

Preparing raster images

Converting images by ESRI ArcGIS ArcMap or by GDAL software to optimal image file format and colouring for achieving the best performance in the **InterChange** program
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The **InterChange** software supports many different raster formats (BMP, ECW, GIF, IMG, JP2, JPG, PNG, SID, TIF) and there are a couple of them which provide the best performance in the software (3 band images in BMP, IMG, JP2, JPG, SID format, uncompressed TIF, and multi-band IMG; regarding to the **User Manual** of the software, Chapter 3.14. *Useful hints*).

However if you have difficulties with your images, in the first part of this document we provide a step by step description about preparing easily usable image format with *ArcGIS* or *GDAL* software. So, that is not necessary to follow our recommendation, this is just a support to facilitate your work if you need it. These methods are universal, but you can use it mainly for preparing *IMAGE2012* images.

Furthermore if you have difficulties to create optimal colours for your colour composite images (e.g. it contains clouds or larger water surfaces), in the second part of this document we provide step by step description about setting optimal colours for photo-interpretation.

Image format conversion is possible with the free software tool **GDAL** (you can find executables and on-line help starting from <http://www.gdal.org/>).

All methodological steps are also provided in the widely used software tool **ESRI ArcGIS**. These steps have been tested in version 9.3.

Note that after alterations we recommend to check projection parameters of images within InterChange project and correct them if needed!

1. Preparing easy to use image format

This section will explain how to convert image files which can not be displayed properly in InterChange, to the ERDAS IMAGINE (.IMG) format which is optimal for this software.

The recommended methodology will result a 3 band image file (e.g. a 4 band IRS image file will be converted to a 3 band image file:

- original band 3 will be converted to band 1 in new image (displayed with Red),
- original band 4 will be converted to band 2 in new image (displayed with Green),
- original band 2 will be converted to band 3 in new image (displayed with Blue).

For usual CLC interpretation work the use of this 3 band composite image is enough. If you still want to use more than three band images it is possible in InterChange (optimally in ERDAS IMG format), but the use of TIFF image format with more than 3 bands or TIFF image format with 16 bit are currently not supported.

Before you start the modification you have to provide enough storage space on your hard disc for the new images.

1.1. Methodology based on GDAL tools

GDAL tools provide probably the most simple and fast way of image format conversions. You can download executables and on-line help starting from <http://www.gdal.org/> as a ZIP file (tested for windows users). After extracting files to a folder start command window with clicking on **SDKShell.bat**. GDAL commands are to be typed after command prompt. You can find more information of using `gdal_translate` command at http://www.gdal.org/gdal_translate.html.

Example 1

To convert 8 bit BIL format *IRS* image (as provided by ESA for *IMAGE2012* coverage1) to 3 band ERDAS IMG format type in the following command:

```
C:\GDAL> gdal_translate {input IRS imagefile name with path} {output image filename with path}
-of HFA -b 3 -b 4 -b 2 -stats
```

Example 2

To convert 16 bit BIL format *RapidEye* image (as provided by ESA for *IMAGE2012* coverage2) to 8 bit 3 band ERDAS IMG format type in the following command. Note that 16 bit ERDAS *IMAGINE* images may be used in InterChange as well. If you want to keep 16 bit bandwidth, delete the `-ot Byte -scale` parameters from command.

```
C:\GDAL> gdal_translate {input IRS imagefile name with path} {output image filename with path}
-ot Byte -scale -of HFA -b 5 -b 3 -b 2 -stats
```

1.2. Methodology based on ArcGIS

1. Start **ESRI ArcGIS ArcMap** software (e.g. 9.3 version with ArcInfo license).
2. Use the **File–Add Data...** command to open the original EO images in the software. One time many images can be loaded, using the **Shift** or **Ctrl** keys.
3. **Right click** on the image name and from the pop-up menu choose the **Properties...** command.
4. In the **Layer Properties** window select *Symbology* tab.
5. In the *Show* frame select the *RGB Composite* option.
6. Set the appropriate band combination. We recommend the following for SPOT and IRS images: RGB – 3,4,2; and for RapidEye images: RGB – 5,3,2.
7. Press *Apply* and after the *OK* button on the lower right corner of the window.
8. **Right click** on the image name and from the pop-up menu choose the **Data–Export Data...** command.
9. In the **Export Raster Data** window:
 - In the *Extent* frame choose the *Raster Dataset (Original)* option.
 - In the *Spatial Reference* frame choose the *Raster Dataset (Original)* option.
 - In the *Output Raster* frame:
 - Check the *Use Renderer* option, but take care to uncheck *Force RGB* option if you do not want to lose original pixel values.
 - Define the *Location* and the *Name* of the new image.
 - From the *Format* option we suggest to choose the *IMAGINE* Image format type.
 - From the *Compression Type* choose the *NONE* option.
 - Check *Cell size (cx, cy)* whether these are in agreement with original cell size (a rounding error may appear). Change cell size if necessary.
 - Finally save the image.

2. Setting optimal colours for interpretation

InterChange software calculates always its own band statistics from the entire image area (excluding nodata and zero values) and applies a standard deviations contrast stretch with 2 sigma parameter. In an average case this method results optimal colours for interpretation. However if the image contains large homogeneous areas with extreme low or high pixel values (typically water surfaces, snow or clouds), the values of these pixels will significantly bias band statistics, and the consequence is that displayed colours for usual landscape features will be over or under saturated, practically useless for interpretation.

Since the optimal colouring is rather hard to derive from original histograms (biased with extreme low or extreme high pixel values), the recommended solution is to calculate image statistics for areas for a subset of an image which does not contain biasing pixel values. In the practice it is recommended to exclude cloud or snow covered areas, cloud shadows and large (dominating) water surfaces from the calculation of image statistics.

1. Start **ESRI ArcGIS ArcMap** software.
2. Use the **File–Add Data...** command to open the original EO image.

3. Once the multispectral (minimum 3 bands) image appears in the software, and it contains clouds or larger water surfaces first zoom to the largest area which does not contain homogeneous unwanted features. This is necessary for setting the optimal colouring.
4. **Right click** on the image name and from the pop-up menu choose the **Properties...** command.
5. In the **Layer Properties** window select *Symbology* tab and set the colour composition used for interpretation.
6. In *Stretch* frame set *Type* to *Standard deviations* and *n* to 2.
7. In *Stretch/Statistics* frame select the *From Current Display Extent* option.
8. Press the OK button.
9. Now you can move the image, zoom in and out, try to find the optimal colours by changing the image extent. Once you are satisfied with the image colours, you would like to see the same colours when opening the image in InterChange.

Now you have two options:

- You may export the image containing the optimized view to an additional image file. To do this right click on the image name, and from the popup menu choose the **Data / Export Data...** command. Set all parameters as described in part 1.2. point 9. when converting image format to ERDAS IMG, except that you have to check *Force RGB* option. Disadvantage of this method is, that you need extra disk capacity to store an image which is optimized for interpretation only and does not contain all possible information available in original image.
- You save an additional XML file only per image containing information about band statistics of the image subset. The advantage is that you keep original pixel values in the image and the extra storage space required by the XML file is minimal.
 - **Right click** again on the image name and from the popup menu choose the **Properties...** command.
 - In the **Layer Properties** window select *Symbology* tab, and in *Stretch/Statistics* frame select the *From Current Display Extent* option again (this way the *Apply* button will be active), and click *Apply* button,
 - As you will see *Statistics used for current display* data will change to actual values. Now click *Save as XML* button and save statistics to an XML file. We recommend to store this XML file in the same folder as the image file is, using the filename:
{raster image filename without extension} . **stat.xml**
 - Use this XML file in **InterChange** software as described in **User Manual** chapter 8.8.

Unfortunately the method described above will not lead to optimal results in all cases, and possibility extra steps are needed. This will happen if at least one of band maximum values for an image file is not equal with band maximum of the image subset you have chosen to derive image statistics. All you have to do is to read original band maximum values for the full image area and type in these values into the XML file, substituting band maximum values saved in step 9. For editing XML file you may use any text editor, but we recommend a free XML editor, e.g. **XML Notepad 2007** (<http://www.microsoft.com/en-us/download/details.aspx?id=7973>)

Original band maximum values may be read in ArcGIS **Layer Properties** window selecting *Source* tab and scrolling down to band statistics.