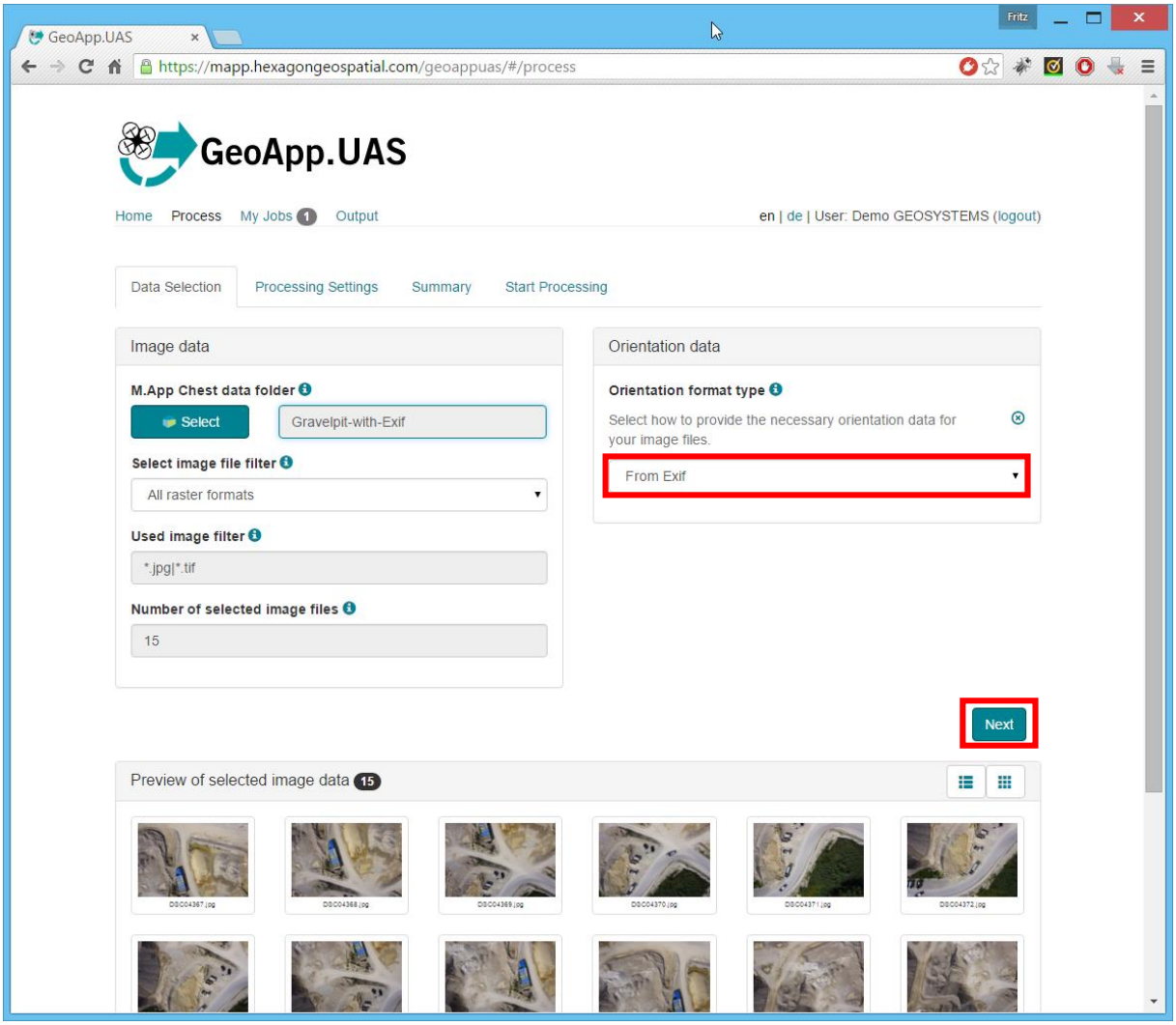
2. Select your input datasets. This means that you have to select your input folder that you have created within M.App Chest. Ensure that this folder contains all the single image files that you want to process. Accept your selection by clicking the **Select** folder button.

Hint: Bold folder icons indicate folders that contain subfolders. Click the bold folder icon to expand the folder. Click the folder name to select the folder.



After you have chosen the folder, the contents of this folder are displayed. You should see the names and the thumbnails of all your input image datasets. You may apply additional filters to select a subset out of your datasets.

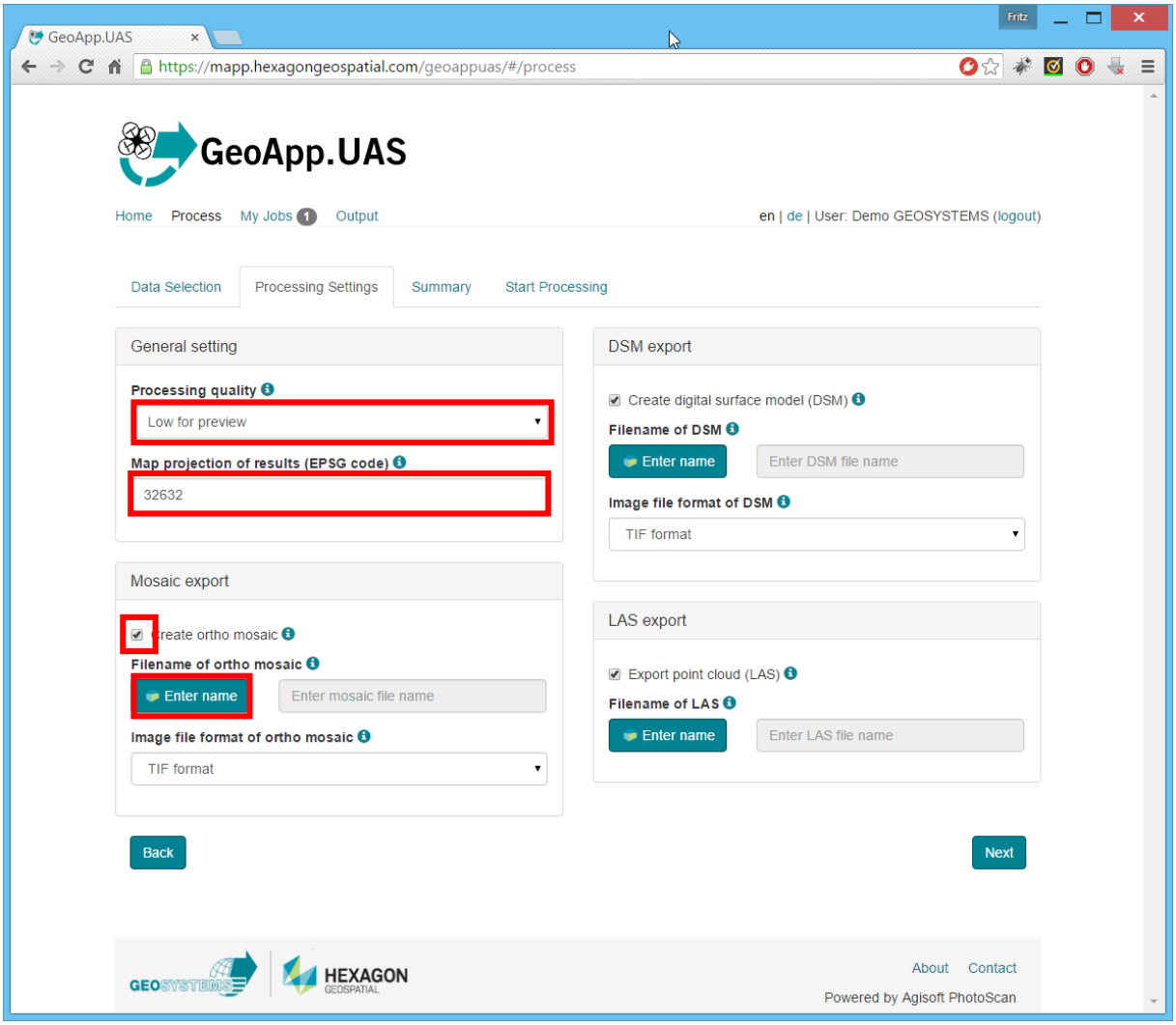
In this example, we use already geotagged images. This means that the images contain the GPS information of the UAS position during image capture in the EXIF header. If your datasets do not contain this information, follow the advanced user guide in the appendix that describes how to use your own orientation format. Additionally you might also use a GPX-track file for geocoding.



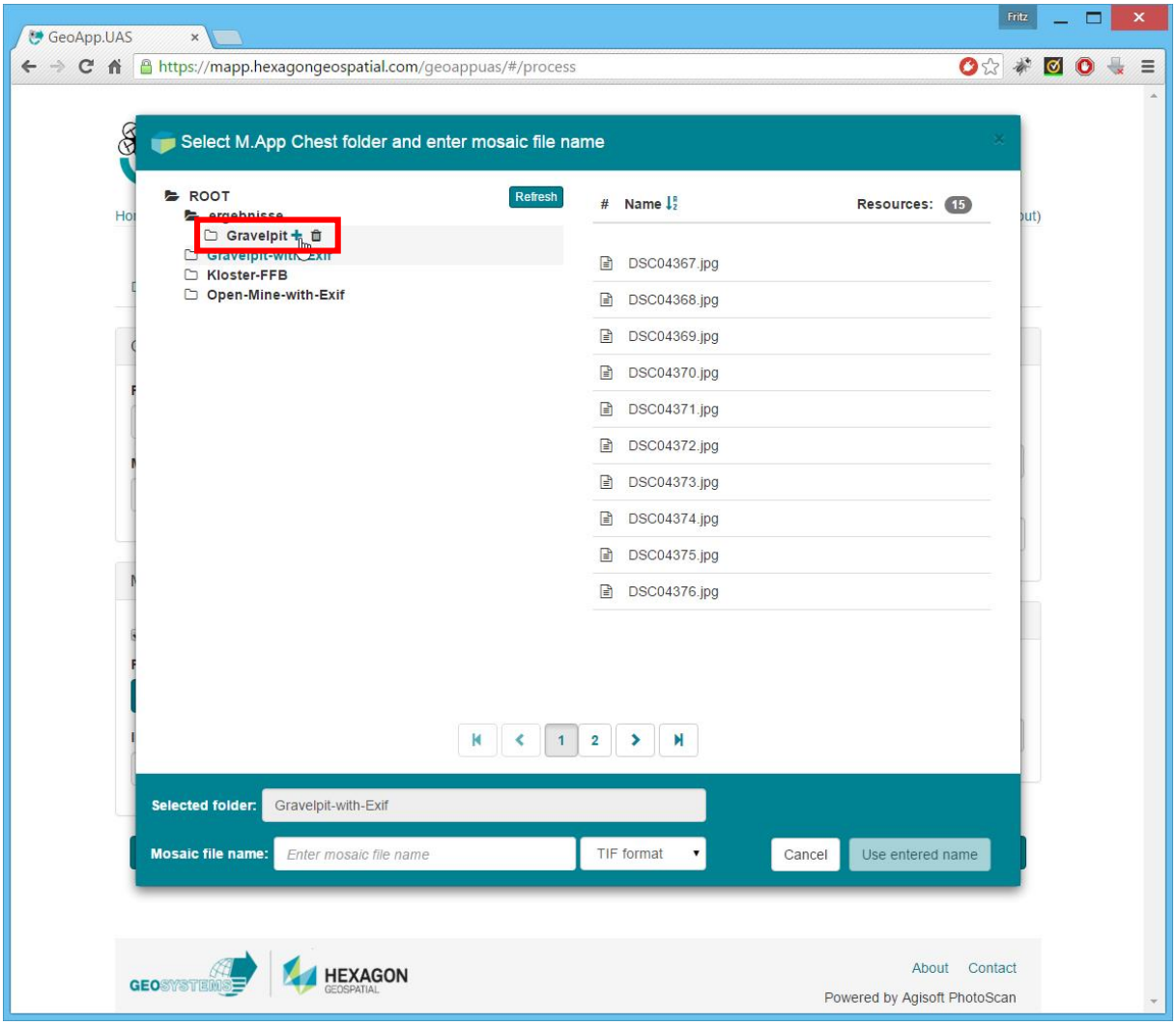
Set Output Options

The output options are defined in the **Processing Settings** tab.

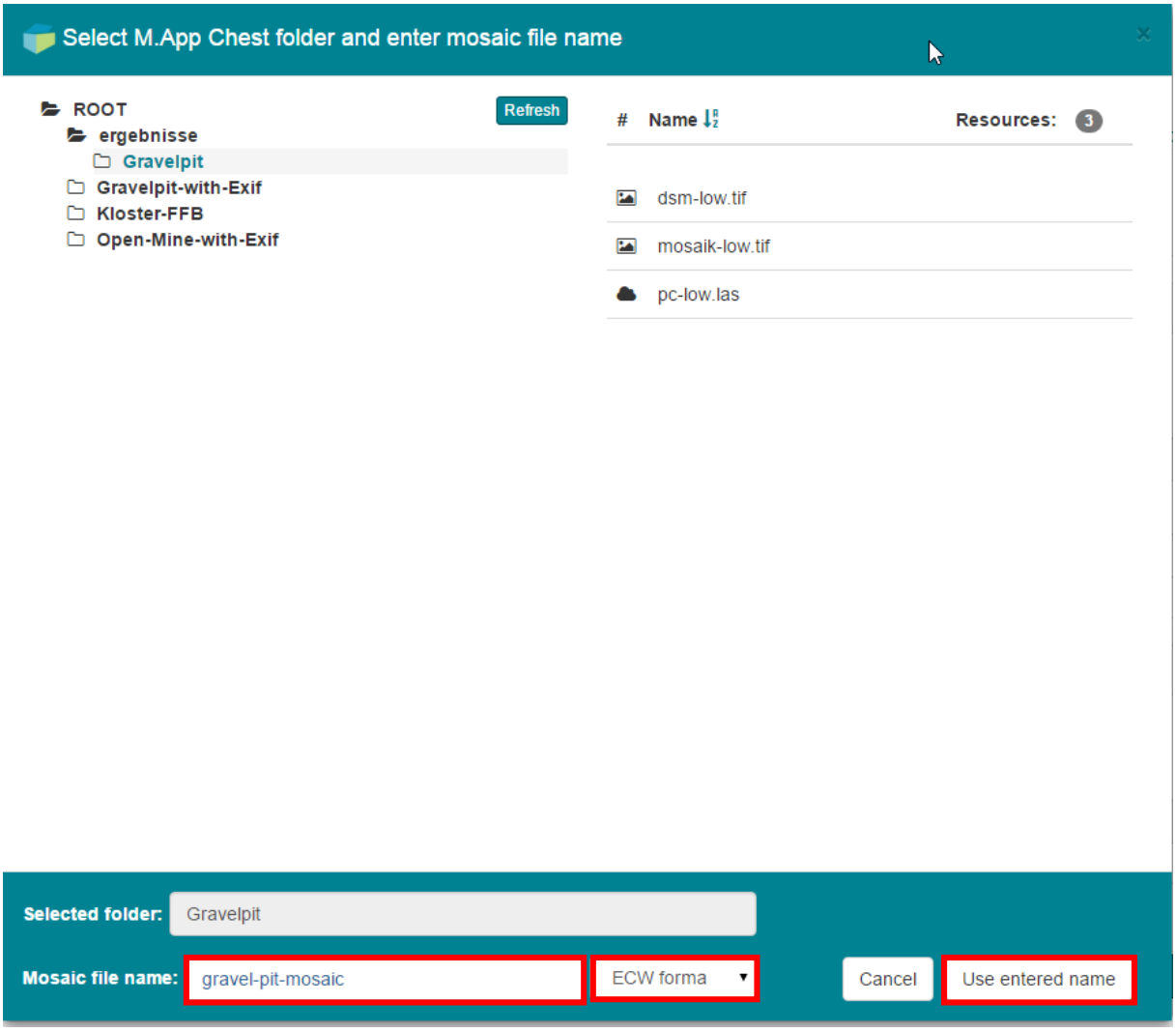
1. Set the processing quality for the computed surface. The option 'Low for preview' will compute a relatively rough surface, but computation time will be quite short. 'High for production' will take approximately **16 times longer**, but the computed surface will be of much better quality.
2. Define the output projection by entering the ESPG code of your coordinate system (visit www.spatialreference.org for more information about EPSG codes).
3. Select the output files. You are able to create an image mosaic, a dense point cloud, and a raster image of the digital surface model. You may choose any combination for the output.



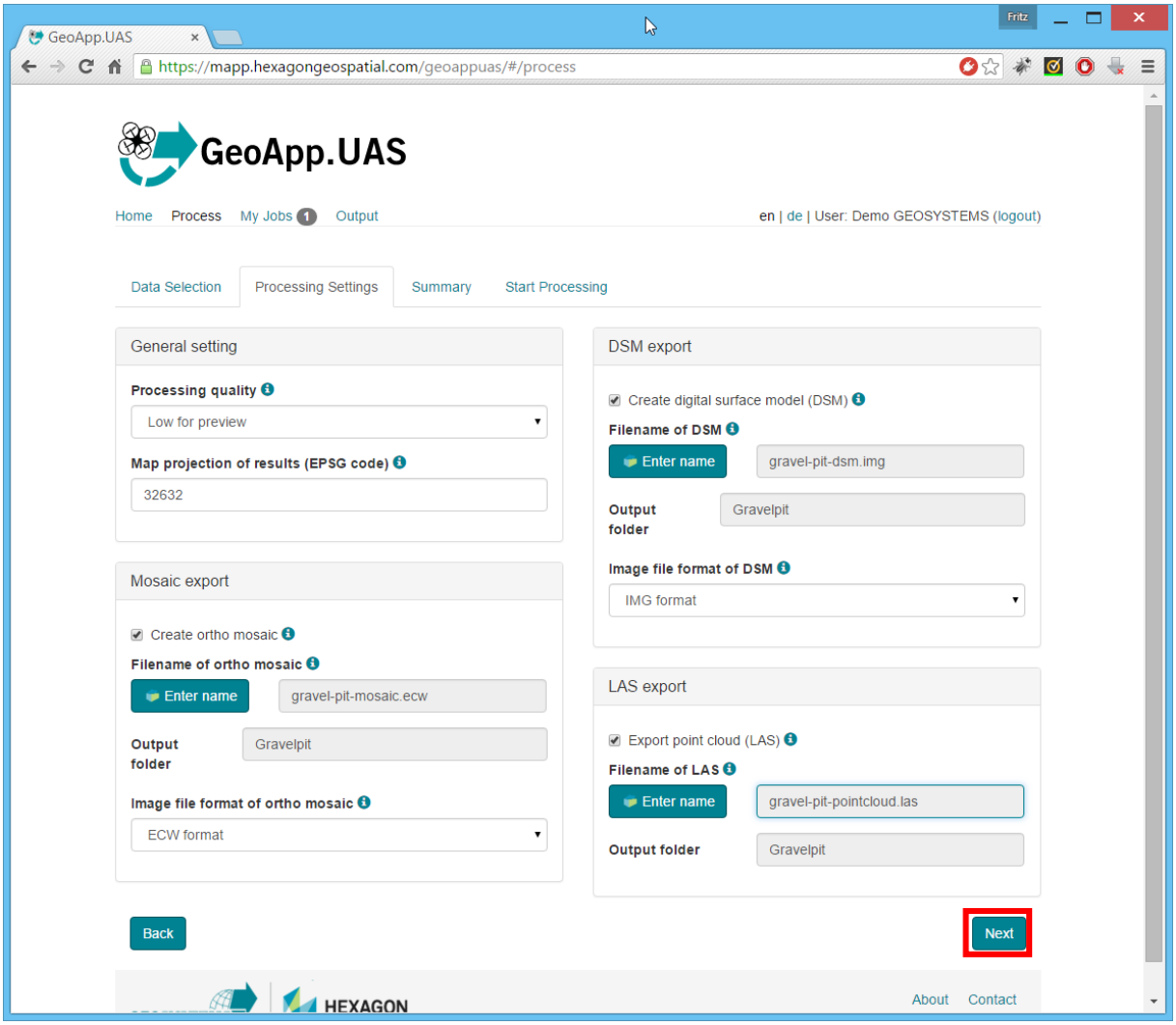
4. Click the **Enter name** button to define the output names for the files that will be created within the workflow.



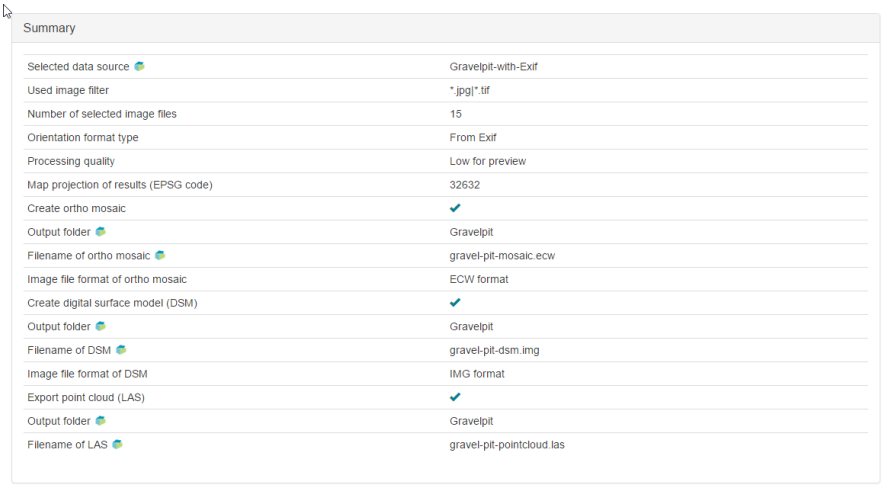
5. You are able to create new folders in your M.App chest environment directly from the following dialog. Click the small “+” sign next to the folder name. Select the output folder by clicking on the folder name. Bold folder icons indicate folders that contain subfolders. Click the bold folder icon to expand the folder.
6. Enter a file name for the output file in the filename field.
7. Select the output format.
8. Accept your choices by clicking the **Use entered name** button.



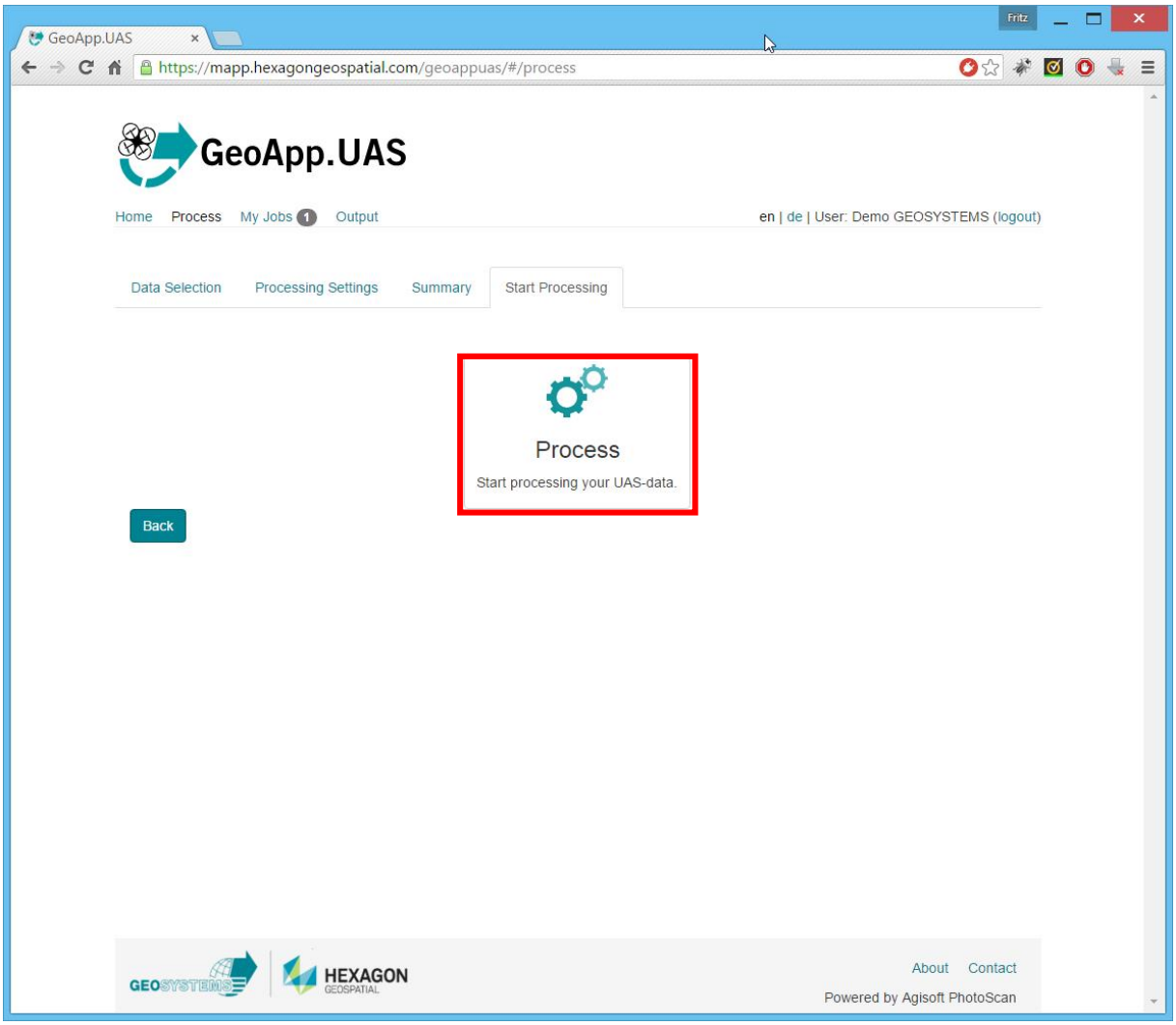
In this example, we have selected to generate mosaic, DSM, and point cloudoutput files.



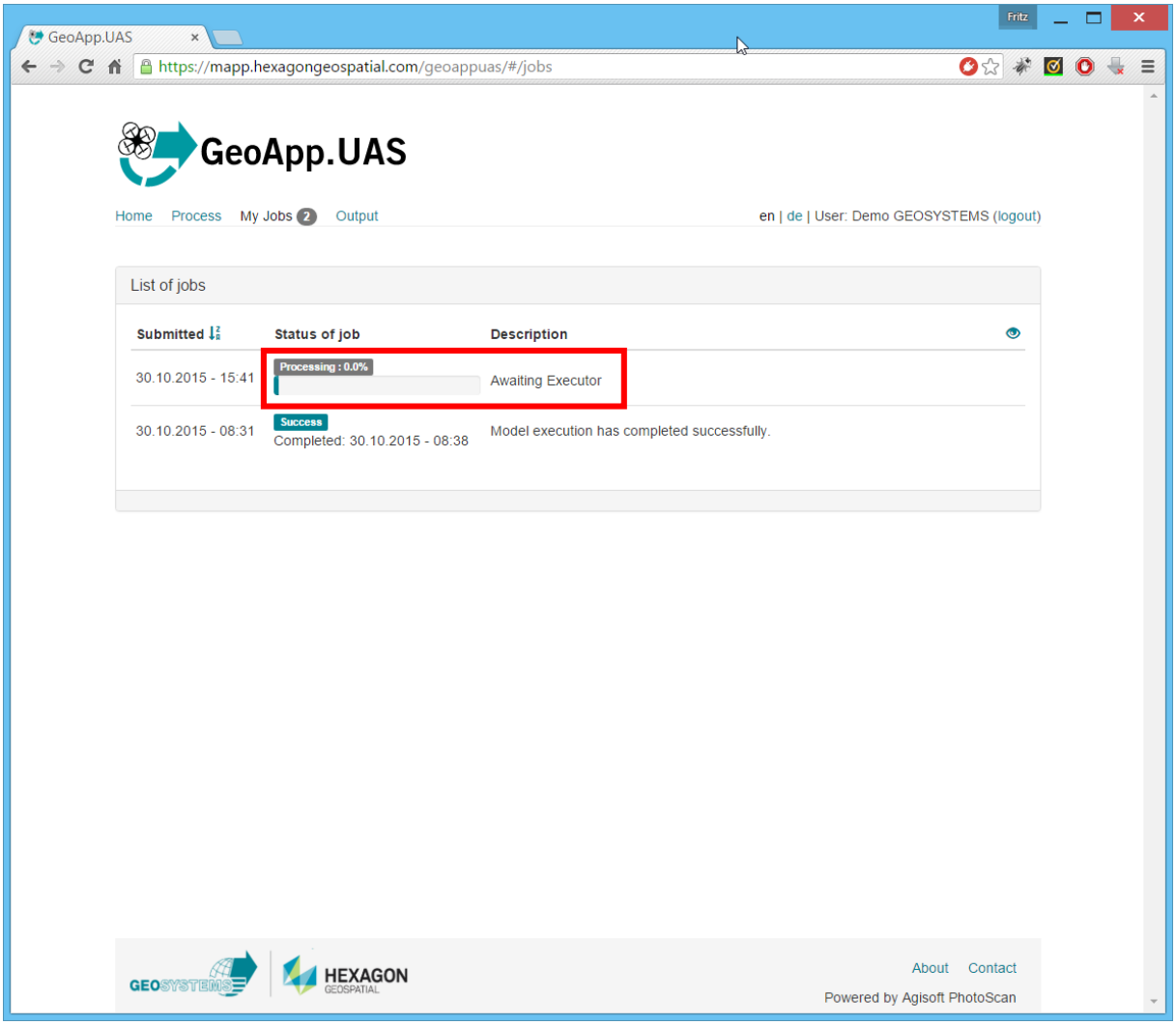
9. Review your settings. Click the **Next** button. Double check your defined processing quality. Are the right amount of images displayed? Did you choose the correct projection, image files, and output formats? If yes, click **Next**. If not, go back and redefine the settings.



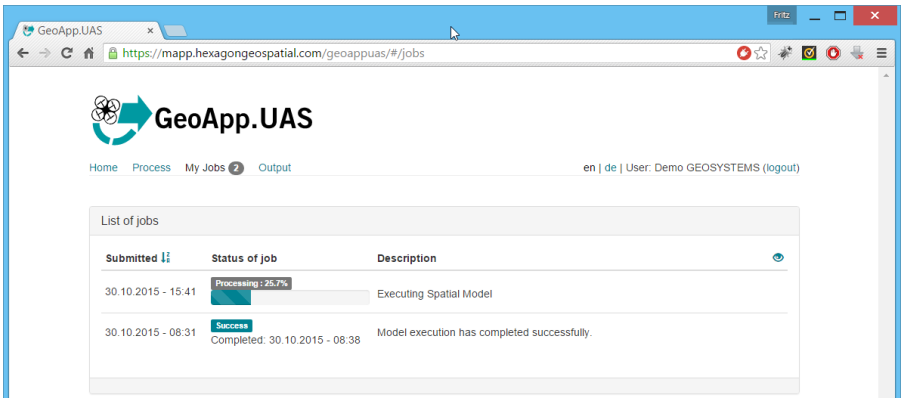
10. Submit the job by clicking the large **Process** button:



The process will start. First, it needs to locate a processing machine (Awaiting Executor). This might take some time. Please be patient.



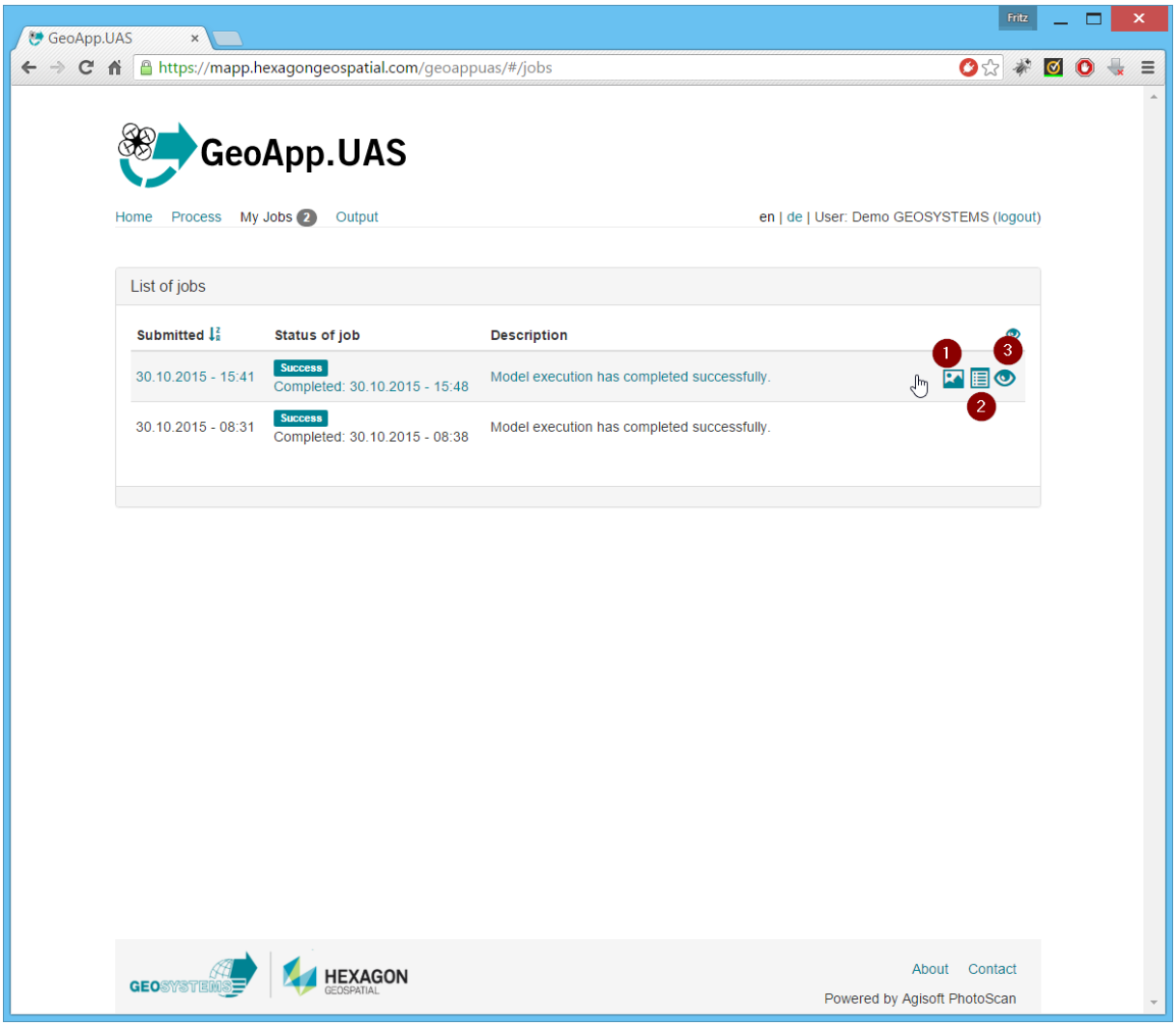
Please be patient. The overall processing time depends on the amount of input datasets, image size, and processing quality. For larger projects, it may take more than 24 hours to finish.



Process is Complete

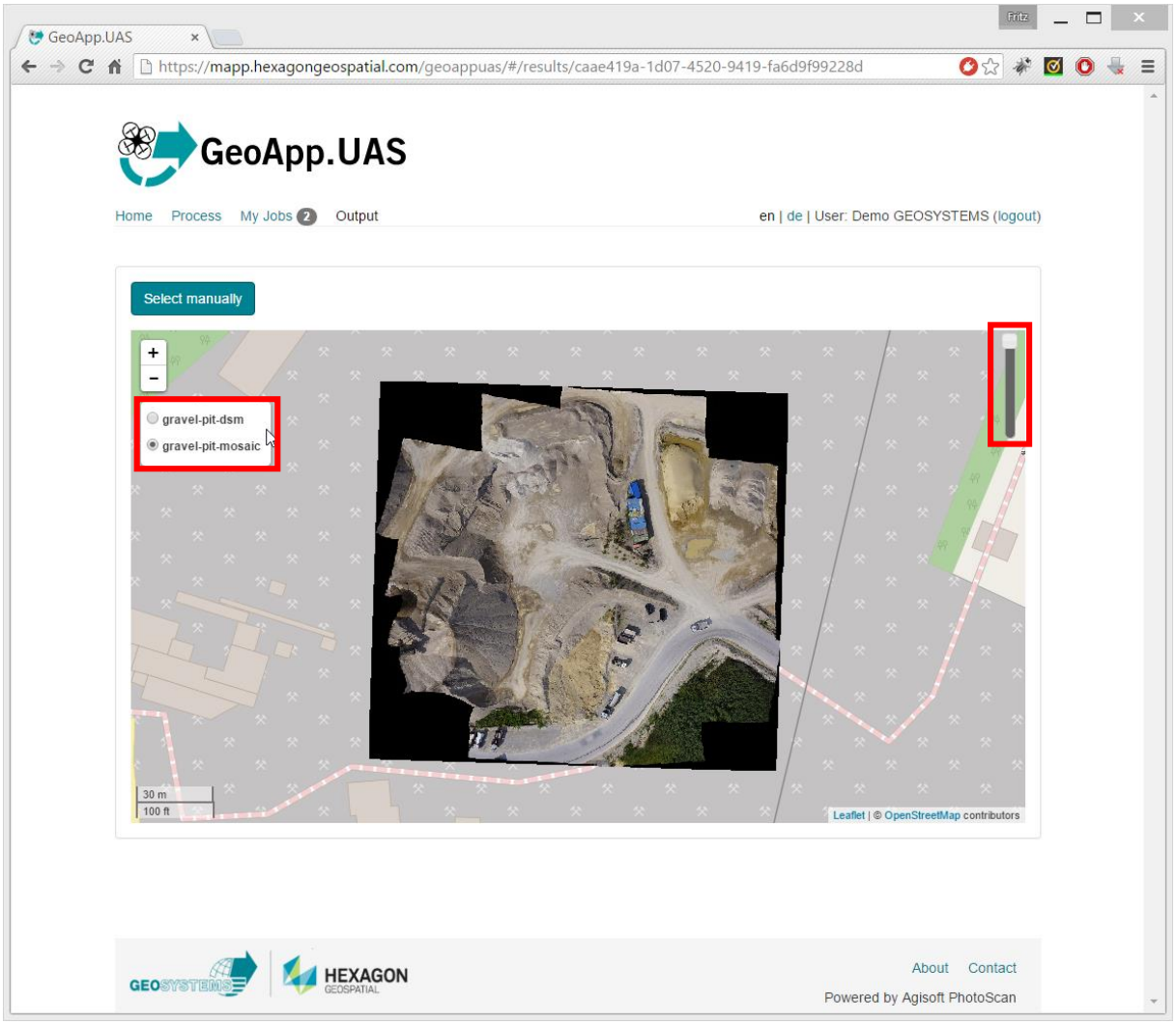
After your process has finished, you are able to use any of the following options:

- Show job results on a base map (1)
- Show the used job parameters (2)
- View the processing log (3)

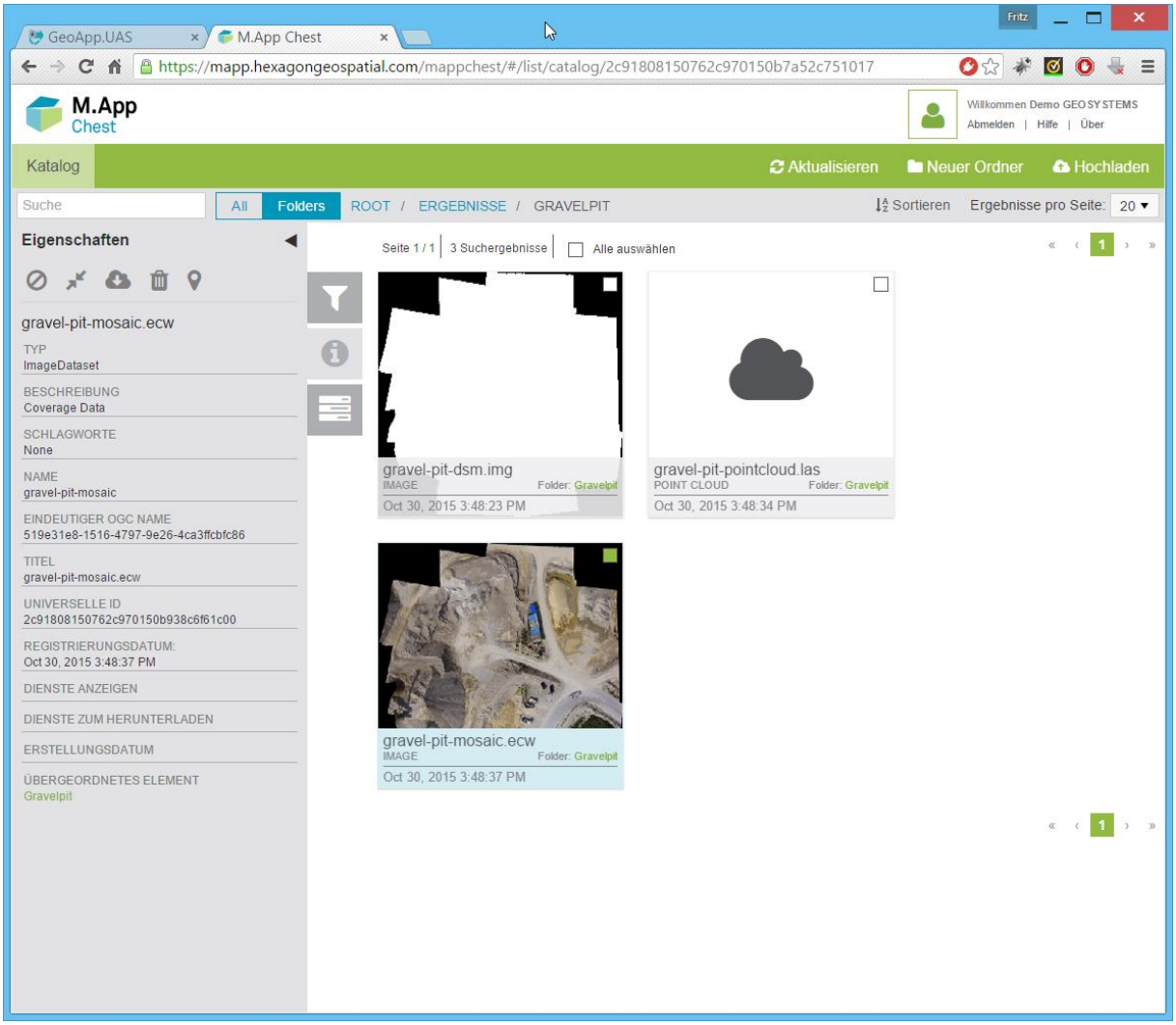


1. Click Show job results on a base map button.

In the map display, the mosaic and/or DSM (depending what outputs you have selected) are displayed on a base map. This allows you to proof your results. You can toggle between both datasets using the layer chooser. You can use the blend tool (slider bar) on the right upper corner of the map. Click and hold the left mouse button to move within the map. Use the scroll wheel to zoom in/out.

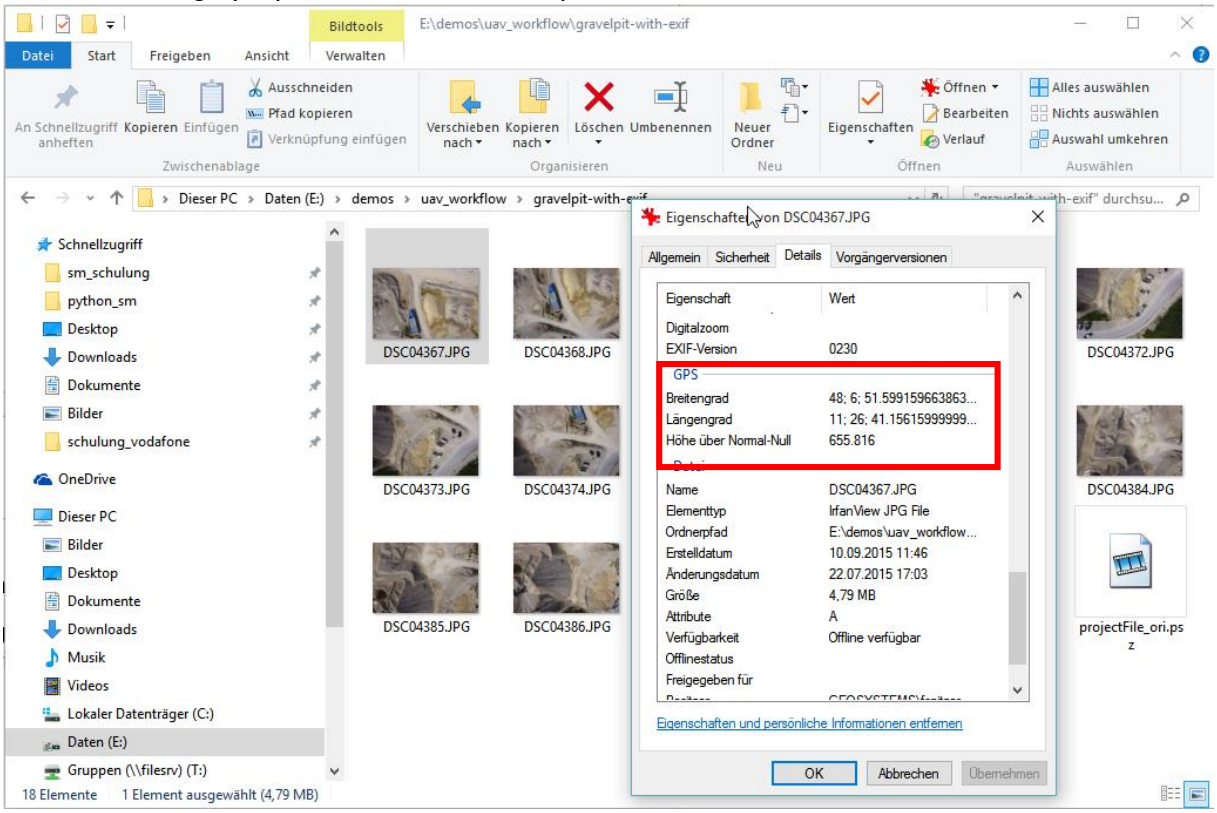


If you want to download your geo products to your local disk, return to your M.App Chest app. Here you are also able to publish the results as WMS/WMTS for direct access using any OGC capable application.



Appendix: Using external orientation information

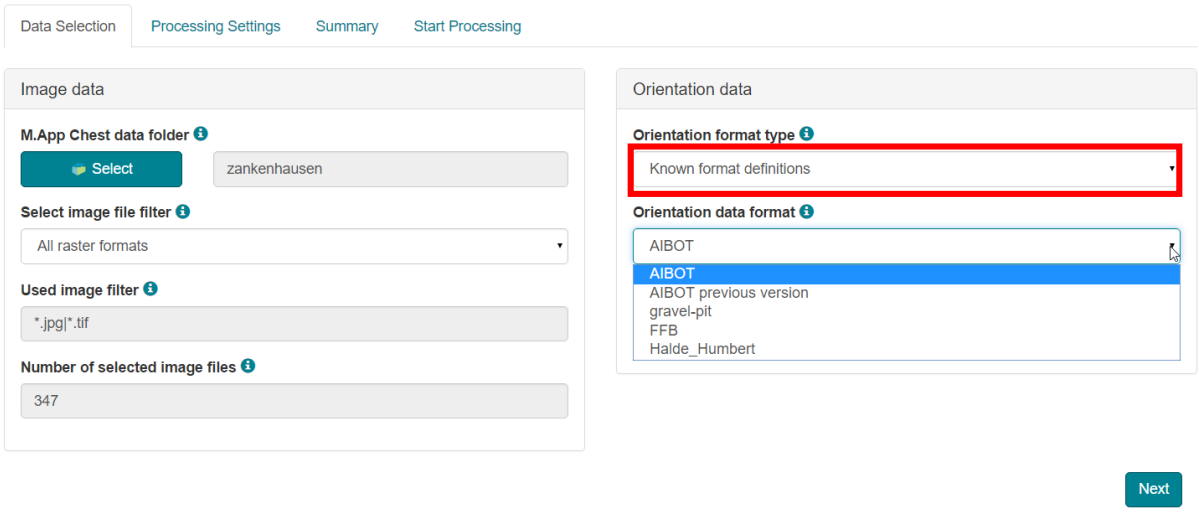
Some UAS-devices provide images that are already geotagged. This means that the images contain the GPS information of the UAS position during image capture in the EXIF header. Check the image properties in Windows explorer:



If you do not find GPS information within the EXIF header, you need to provide another source for the orientation data.

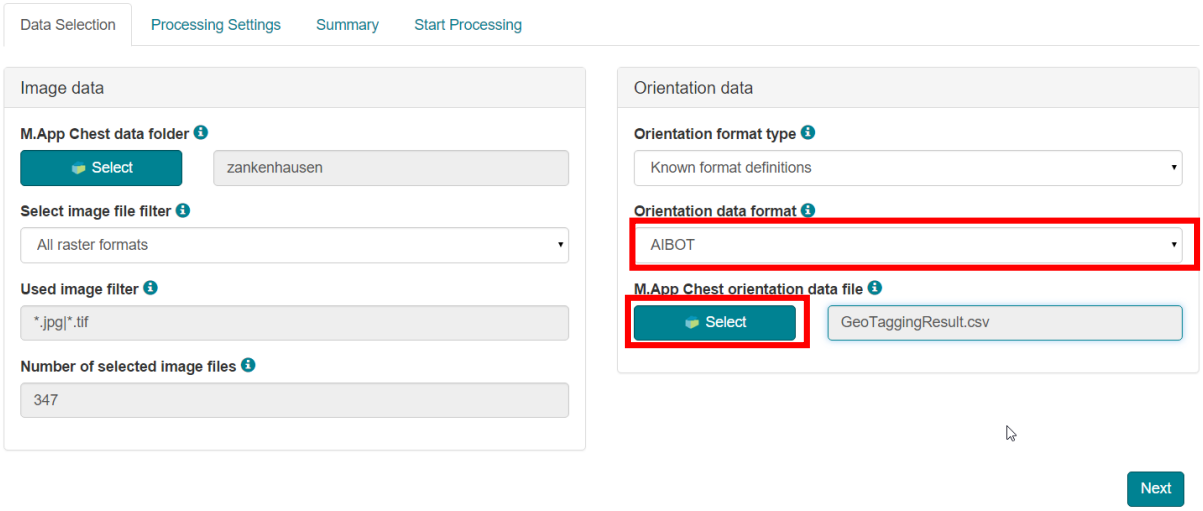
Alternative 1: Using an existing orientation data definition

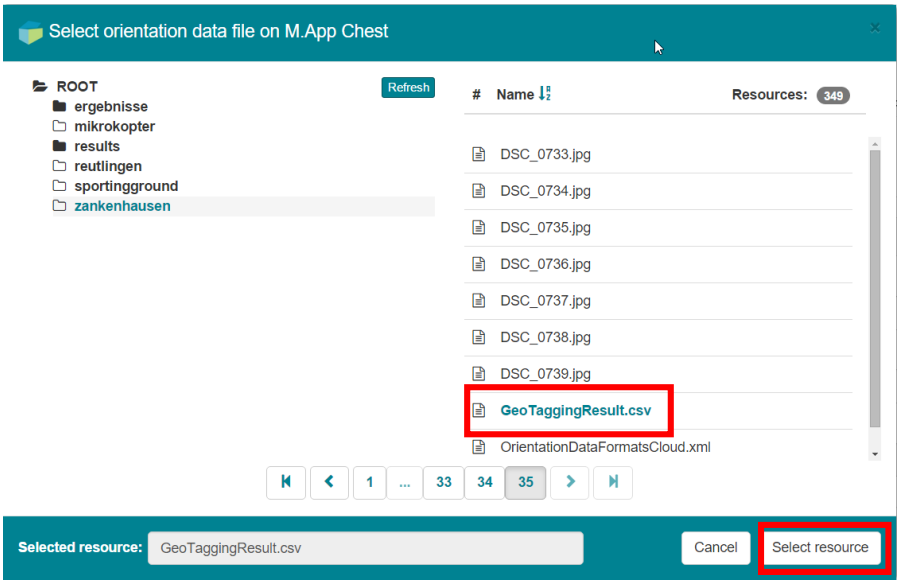
GeoApp.UAS has a number of predefined orientation data definitions:



If you are using the actual version of an Aibot, you can use the corresponding data format definition directly. Select “Known format definitions” in the Data selection tab, then choose

AIBOT from the list. Upload the file with the orientation information into the image directory using M.App Chest. After this step, you can select it by pressing the **Select** button:

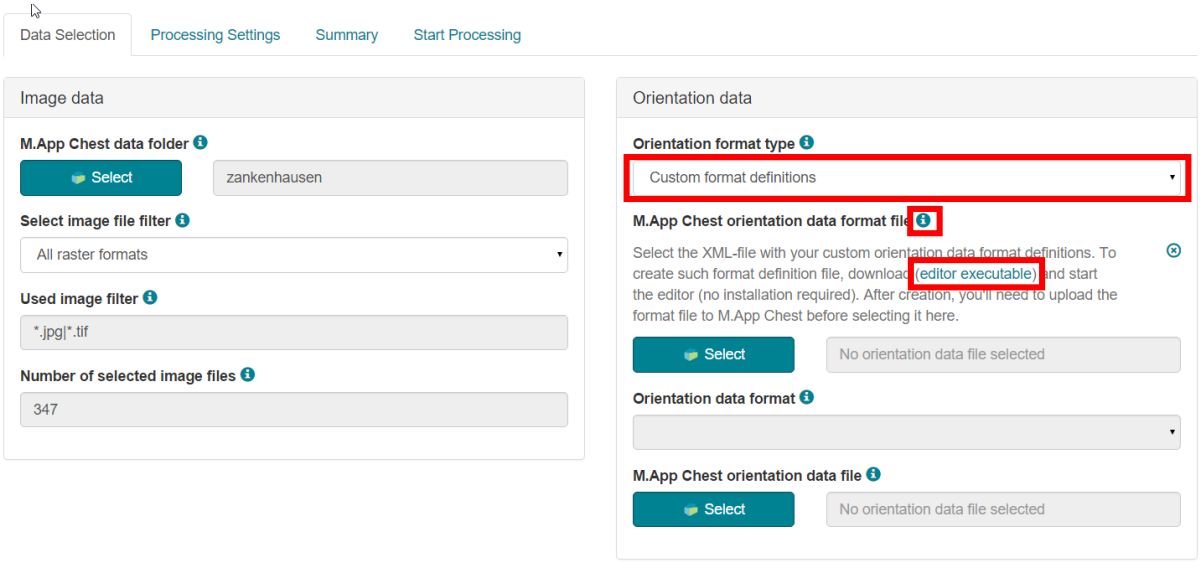




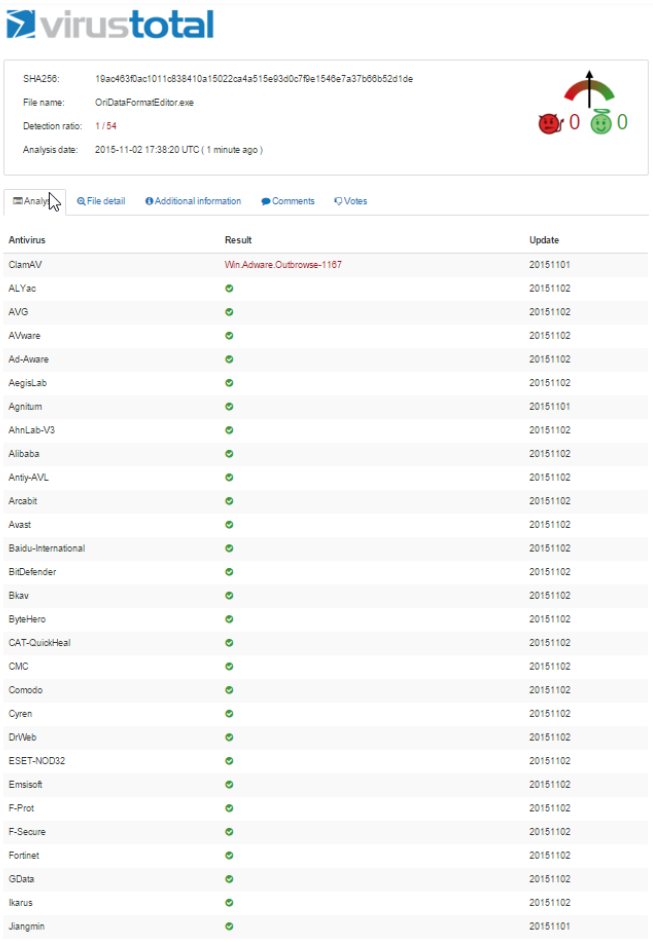
After applying the existing orientation data definition, continue with the steps described in the Processing Step section above.

Alternative 2: Create your own orientation data definition

If your orientation data format does not appear in the list, you can create your own definition. First you must download the **editor executable** application from the download link in the **M.App Chest orientation data format file** description. This entry will become active after selecting the option **Custom format definitions**:

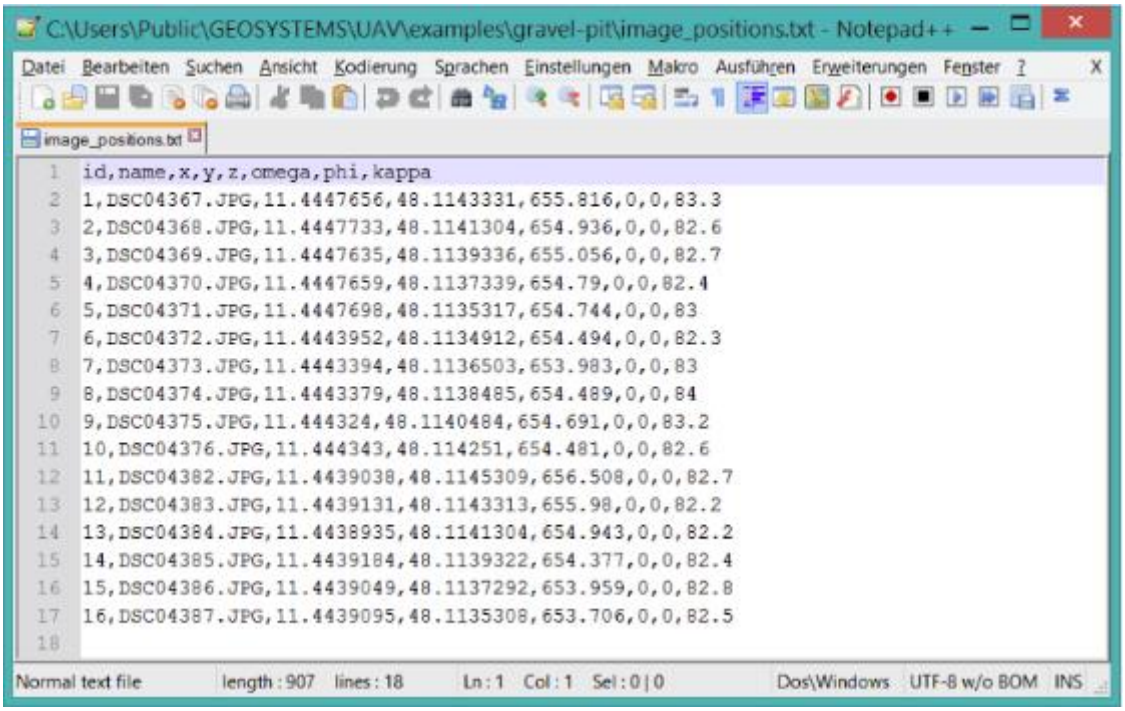


Download and start the application. Ensure that your Virus scanner or the Windows smart screen does not block the access to the executable. It is safe to run.



To use the orientation information stored in a text file, define the structure of your input files:

1. Analyze your orientation file format. To do so, open the data file in any text editor. This is an example:

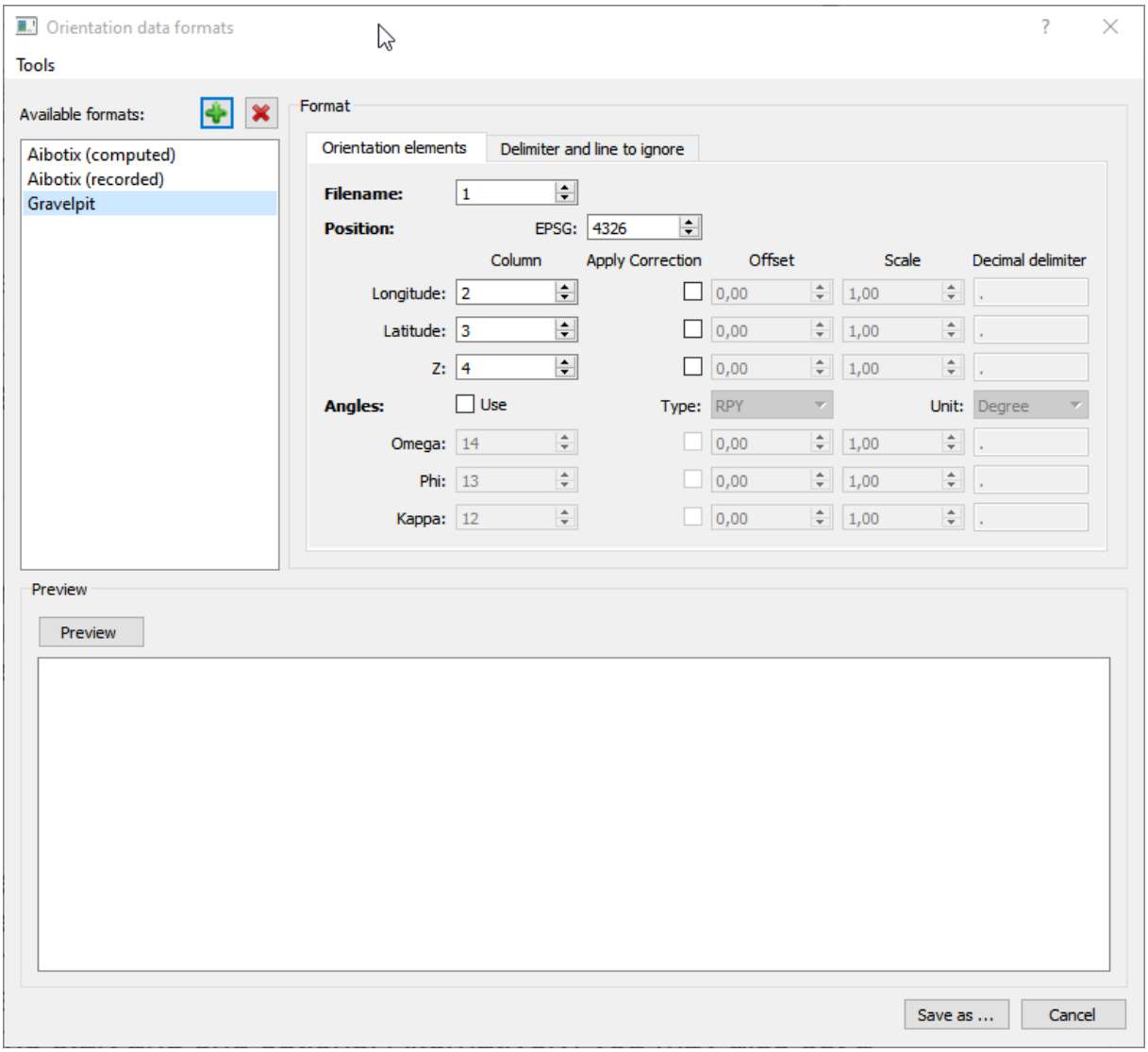


   - This plain text file contains comma separated values.
   - The actual data values start from the second row. The first row is a header that identifies each value.

   Note that the filename (column 2), and the image center coordinates X, Y and Z (column 3, 4 and 5). Since the algorithm used during image orientation is intelligent, you can skip the camera rotation angles (omega, phi, kappa) for most of the cases. In order to project the final results correctly, you must know which coordinate reference system is used. In this case, Lat/Lon values are based on WGS84, and so the EPSG code of the underlying coordinate reference system is 4326.

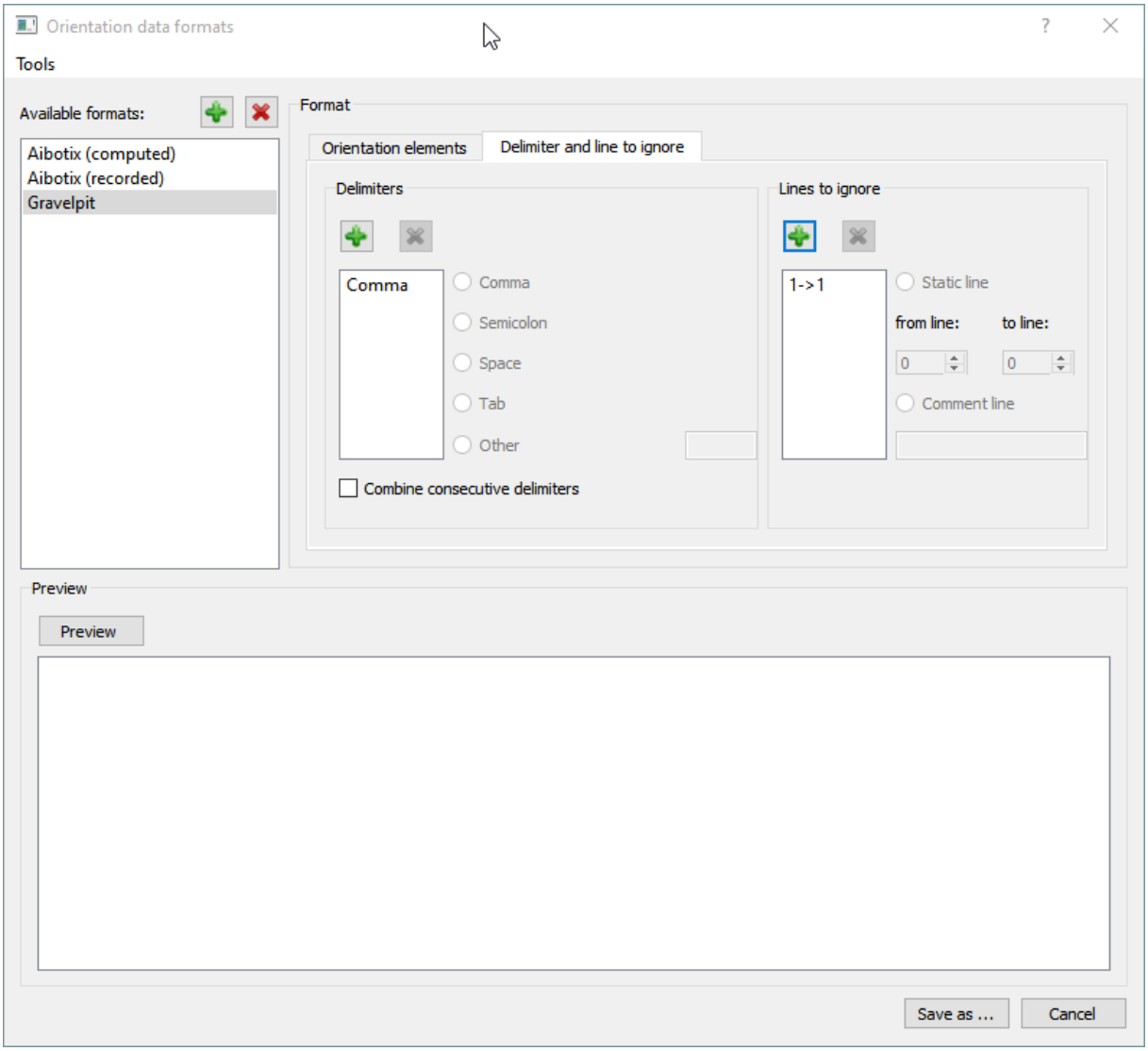
   With all this information you are able to define the orientation format using the **Edit orientation formats** dialog.

2. Use the Orientation editor to create a new format definition in the **Orientation Format Editor** by clicking the “+” icon next to **Available formats**. A new row is added to the formats list. To rename the new entry, double click on it. In this example, the new entry has been renamed to Gravelpit.



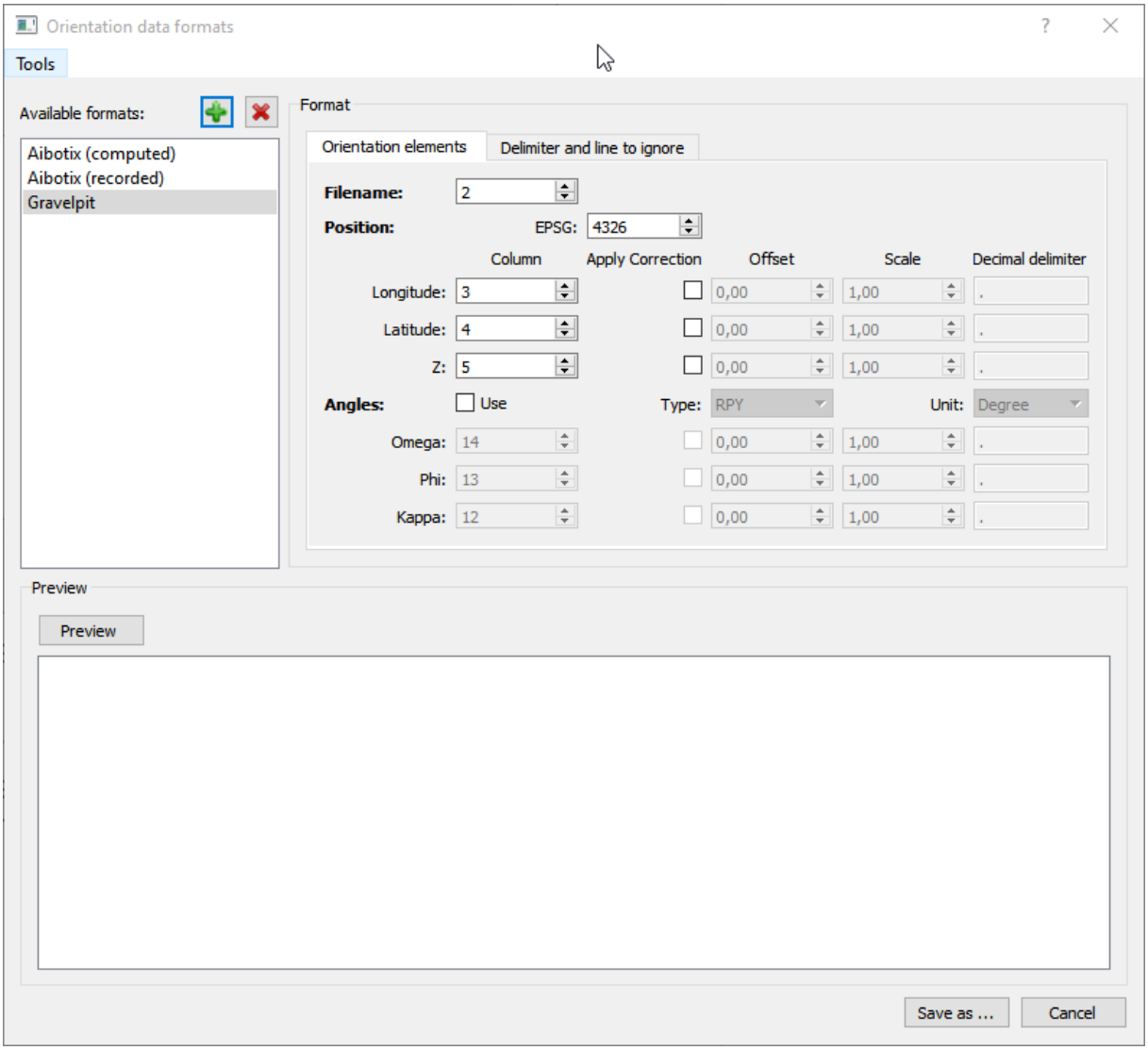
3. Click the **Delimiter and ignore line** tab.
4. Ensure that Comma is selected as column delimiter.
5. You want to ignore the first line, since it contains column descriptions rather than data. To do so, add a new ignore line entry by clicking the “+” icon in the **Lines to ignore** group. This adds a new skip entry starting from 1 and ending with line 1.

Entries can easily be modified. Select the ignore option and modify the start and end options. Alternatively, you can specify a comment character or characters. All lines starting with this character are skipped. You may add any number of skip options. For our example, the settings in **Delimiter and ignore line** tab are as shown:

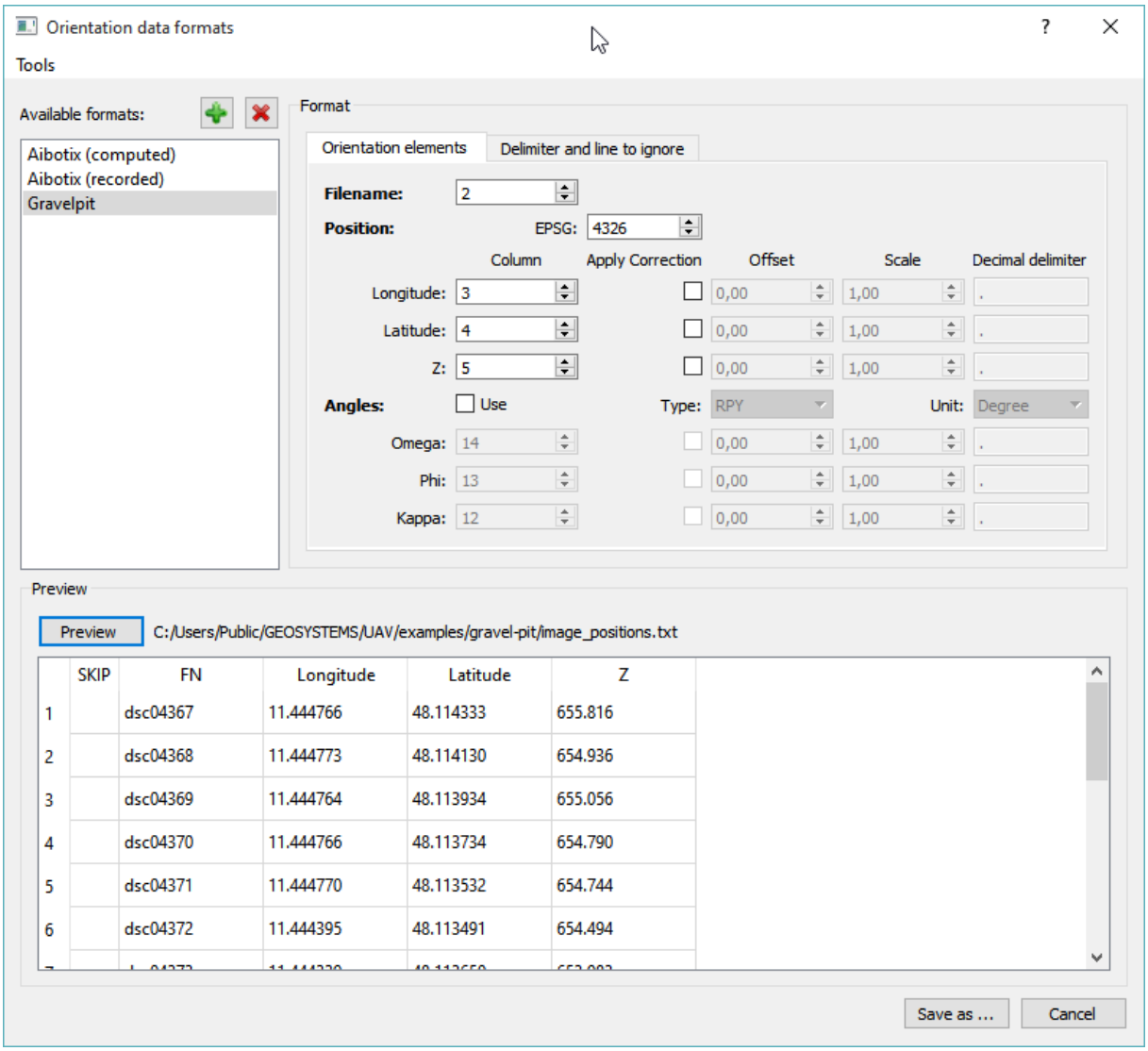


6. Assign the column numbers to the needed processing values and specify the coordinate reference system of the input values.

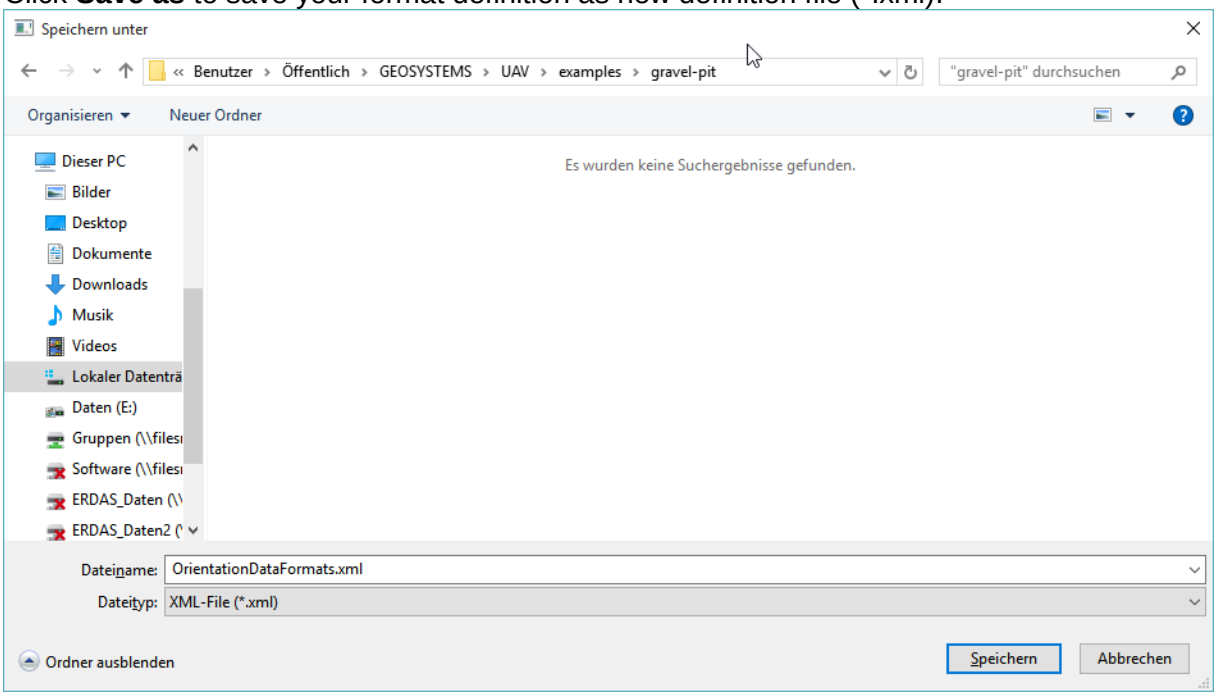
   The image filename is stored in column 2 of the input data. Find the image center coordinates X, Y and Z in column 3, 4 and 5. Since you are not using the rotation angles, keep this option disabled. The EPSG-code of the coordinate reference system is 4326. This creates the following final settings:



7. Use the Preview to check your settings. Click **Preview** and select your orientation data file. It should now be displayed correctly. All columns must contain the correct values:

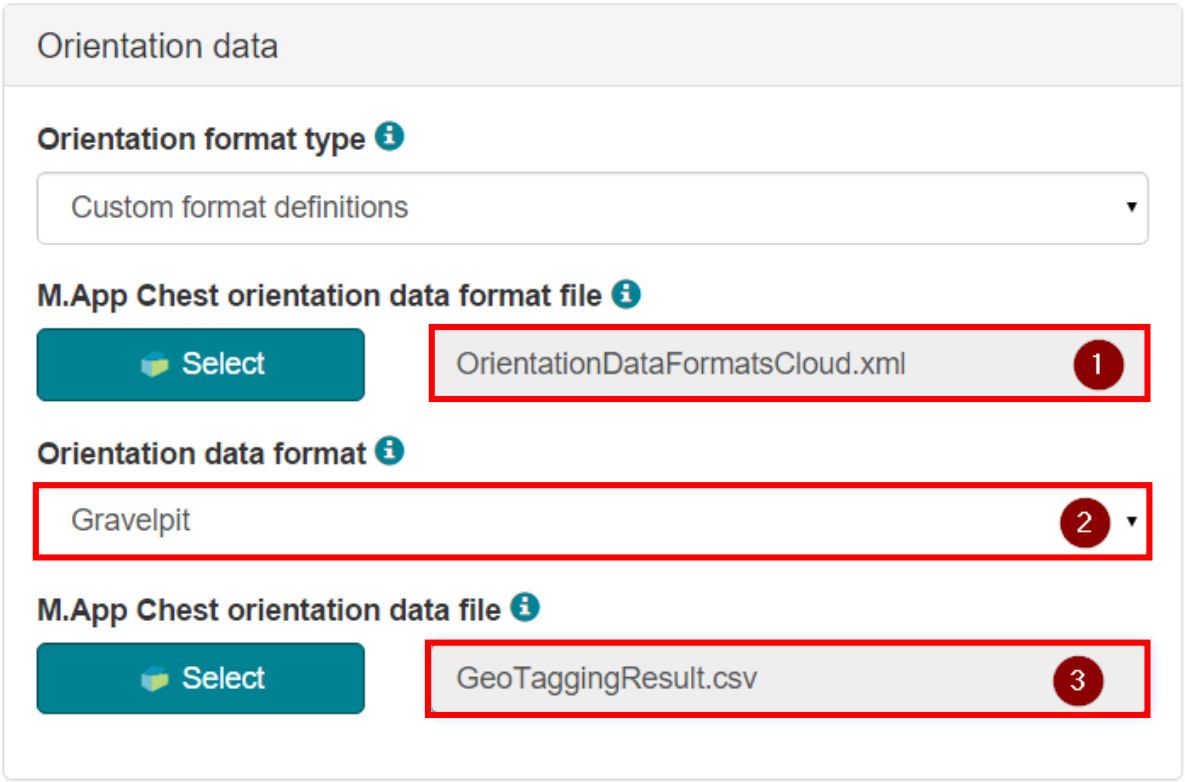


8. Click **Save as** to save your format definition as new definition file (*.xml).



9. Upload your data file and the newly created format definition file into the image folder using the M.App Chest upload functionality.

10. Reference both files (orientation data file and orientation definition file) in the GeoApp.UAS workflow. The orientation definition file (1) fills the list of available orientation data formats (2). Choose your own definition. Now select the uploaded orientation data file (3).

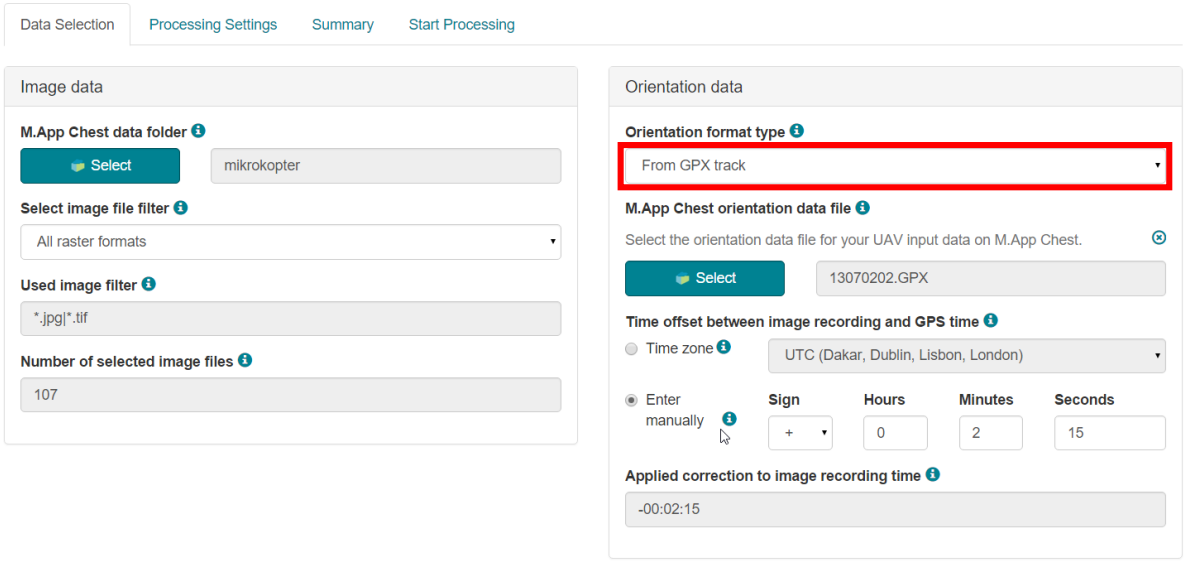


Continue with the steps described in the Processing Step section above.

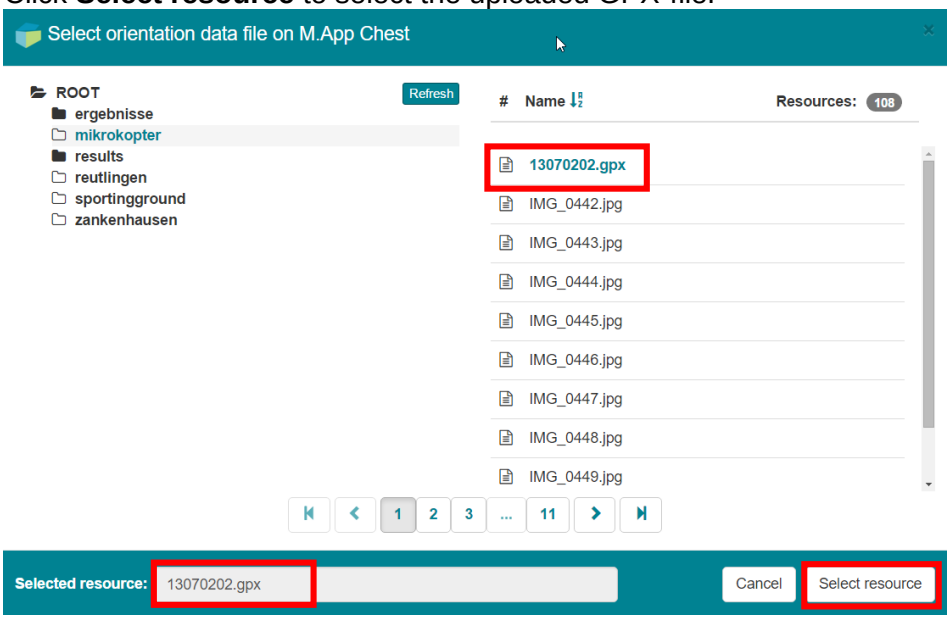
Alternative 3: Using a GPX-track file as orientation source

If you are using a UAS system that records a GPX track file (GPS coordinates with time stamps), you can choose this option.

1. Upload the GPX-track file with M.App chest into the image folder
2. Select From GPX track as the **Orientation format type**.



3. Click **Select resource** to select the uploaded GPX-file.



4. Define a potential time offset between image recording and GPS time. In case of an offset, specify the time difference between the two times. How much later or earlier have the images been recorded with respect to the GPS time? This is necessary to determine the correct position data from the provided GPX file.
5. Select the time zone used when the images were recorded to synchronize your camera time stamp with the GPS recording time. GPS time typically refers to UTC. NOTE: Daylight saving time must be manually applied.

Continue with the steps described in the Processing Step section above.

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