GROUND SITE OVERPASS TOOL – FILE TRANSFER DOCUMENT

1. INTRODUCTION

This is the File Transfer Document for the GroundSitePass executable program that calculates the time when a given instrument swath passes over a ground site or set of ground sites.

1.1 Change History

Issue	Change Description
1.0	First Issue
1.1	Internal release
1.2	Update *mission_configuration_files* folder to v1.4 GroundSitePass generates HTML output files
1.3	Update *mission_configuration_files* folder to v1.14 Added swath color to input configuration file Added topocentric satellite azimuth and elevation to output files KML: Draw circle of given radius, Draw balloon for 1-point swaths CSV, HTML: move Asc/Desc column next to Pass counter

1.2 Distribution List

Project/Unit	Name	Project/Unit	Name	Project/Unit	Name

1.3 Reference Documents

[RD 01] Earth Observation Mission Software File Format Specification
Ref. PE-ID-ESA-GS-584-1.1 - Issue 1.1- 21/03/17

[RD 02] OGC® KML Standard
Ref. OGC 12-007r2 - Version: 2.3.0 - Date: 2015-08-04

2. ARCHIVE CONTENT

Separate archive files are available, to support execution in Linux, Mac OS X and Windows platforms.

2.1 Linux 64-bit

The following archive file has been delivered (compressed with the zip utility):
GroundSitePass_LINUX64_v1_3_date_27_DEC_2019.zip

The archive has the following MD5 checksum:
9606d4270a297fe2c3671e6e4e08908a

The archive contains the following files:

```
GROUND_SITES_EXAMPLE_ZONEDBFILE.EOF
GroundSitePass
input_config_file.txt
mission_configuration_files/…
overpass_table.css
Readme.txt
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.CSV
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.HTML
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.KML
```

2.2 Mac OS X 64-bit

The following archive file has been delivered (compressed with the zip utility):
GroundSitePass_MACIN64_v1_3_date_27_DEC_2019.zip

The archive has the following MD5 checksum:
81acbd0256ab680806b663f735be422a

The archive contains the following files:

```
GROUND_SITES_EXAMPLE_ZONEDBFILE.EOF
GroundSitePass
input_config_file.txt
mission_configuration_files/…
overpass_table.css
Readme.txt
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.CSV
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.HTML
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.KML
```

2.3 Windows 32-bit

The following archive file has been delivered (compressed with the zip utility):
GroundSitePass_WINDOWS32_v1_3_date_27_DEC_2019.zip

The archive has the following MD5 checksum:
fad60012fbcbe133abe594df2c8285f4

The archive contains the following files:

```
GROUND_SITES_EXAMPLE_ZONEDBFILE.EOF
GroundSitePass.exe
input_config_file.txt
mission_configuration_files/…
overpass_table.css
pthreadVC2.dll
Readme.txt
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.CSV
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.HTML
S5P_TROPOMI_VISIBILITY_SEGMENTS_20180301_000000_20180303_000000_0001.KML
```

3. ARCHIVE CONTENT DESCRIPTION

The files contained in the archives are described in table below:

File		Description
GROUND_SITES_EXAMPLE_ZONEDBFILE.EOF		Example Zone Database File
input_config_file.txt		Example configuration file of SENTINEL5P with TROPOMI swath, with example zone database file
mission_configuration_files/…		Default input orbit files and swath files
Readme.txt		Readme file with example commands and input/output file description
overpass_table.css		CSS stylesheet file for HTML output
For LINUX 64-bit	GroundSitePass	Executable file for Linux
For MAC OS X 64-bit	GroundSitePass	Executable file for Mac OS X
For WINDOWS 32-bit	GroundSitePass.exe	Executable file for Windows
	pthreadVC2.dll	Auxiliary pthread library for Windows

4. INSTALLATION

The archive can be expanded with Winzip / 7-zip (in MS Windows) or with the command unzip (in Linux/Mac OS).

5. USAGE

5.1 Executable program *GroundSitePass*

For a requested UTC time interval, the executable program *GroundSitePass* calculates the UTC times when a given orbit ground-track or instrument swath passes over a given ground site (or set of ground sites).

The program expects as input a configuration file setting the various input parameters, among them the mission name, orbit file, swath file, zone database file and instrument swath name.

A ground site is defined as an EOCFI point with a single point (geocentric longitude, geodetic latitude) and a given circle diameter. For point-like zones, the circle diameter is set to 0 m, otherwise it is a circular zone. In this case, the time of overpass will be half way between entry and exit time of the circular zone. Being able to define a circle centered on the site is useful to determine ground-track overpass.

The default orbit and swath characteristics are defined in the mission configuration files folder. It is possible to provide as orbit file other types of EOCFI-compatible OSV-based orbit files (see [RD 01]), e.g. Predicted Orbit File (ORBPRE file type) or Restituted Orbit Files (ORBRES file type).

The maximum distance to ground-track and the minimum Sun Elevation angles (parameters in the input configuration file) are used to discard passes not verifying the constraints.

For editing the Zone Database File, it is recommended to use an XML editor or source code editor (e.g Atom, Notepad ++, Xcode). Rich format editors (e.g. Word, TextEdit) may introduce characters that are not supported.

The program generates a set of output files with the overpass tables per zone (in .CSV, .KML format and .HTML format).

5.1.1 Command line input parameters description

The command line parameters of the executable routine are the following (provided in the order in which they have to be supplied):

INPUT PARAMETERS	Definition	Value
Input Configuration File	Filename (it may include the path to the file)	Given by the user
UTC Start Time	UTC start time of the time interval CCSDS-A ASCII format with seconds (YYYY-MM-DDTHH:mm:ss)	Given by the user
UTC Stop Time	UTC stop time of the time interval CCSDS-A ASCII format with seconds (YYYY-MM-DDTHH:mm:ss)	Given by the user

5.1.2 Input configuration file format description

The contents of the input configuration file are detailed below:

INPUT	Definition	Value

PARAMETERS		
Satellite	Satellite identifier	AEOLUS CRYOSAT2 EARTHCARE FLEX METOPSG SEOSAT SENTINEL1A SENTINEL1B SENTINEL2A SENTINEL3A SENTINEL3B SENTINEL5P SENTINEL6 SEOSAT SMOS GENERIC (see Section 5.2)
Orbit Filename	Orbit Filename Default: Orbit Scenario Filename in mission_configuration_files OSF or POF folders	Given by the user
Swath Filename	Orbit Filename Default: Swath Definition Filename in mission_configuration_files SDF folders	Given by the user
Zone Database Filename	File with list of zones, in EO CFI / Esov NG Zone Database format (see [RD 01])	Given by the user
Instrument Swath	Instrument swath name	String given by the user, based on Swath Definition Files available
Maximum Ground-track Distance	Maximum Distance between the ground site and the ground-track (in kilometers)	Set by default to 3000.0 km (bigger than half swath width i.e. no constraint applied, full swath used)
Minimum Sun Elevation	Minimum Sun Elevation Angle at the ground point (in degrees)	Set by default to 0.0 (i.e. Sun visibility)
Swath Colour	Swath Color (aabbggrr, aa=alpha, bb=blue, gg=green rr=red, with ranges 00 to ff)	Given by the user

5.1.3 Output file format description

The executable program *GroundSitePass* produces two output files per zone in Zone Database file:

- Comma Separated Value (.CSV)
- Google Earth KML file (.KML)
- Web browser HTML file (.HTML)

The output file names are automatically generated using the satellite identifier, the zone name, the swath name and the start and stop UTC times.

5.1.3.1 CSV Files

The CSV output file contains one row per each entry/exit visibility time segment, format of the CSV output file:

- Row 1-11: Header containing execution input information
- From Row 12:
  - Column 1: Ground Site Name

- Column 2: Pass Number
- Column 3: Ascending or Descending Pass (ASC/DESC)
- Column 4: UTC Time of overpass in calendar format (CCSDS format “yyyy-mm-ddThh:mm:ss”)
- Column 5: Absolute Orbit
- Column 6: Relative Orbit
- Column 7: Seconds since Ascending Node Crossing (ANX)
- Column 8: Distance from site to ground-track [km]. Distance from site to ground-track is regarded as positive distance when the site is located on the left hand side of the ground-track. See Section 6.
- Column 9: Topocentric Sun Azimuth Angle at site [deg]. Convention: az=0 is the North direction, az=90 deg = East
- direction
- Column 10: Topocentric Sun Elevation Angle at site [deg]. Convention: el=90 is the Zenith direction, el < 0 means below Earth surface
- Column 11: Topocentric Satellite Azimuth Angle at site [deg]. Convention: az=0 is the North direction, az=90 deg = East
- Column 12: Topocentric Satellite Elevation Angle at site [deg]. Convention: el=90 is the Zenith direction, el < 0 means below Earth surface

  - Last Row: End of file (EOF)

The CSV files can be opened with dedicated spreadsheet software (e.g. Excel, LibreOffice) or any text editor.

5.1.3.2 KML Files

The KML output file contains the same information as the CSV but presented graphically.
The format of the provided KML files is defined in KML Version 2.3 standard (see [RD 02]).

The KML files can be opened with Google Earth v7 or higher.

5.1.3.3 HTML Files

The HTML output file contains the same information as the CSV but presented in a tabular format, ready to be displayed in a web browser. A CSS stylesheet (*overpass_table.css*) is provided as part of the package to apply a given style to the HMTL elements. The HTML output file requires the CSS stylesheet to be located in the same folder.

The HTML files can be opened with any web browser (e.g. Firefox). Once opened in a web browser, it is possible to export the HTML report to PDF.

5.1.4 Example

5.1.4.1 Running the executable

The executable program can be called in the following way:

- From Mac OSX / Linux Terminal window

```
./GroundSitePass input_config_file.txt 2019-12-01T00:00:00 2019-12-03T00:00:00
```

- From Windows command prompt window

```
GroundSitePass.exe input_config_file.txt 2019-12-01T00:00:00 2019-12-03T00:00:00
```

The executable program shows the following messages:

```
Execution of program GroundSitePass v1.3

Input data set by the user:
Satellite: SENTINEL5P
Orbit File:
./mission_configuration_files/SENTINEL5P/OSF/S5P_OPER_MPL_ORBSCT_20171013T104928_99999999T999999_0008.
EOF
Swath File: ./mission_configuration_files/SENTINEL5P/SDF/SDF_TROPOMI.S5P
Swath ID: TROPOMI
Zone File: GROUND_SITES_EXAMPLE_ZONEDBFILE.EOF
Maximum Ground-Track Distance [km]: 3000.000000
Minimum Sun Elevation Angle [deg]: 0.000000
Start Time: 2019-12-01T00:00:00
Stop  Time: 2019-12-03T00:00:00
Start Time: 7274.000000000000
Stop Time: 7276.000000000000
Start Orbit: 11047
Stop  Orbit: 11075

Output Filename KML: S5P_TROPOMI_VISIBILITY_SEGMENTS_20191201_000000_20191203_000000_0001.KML
Output Filename CSV: S5P_TROPOMI_VISIBILITY_SEGMENTS_20191201_000000_20191203_000000_0001.CSV
Output Filename HTML: S5P_TROPOMI_VISIBILITY_SEGMENTS_20191201_000000_20191203_000000_0001.HTML

Ground Point Anmyeondo (LON, LAT, ALT)=(126.331100, 36.538200, 0.000000)
Zone ID: Anmyeondo
Number of segments: 4
Segments: Start (Orbit, seconds, microseconds) -- Stop (Orbit, seconds, microseconds)
     (11050,  593, 969833) -- (11050,  624, 554564)
     (11057, 2405, 789488) -- (11057, 2436,  17004)
     (11064,  604, 781282) -- (11064,  634, 999595)
     (11071, 2416, 240976) -- (11071, 2446, 835166)

Distance to Groud-Track Pass #0 = -548.552956 [km]
Sun Elevation angle Pass #0 = 27.105443 [deg]
Satellite Elevation angle Pass #0 = 52.384053 [deg]
Distance to Groud-Track Pass #1 = -142.098030 [km]
Sun Elevation angle Pass #1 = -60.047675 [deg]
Satellite Elevation angle Pass #1 = 79.014869 [deg]
Distance to Groud-Track Pass #2 = -131.544918 [km]
Sun Elevation angle Pass #2 = 28.520569 [deg]
Satellite Elevation angle Pass #2 = 79.815452 [deg]
Distance to Groud-Track Pass #3 = -559.211178 [km]
Sun Elevation angle Pass #3 = -63.673215 [deg]
Satellite Elevation angle Pass #3 = 51.815664 [deg]
[…]
```

Output files created successfully

5.1.4.2 Input File

Contents of the input configuration file used as example (`input_config_file.txt`):

```
SENTINEL5P
./mission_configuration_files/SENTINEL5P/OSF/S5P_OPER_MPL_ORBSCT_20171013T104928_99999999T999999_0008.
EOF
./mission_configuration_files/SENTINEL5P/SDF/SDF_TROPOMI.S5P
GROUND_SITES_EXAMPLE_ZONEDBFILE.EOF
TROPOMI
3000.0
0.0
800000ff
```

5.1.4.3 Output Files

5.1.4.3.1 CSV Files

A CSV output file is created:

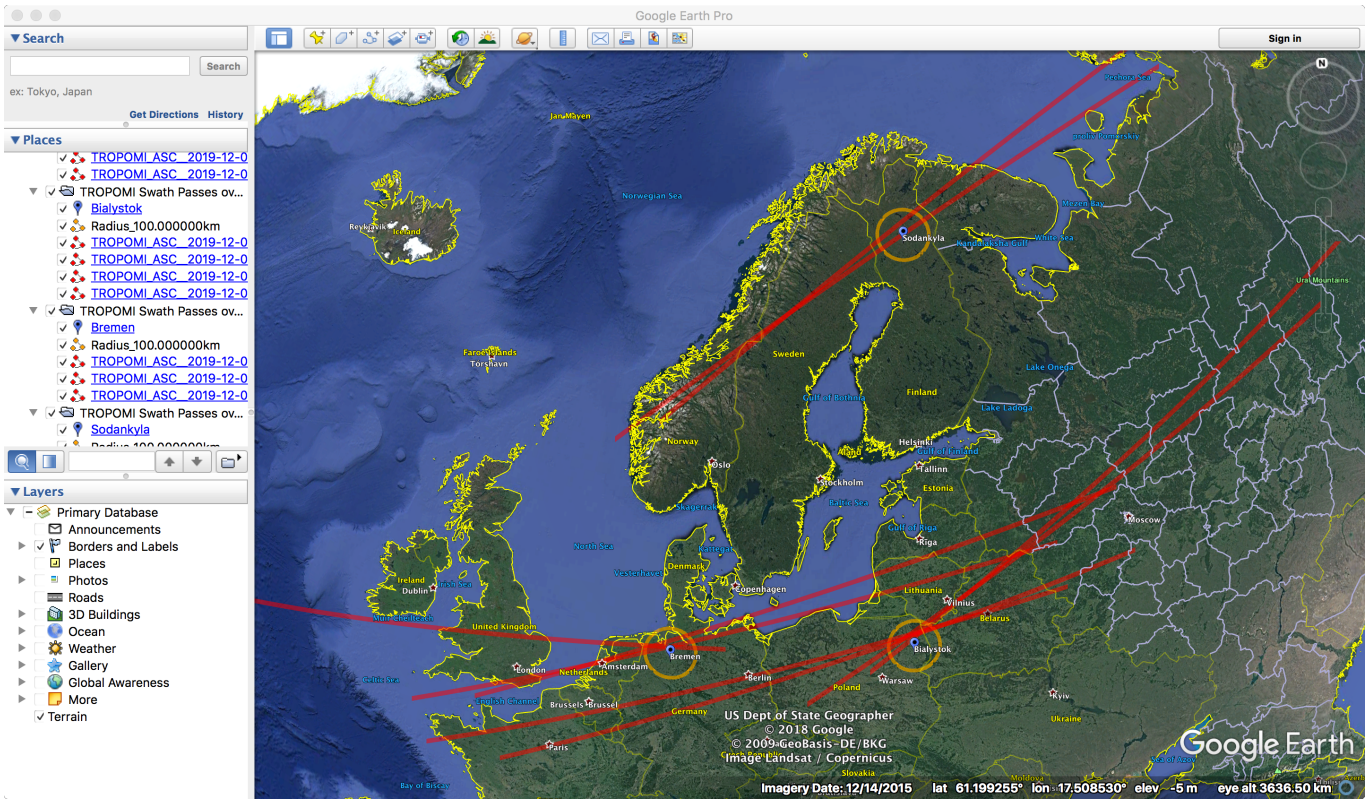
```
S5P_TROPOMI_VISIBILITY_SEGMENTS_20191201_000000_20191203_000000_0001.CSV
```

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	FILENAME	SSP_TROPOMI_VISIBILITY_SEGMENTS_20191201_000000_20191203_000000_0001.CSV											
2	CREATION_DATE	2019-12-27T10:29:31											
3	EXECUTABLE_NAME	GroundSitePass_v1.3											
4	ORBIT_FILE	./mission_configuration_files/SENTINEL5P/OSF/S5P_OPER_MPL_ORBSCT_20171013T104928_99999999T999999_0008.EOF											
5	SWATH_FILE	./mission_configuration_files/SENTINEL5P/SDF/SDF_TROPOMI.SSP											
6	SWATH_ID	TROPOMI											
7	ZONE_DATABASE_FIL	GROUND_SITES_EXAMPLE_ZONEDBFILE.EOF											
8	MAX_GROUNDTRACI	3000											
9	MIN_SUN_ELEVATIO	0											
10	VALIDITY_START	2019-12-01T00:00:00											
11	VALIDITY_STOP	2019-12-03T00:00:00											
12	GROUND_POINT	PASS	ASCENDING/DESCENDING PASS	UTC_TIME	ABS_ORBIT	REL_ORBIT	SECONDS_SINCE_ANX[s]	DISTANCE_TO_GROUNDTRACK[km]	SUN_AZIMUTH[deg]	SUN_ELEVATION[deg]	SATELLITE_AZIMUTH[deg]	SATELLITE_ELEVATION[deg]	
13	Anmyeondo	1	ASC	2019-12-01T05:03:33	11050	152	609.262198	-548.552956	206.179204	27.105443	262.334615	52.384053	
14	Anmyeondo	2	ASC	2019-12-02T04:44:41	11064	166	619.890438	-131.544918	201.392038	28.520569	261.073553	79.815452	
15	Arrival_Heights	1	ASC	2019-12-01T01:08:21	11047	149	4767.60246	1383.839473	352.659024	33.80323	106.239297	23.781956	
16	Arrival_Heights	2	ASC	2019-12-01T02:49:29	11048	150	4744.990349	792.067897	324.751291	31.892377	94.825813	40.808717	
17	Arrival_Heights	3	ASC	2019-12-01T04:30:36	11049	151	4722.450438	240.118743	298.012917	27.934566	84.319435	70.073768	
18	Arrival_Heights	4	ASC	2019-12-01T06:11:14	11050	152	4670.559227	-173.777278	272.743202	22.871587	197.349846	76.561959	
19	Arrival_Heights	5	ASC	2019-12-01T07:51:23	11051	153	4589.936461	-376.206942	248.568651	17.71451	183.962077	63.131145	
20	Arrival_Heights	6	DESC	2019-12-01T09:31:35	11052	154	4512.036326	-330.62602	224.868394	13.344113	171.443792	65.899082	
21	Arrival_Heights	7	DESC	2019-12-01T11:11:42	11053	155	4428.963558	-45.3181	201.317038	10.495136	156.92327	86.388916	
22	Arrival_Heights	8	DESC	2019-12-01T12:52:43	11054	156	4399.848021	428.540219	177.545686	9.640018	272.018035	57.832415	
23	Arrival_Heights	9	DESC	2019-12-01T14:33:50	11055	157	4377.109825	1007.169481	153.755248	10.962077	261.169997	33.550214	
24	Arrival_Heights	10	ASC	2019-12-02T00:49:16	11061	163	4763.852654	1490.275141	358.09922	34.039209	110.504837	21.489878	
25	Arrival_Heights	11	ASC	2019-12-02T02:30:31	11062	164	4749.278512	903.240348	329.993835	32.593257	96.891961	36.859513	
26	Arrival_Heights	12	ASC	2019-12-02T04:11:38	11063	165	4726.642843	335.787438	302.983271	28.961666	86.18426	63.512549	
27	Arrival_Heights	13	ASC	2019-12-02T05:52:28	11064	166	4686.452355	-110.499149	277.421198	24.023943	200.160568	81.30384	
28	Arrival_Heights	14	ASC	2019-12-02T07:32:36	11065	167	4604.575691	-356.629313	253.107054	18.815968	186.302275	64.300356	
29	Arrival_Heights	15	DESC	2019-12-02T09:12:48	11066	168	4526.861996	-358.311119	229.355323	14.232518	173.863031	64.19891	
30	Arrival_Heights	16	DESC	2019-12-02T10:52:56	11067	169	4445.083254	-115.238813	205.803567	11.048043	160.054794	80.940903	
31	Arrival_Heights	17	DESC	2019-12-02T12:33:45	11068	170	4404.053319	328.835502	182.096359	9.786863	273.947911	63.96399	
32	Arrival_Heights	18	DESC	2019-12-02T14:14:52	11069	171	4381.419273	895.303763	158.315914	10.697235	263.256532	37.126623	
33	Arrival_Heights	19	DESC	2019-12-02T15:56:07	11070	172	4366.05988	1482.806894	134.516069	13.636993	249.845141	21.644221	
34	Ascension_Island	1	ASC	2019-12-01T14:59:41	11055	157	5927.941245	-749.017017	242.890622	55.018952	255.84626	42.788871	
35	Ascension_Island	2	ASC	2019-12-02T14:40:57	11069	171	5946.563169	-238.672277	239.786605	59.118421	256.298524	71.921435	
36	Bialystok	1	ASC	2019-12-01T10:14:08	11053	155	974.530722	886.953268	179.357647	14.981848	58.493659	37.417215	
37	Bialystok	2	ASC	2019-12-01T11:54:18	11054	156	895.191449	-713.356029	203.06431	12.054778	265.601676	44.379992	
38	Bialystok	3	ASC	2019-12-02T09:55:27	11067	169	995.356438	1161.173494	174.79142	14.685517	56.381762	28.758239	
39	Bialystok	4	ASC	2019-12-02T11:35:24	11068	170	902.585416	-400.783581	198.569333	12.93384	263.834365	60.973188	
40	Bremen	1	ASC	2019-12-01T11:54:47	11054	156	923.891314	208.756081	189.890489	14.569252	63.447987	74.033097	
41	Bremen	2	ASC	2019-12-02T11:36:06	11068	170	944.506126	505.493631	185.322613	14.798159	61.381789	54.783321	
42	Bremen	3	ASC	2019-12-02T13:16:34	11069	171	882.665703	-1140.271924	208.737698	10.370192	267.961879	29.29884	
43	Sodankyla	1	ASC	2019-12-01T10:17:18	11053	155	1164.634206	2.402932	183.463336	0.803495	25.572815	89.757951	
44	Sodankyla	2	ASC	2019-12-02T09:58:36	11067	169	1184.453379	184.89343	179.036607	0.69271	48.298497	75.592484	
45	EOF												

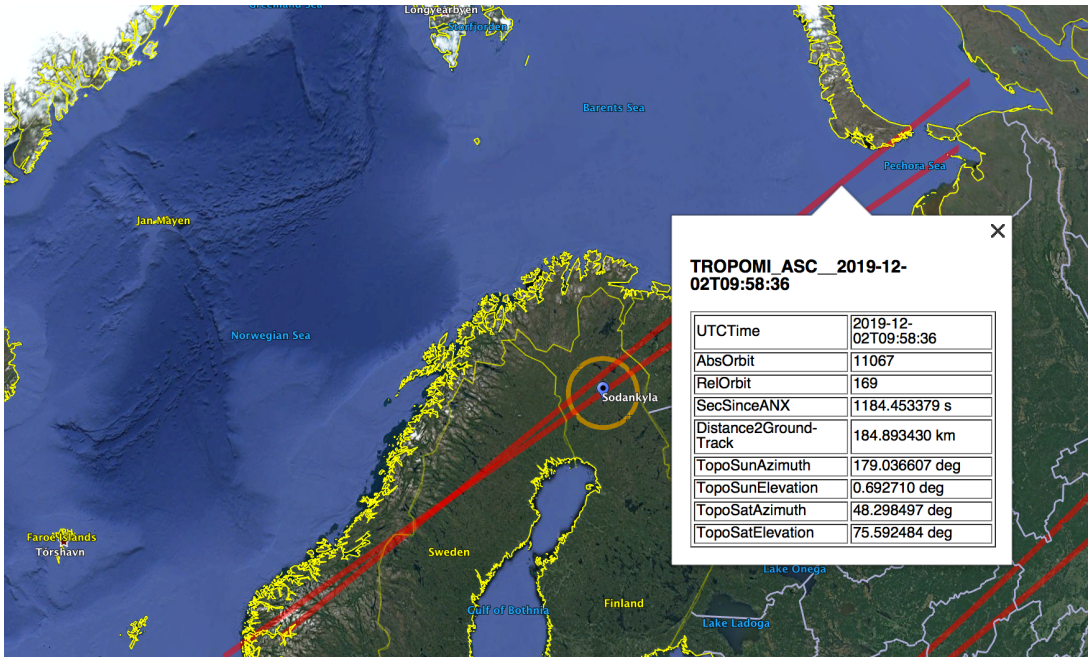
5.1.4.3.2 KML Files

A KML output file is created:
`S5P_TROPOMI_VISIBILITY_SEGMENTS_20191201_000000_20191203_000000_0001.KML`

After loading the files with Google Earth, the overpass data can be found in the “Places” window, under “Temporary Places”.



When moving the mouse over the swaths, the lines are highlighted (increase in thickness and lighter in colour). Then by clicking on top of the track, a balloon showing additional information is displayed, namely the absolute and relative orbit number, seconds since ANX, distance between the site and the ground-track and the Sun azimuth and elevation at the site.



5.1.4.3.3 HTML Files

A HTML output file is created:
`S5P_TROPOMI_VISIBILITY_SEGMENTS_20191201_000000_20191203_000000_0001.HTML`

By double-clicking on the HTML file, it opens with the default browser, applying the style from CSS stylesheet.

GROUND SITE OVERPASS TABLE HTML REPORT

Creation Date: 2019-12-27T10:42:41

Filename	S5P_TROPOMI_VISIBILITY_SEGMENTS_20191201_000000_20191203_000000_0001.HTML
Executable Name and Version	GroundSitePass_v1.3
Orbit File	./mission_configuration_files/SENTINEL5P/OSF/S5P_OPER_MPL_ORBSCT_20171013T104928_99999999T999999_0008.EOF
Swath File	./mission_configuration_files/SENTINEL5P/SDF/SDF_TROPOMI.S5P
Swath ID	TROPOMI
Zone Database File	GROUND_SITES_EXAMPLE_ZONEDBFILE.EOF
Maximum ground-track distance [km]	3000.000000
Minimum Sun elevation [deg]	0.000000
Validity Start	2019-12-01T00:00:00
Validity Stop	2019-12-03T00:00:00

Zone Overpass Table

Ground Site ID	Pass	Ascending / Descending	UTC Time	Abs Orbit	Rel Orbit	Seconds since ANX [s]	Distance to Ground-Track[km]	Sun Azimuth [deg]	Sun Elevation [deg]	Satellite Azimuth [deg]	Satellite Elevation [deg]
Anmyeondo	1	ASC	2019-12-01T05:03:33	11050	152	609.262198	-548.552956	206.179204	27.105443	262.334615	52.384053
Anmyeondo	2	ASC	2019-12-02T04:44:41	11064	166	619.890438	-131.544918	201.392038	28.520569	261.073553	79.815452
Arrival_Heights	1	ASC	2019-12-01T01:08:21	11047	149	4767.602460	1383.839473	352.659024	33.803230	106.239297	23.781956
Arrival_Heights	2	ASC	2019-12-01T02:49:29	11048	150	4744.990349	792.067897	324.751291	31.892377	94.825813	40.808717
Arrival_Heights	3	ASC	2019-12-01T04:30:36	11049	151	4722.450438	240.118743	298.012917	27.934566	84.319435	70.073768
Arrival_Heights	4	ASC	2019-12-01T06:11:14	11050	152	4670.559227	-173.777278	272.743202	22.871587	197.349846	76.561959

5.2 User-defined Mission Configuration

It is possible to use the *GroundSitePass* tool with user-defined missions.

5.2.1 Input Configuration Files

A dedicated input configuration file (see Section 5.1.2) needs to be created to set the satellite identifier, the path of the orbit file and the path to the instrument swath file, among other inputs.

5.2.2 Satellite Identifier

The satellite identifier GENERIC can be used for a user-defined satellite. This identifier assumes certain values for the internal orbit parameters, among them the mean frozen eccentricity which is set to a default value (0.001165). This assumption introduces about 100 meters of error in altitude respect to the orbit that it would be obtained by applying the frozen eccentricity value that would be applicable to the user-defined orbit. For certain applications this approximation is good enough.

5.2.3 User-defined Mission File Folder Organisation

The user-defined folder must be located at the same level of the *GroundSitePass* executable tool. As mentioned in Section 5.2.1, the name of the folder should match the string GENERIC.

5.2.4 Orbit Files

The path to the orbit file is specified in the input configuration file (see Section 5.1.2).
The supported Orbit File types are ORBSCT, ORBPRE, ORBRES and ORBTLE (see) for file format specification.

5.2.5 Instrument Swath Files

The path to the instrument swath file is specified in the input configuration file (see Section 5.1.2).
See [RD 01] for file format specification.

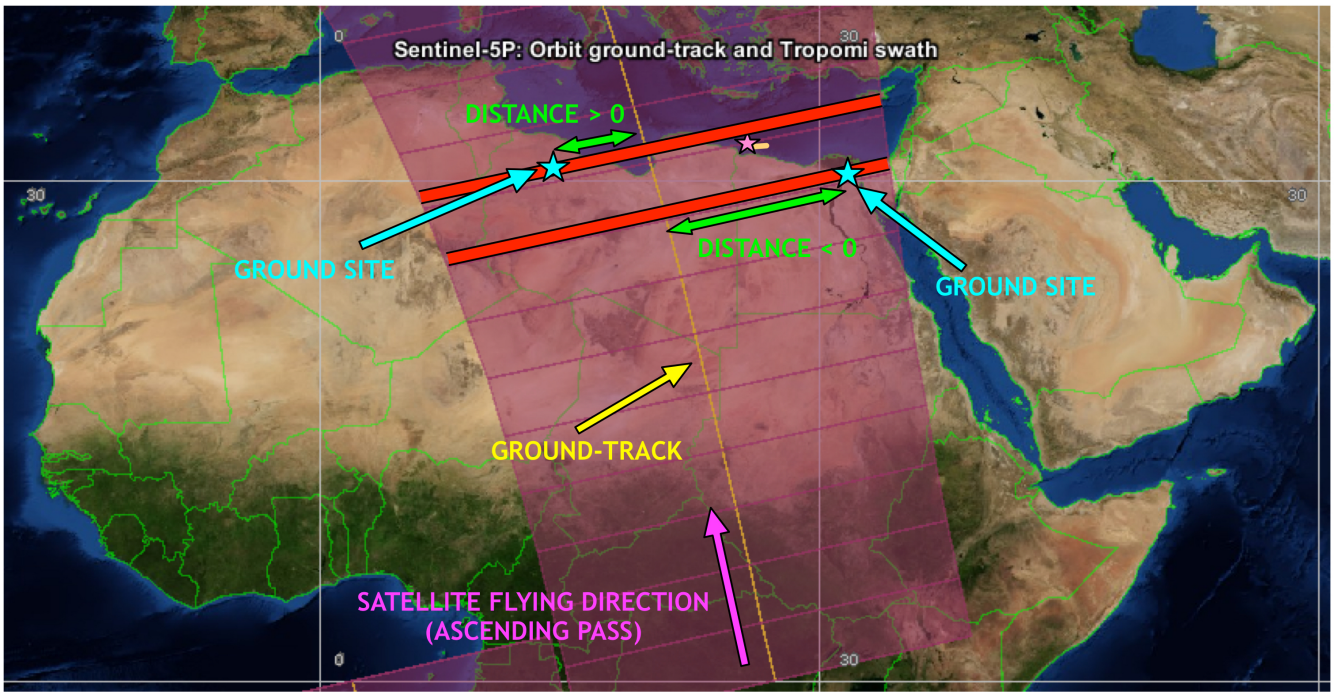
6. TECHNICAL DETAILS AND ASSUMPTIONS

6.1 Earth Observation CFI Software Version

The dataset will be generated using EO CFI v4.14.

6.2 Distance between ground site and satellite ground-track

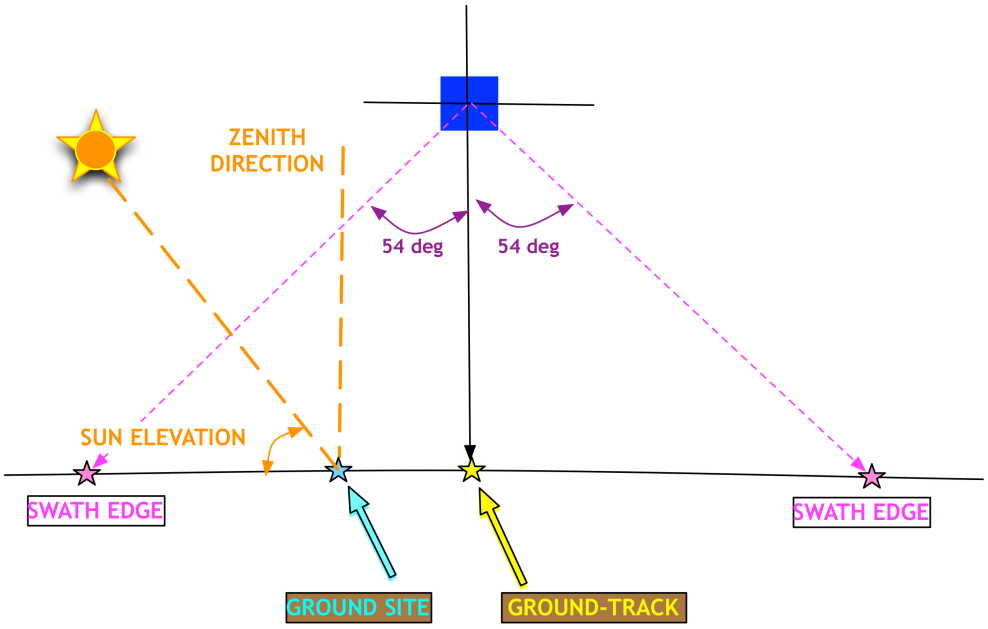
Example drawing for SENTINEL-5P TROPOMI swath



6.3 Sun Elevation

Example drawing for SENTINEL-5P TROPOMI swath

In this drawing, SENTINEL-5P is flying
away from the viewer (velocity
vector pointing into the diagram)
TROPOMI swath FOV = 108 deg



6.4 Satellite Elevation

Example drawing for SENTINEL-5P TROPOMI swath

In this drawing, SENTINEL-5P is flying
away from the viewer (velocity
vector pointing into the diagram)
TROPOMI swath FOV = 108 deg