Sentinel-5p import Toolbox

Important comments and credits

This toolbox is based on the work by Magdalena Halbgewachs at Esri Germany. She has written R-scripts for automated Download and processing (conversion, projection, clipping) of NitrogenDioxide Sentinel 5p datasets. Her work is making use of two github R packages:

- https://github.com/16EAGLE/getSpatialData
- https://github.com/MBalthasar/S5Processor

which I also use in the download/conversion routines. Thanks to all of them for the work and support. Compared to Magdalenas R-Scripts I made some modifications:

- Allow not only NO2 but also other substances
- Do not auto-accumulate data to "mean-per day"
- Do not offer a "5-day mean" as part of the routines (reasoning see tools below)

Similar to Magdalenas Scripts, there are some specific requirements to be met:

Install requirements and dependencies

To be able to use the tools, you need to have

- ArcGIS Pro (2.5 or later)
- R itself (version 3.5 or later) and a working version of the ArcGIS Pro R-bridge installed
- The additional R-packages mentioned above installed
  (R and dependencies can be tricky to set up. Best do the check in R itself)
- A working account for the Sentinel Hub

Known limitations to the tools

As it is/was easiest to use shapefiles as Clip/Bounding geometries, this is the only supported Feature-Type for the clipping option. If anyone finds the time to also implement GDB-Feature classes – please contribute. Would be helpful.

No-Test no warranty warning

While Magdalenas usecase (Nitrogen Dioxide) has been tested/used by her, the additions I made, opening it up for other S5P products, has not been tested for consistency by me. There are conversion flags in the s5Processor function that are used yet not verified. Please do this yourself in case you use it. The same applies to the spatial resampling in the conversion function.

THIS TOOLBOX IS PROVIDED AS IS, as a (hopefully) working example of how to combine ArcGIS, R, Python to ease retrieval and maintenance of Sentinel 5P data in ArcGIS. We do provide no support, no maintenance and take no liability! Source code is provided. Comments/contributions welcome!

About the 3 tools

There is rudimentary help in the metadata of the tools – the essentials following here to be aware of it before you start. More details in the tools descriptions when you open them

General: You can streamline some of the tools for you by opening the properties and setting defaults (like your credentials and some paths).

Step1: Download Sentinel-5P from Hub

1: As mentioned above, it is mandatory in the current stage of development to use a SHAPEFILE as the AOI used to find suitable images

2: Both dates are really dates, not date-time or time. So when you open the dialog, select DATE or in scripting use the syntax 'month/day/year' like in this screenshot

3: You have to have an account working with the Sentinel Hub/SCI Hub. This is where you enter your credentials for this

4: The tools used (better: the r-library called) will always create an additional sub-directory called "Sentinel-5P" in the Directory you specify. This is important if you chain the Download with the second tool, the conversion, as the input folder to the conversion needs to take this into account.

The code of the Tool also contains lines (commented out) to check/install needed packages. These can be used on 1st run to install dependencies. But again: I recommend doing in R before starting.

Step 2: Convert NC files to GTIFF

This tool IS NOT a general NC-2-TIFF converter – but rather a very specific version that will work with the downloads made in step 1. This is mainly because the naming convention of the NC files downloaded is essential for the tool and it uses a converter ONLY meant to be used with these Sentinel-5P NC files.

1: This filed only exposes if you check the Projection checkbox

2: This field only exposes if you check the Clip checkbox. Like the download tool, currently the only supported clipping-geometry is SHAPEFILE

3: If you clip, you can add a buffer distance around your clipping geometry. Recommended is at least once the chosen target resolution (see below) to avoid gaps close to the boundary.

4: The r-library used offers only these resolutions

5: If you check "New Files only", and the Output GTiff folder does already contain result files from previous runs, a comparison will be made and only new files (NetCDFs that have no TIF representation in the output folder yet) will be processed. So if you have TIFFS you want to reprocess, you have to delete them first when using this flag.

Step 3: Create or update Mosaic from GTIFFs

This tool has been created to best support the capabilities of ArcGIS Pro (2.5 and later) for multi-temporal and multidimensional data. Especially when using the option to built the Multidimensional info (4), the pre-requisites for very flexible and powerful aggregation/trending/analysis using ArcGIS Pro Standard features are met.


1: This is just a text fields as it can be an existing or new Mosaic. Code-improvements welcome 😊

2: If you have specified an existing MosaicDataset above, this will not be used at all. Only if a new MD is created, this will be used

3: If n Step 2 you are using the option to write new Tiffs to an existing results folder, you can specify that folder here even if some of the content in this folder is already ingested in the existing Mosaic: The reason being: For a new Mosaic the tool will ingest all images, for an existing Mosaic the Add Rasters routine called will exclude duplicates.

4: This tool will try to build meaningful multidimensional information (even for more than one variable), but more than one variable does only make sense, if the dimension (which is Time!) of the variables does match. If you successfully build Multidimensional information, you can then do the aggregation (for days, weeks, months, ..) with the Multidimensional toolbar in ArcGIS Pro:
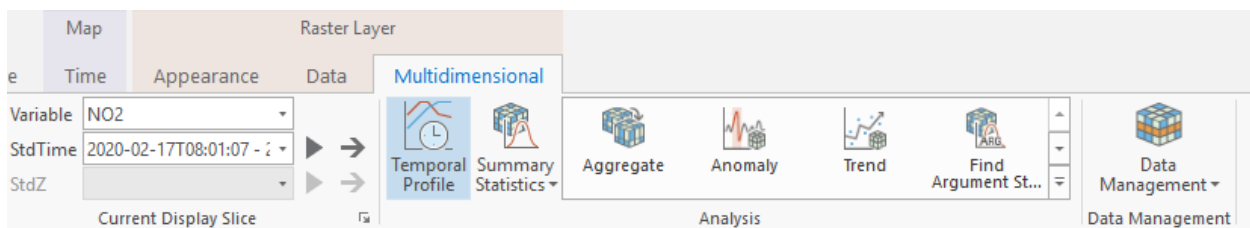
And THAT'S the reasoning why this aggregation, that Magdalenas script will do for you, will not be done by this toolbox.