

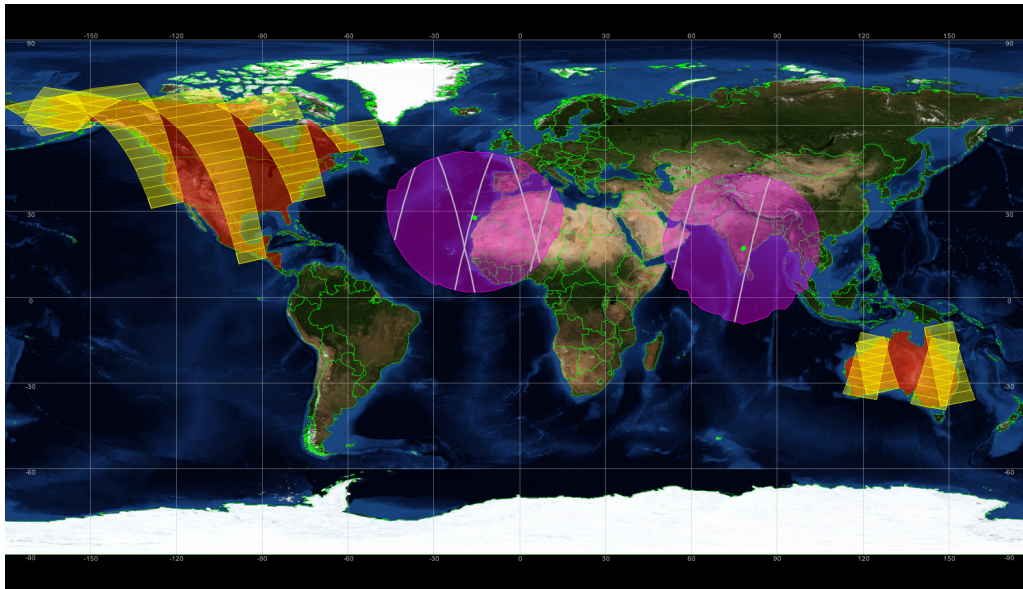
A set of Software Tools supporting EO satellites: Instrument Swath and Visualization

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A set of software applications are freely available to the ESA Earth Observation community:

- For mission analysis activities related to instrument swath coverage over regions of interest and ground station contact
 - ✓ The Earth Observation Swath and Orbit Visualization software (**ESOV NG**)
 - ✓ The Earth Observation Mission Evaluation and Representation software (**EOMER**)
- For display of 3D high-resolution satellite mission scenarios
 - ✓ The Satellite Mission Editor & Player software (**SAMIEdit**)

Mission Planning Applications: ESOV NG vs EOMER

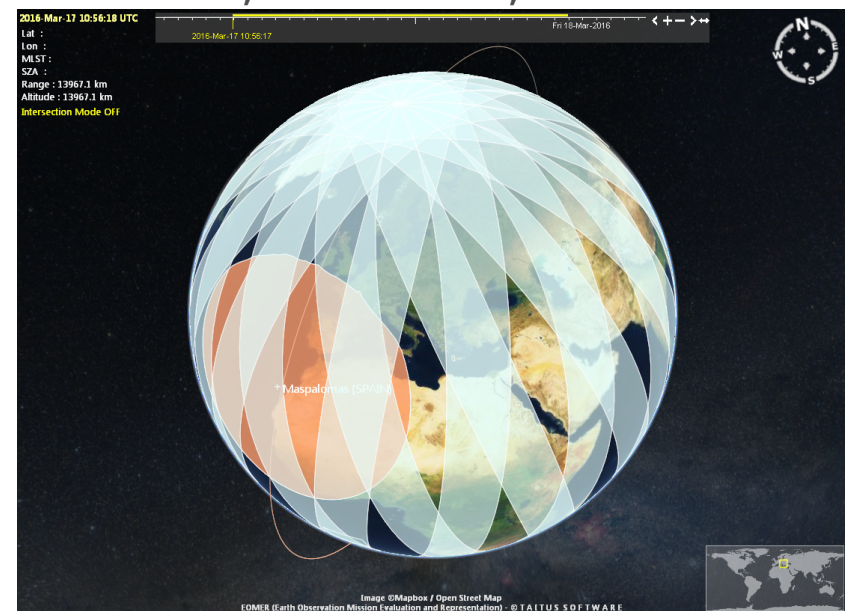


ESOV NG (2D Earth map)

- Application using orbit, swath and visibility capabilities from EO CFI SW libraries
- Tailored to pre-defined ESA EO missions + user-defined satellites
- Linux, Mac OS X, Windows

EOMER (2D/3D Earth map)

- Multi-mission application making use of SatX and GanttX components
- Tailored to pre-defined ESA EO missions
- Windows



Both ESOV NG and EOMER allow the user to visualize:

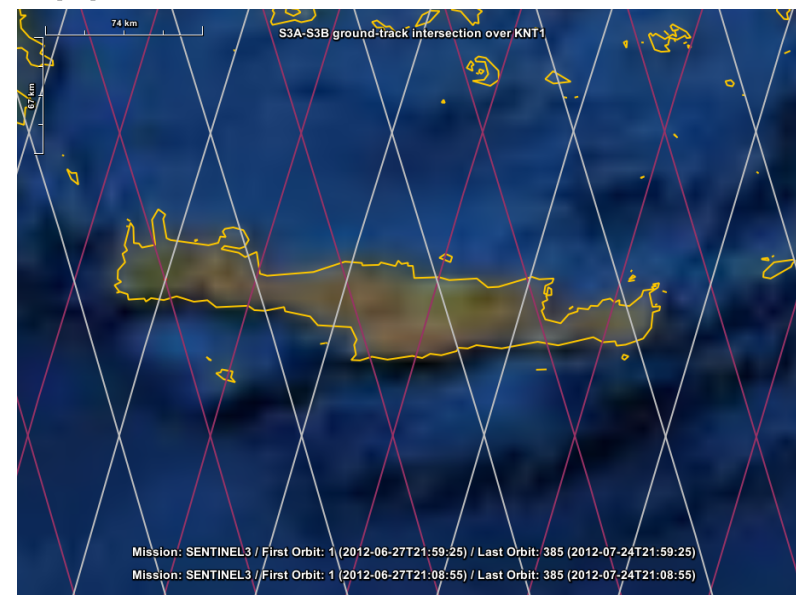
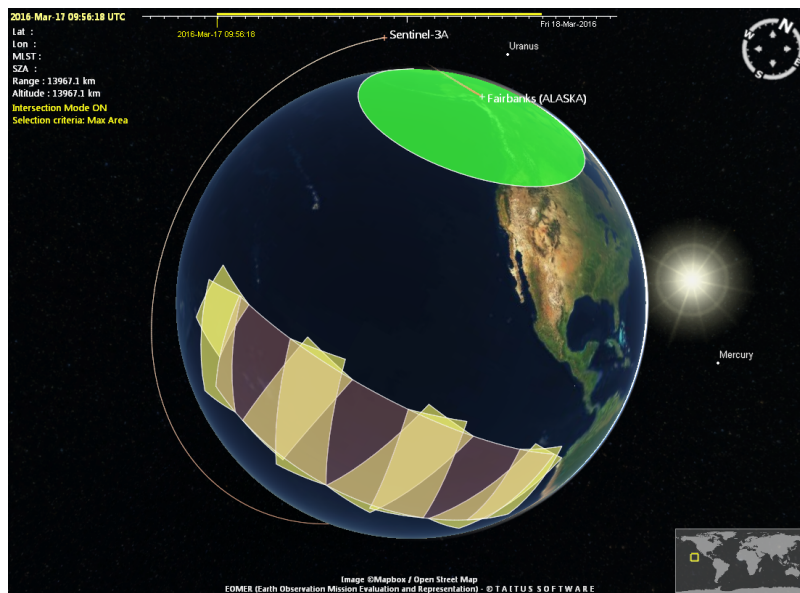
- Orbit ground-tracks
 - ✓ Using EO ground segment standard orbit files
 - Orbit Scenario File (ORBSCT)
 - Predicted Orbit File (ORBPRES, ORBLPR)
 - Restituted Orbit File (ORBRES)
- Instrument swaths
- Ground station visibility area
- Regions of interest (ROI)
 - ✓ Regions can be defined with embedded zone editors

ESOV NG & EOMER: Common Features



Both ESOV NG and EOMER allow the user to calculate:

- When an instrument swath overlaps with a given region of interest
- Time of overpass over a given ground point of interest (e.g. transponder location)
- Ground station visibility passes
- Sun zenith angle constraints applied to instrument swaths



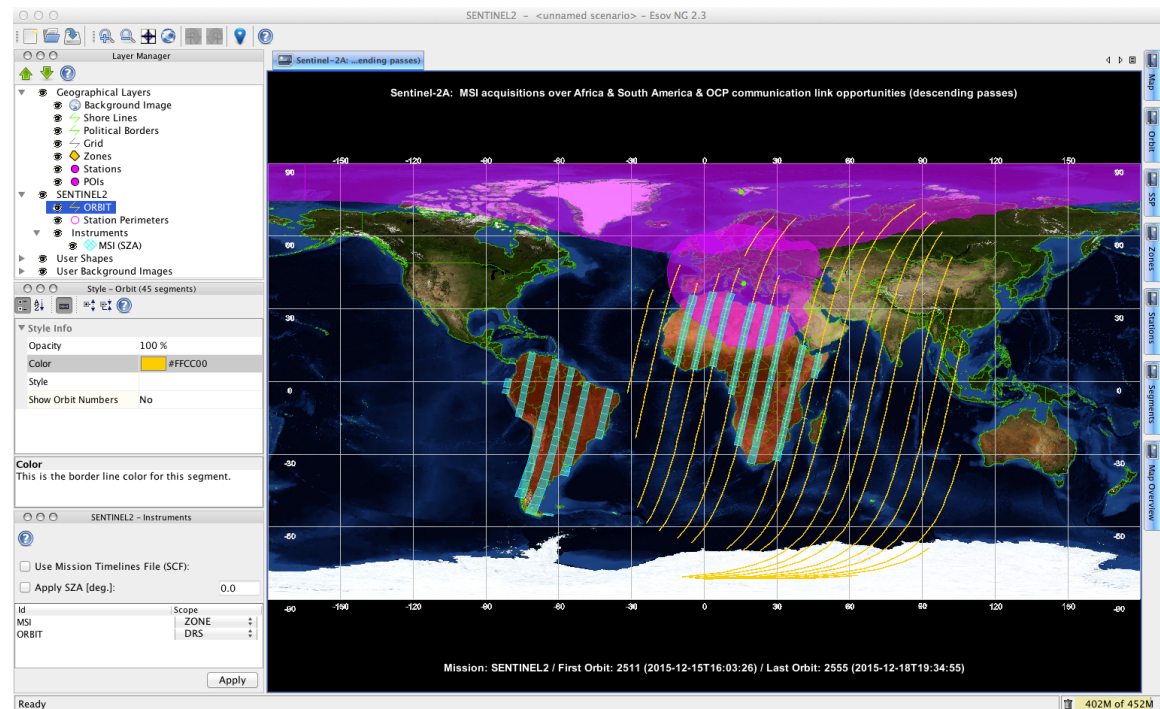
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ESOV NG Specific Features



In addition, ESOV NG provides the following features:

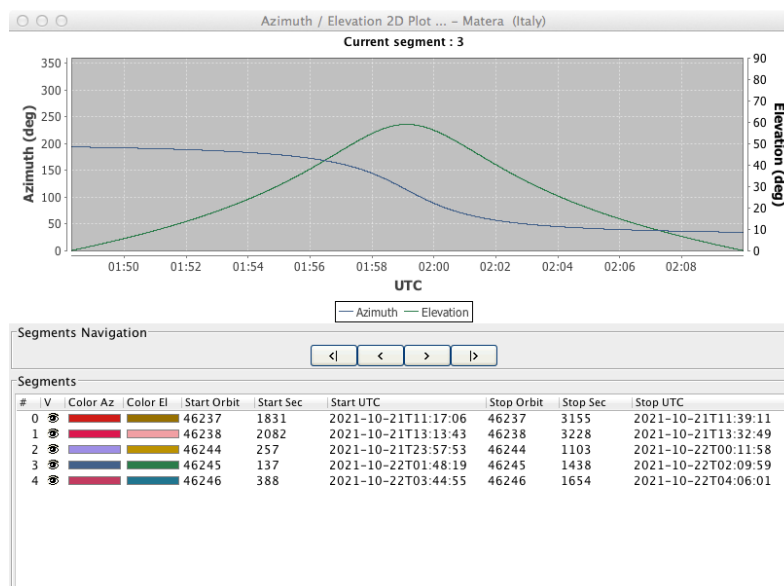
- Calculation of visibility time segments between a LEO satellite and a Data Relay Satellite in GEO orbit (e.g. communication links between Sentinel-1/2 and TDP-1, EDRS)
- Apply logical operations to sets of time segments (e.g. instrument swath over Europe, but not in visibility of a station)



ESOV NG Specific Features (cont.)



- Viewing angles from the ground station to the satellite during a pass



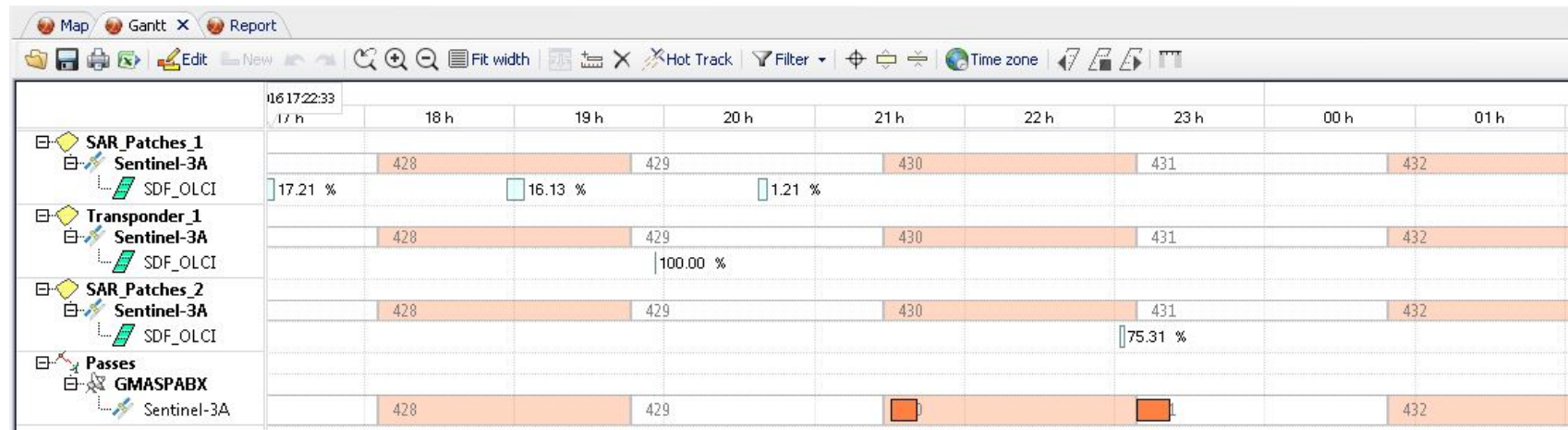
- Generation of Swath Control File (.SCF), an XML file with time segments and style settings. This format is used for exchange of timelines, allowing ESOV NG to display orbit/swath time segments calculated by external programs or to feed EOMER

EOMER Specific Features



In addition, EOMER provides the following features:

- 3D Visualisation Map with various map options
- Scenario animation within user-selected time window, applying a given time factor
- Visualization and highlight of events within given time window (including GANTT representation of events)



- A pre-defined set of ESA EO satellite mission configuration files are provided together with the applications
 - ✓ ESOV NG: Sentinel-1/2/3/5p/6, Cryosat-2, SMOS, Swarm, Aeolus, EarthCARE, Seosat, MetOp-SG, SAT_EXAMPLE (dummy satellite, starting point to create an user-defined mission)
 - ✓ EOMER: Sentinel-1/2/3/5p, MetOp-SG, Aeolus, Biomass
- The ESOV NG / EOMER Helpdesk provides support to define ad-hoc mission files (e.g. for orbit and instrument swaths) to be incorporated as user-customized mission data files

ESOV NG vs EOMER: : Import & Export File Formats



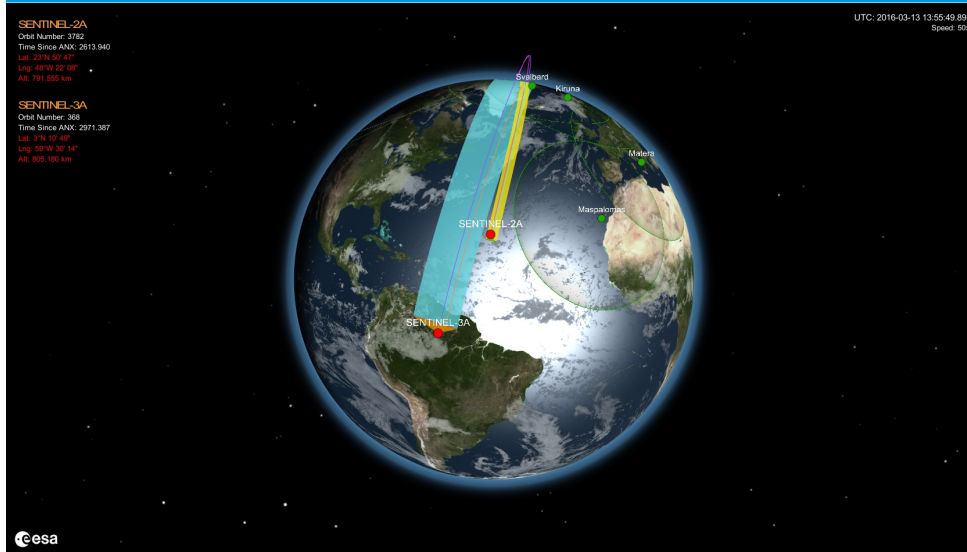
Import / Export File Formats

Type of File	ESOV NG		EOMER	
	Import	Export	Import	Export
EO Ground Segment Standard Orbit Files	✓	✗	✓	✗
EO CFI Zone Database File	✓	✓	✓	✓
EO CFI Station Database File	✓	✓	✓	✓
Excel or CSV	✗	✓	✗	✓
Google KML	✗	✓ ⁽¹⁾	✓ ⁽²⁾	✓ ⁽²⁾
ESRI Shapefiles (for Zones)	✓	✗	✓	✓
UTC Time File (.UTF)	✗	✓	✓	✗
Swath Control File (.SCF)	✓	✓	✗	✓
Longitude-Latitude File (.LLF)	✗	✓	✗	✗

⁽¹⁾ Only for swath segments

⁽²⁾ Only for zones

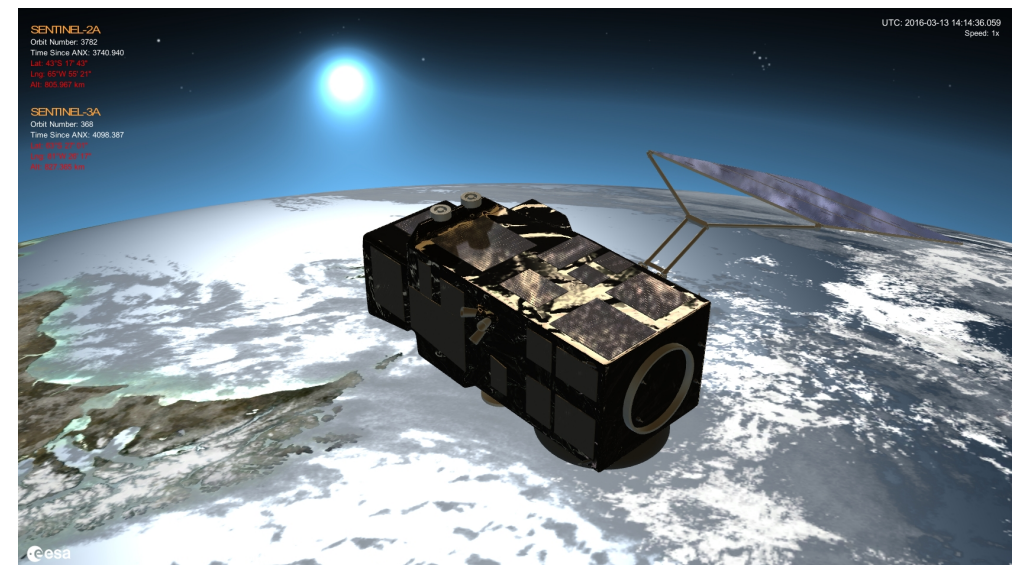
High-Resolution 2D/3D Application: SAMIEdit



SAMIEdit

- Application which displays stunning high-definition 3D and 2D real time animation and simulations of ESA Earth Observation satellites
- The satellite position, attitude and swath footprint are obtained from the EO CFI SW libraries

- Tailored to pre-defined ESA EO missions
- ✓ Sentinel 1/2/3/5p
- ✓ Swarm, SMOS, Cryosat-2, Aeolus, EarthCARE
- Desktop: Mac OS X, Windows
- Mobile: iPad version (available in AppStore)

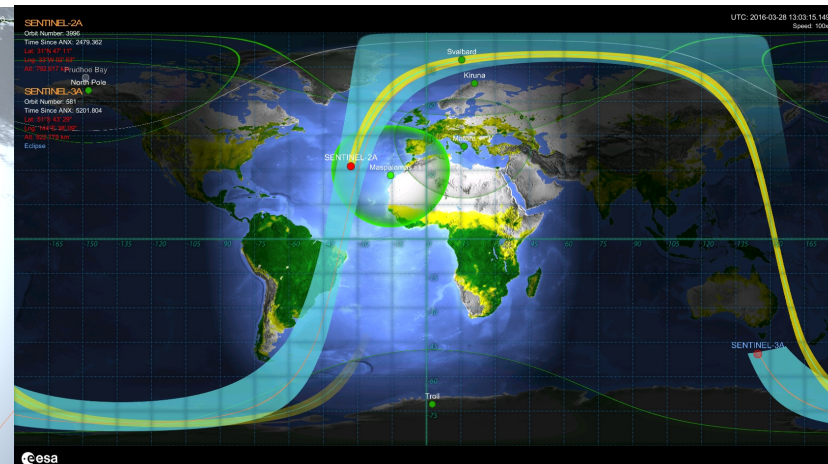
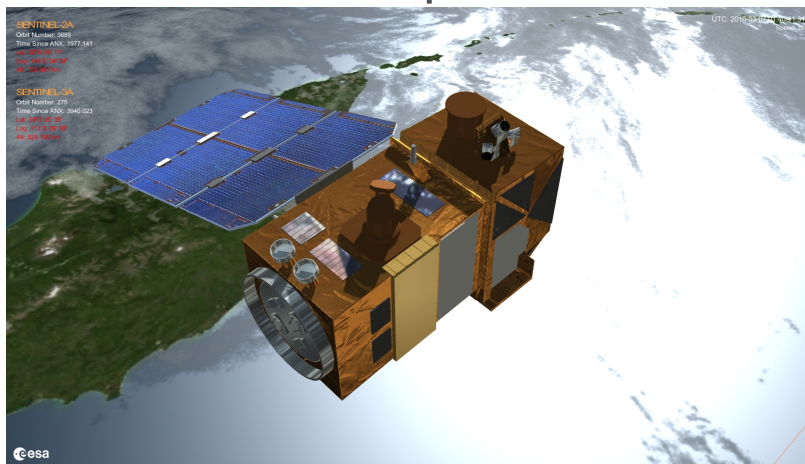


- SAMIEdit displays the following elements of a mission scenario:
 - ✓ Orbit tracks, orbit ground-tracks and footprints (swath) of the instruments on-board
 - ✓ The event of entering/exiting the area of visibility between the satellite and the ground stations
 - ✓ Moving parts deployments, like solar arrays and antenna and thruster firing
- With the editing capabilities of SAMIEdit it is possible to:
 - ✓ Drive various camera views (camera attached to the Earth or to the Satellite,...)
 - ✓ Select textures for the Earth's surface
 - ✓ Enable/disable display of instrument swaths
 - ✓ Make active/inactive a given ground station

SAMIEdit Features



- It is possible to run a simulation and give the user control over time simulation parameters:
 - ✓ Play/Pause, Speed factor
 - ✓ Set simulation start/stop time
 - ✓ Real-Time simulation mode (set to UTC time)
 - ✓ Run in endless loop mode
- The user can generate standalone animation for kiosk type application and export the result in HD video or as series of snapshots



EO Software Tools: Download & User Support



- Software and documentation available in the System Support Division Website: <http://eop-cfi.esa.int>
- For questions, suggestions or technical support, please contact the user support helpdesk at:
 - ✓ ESOV NG & EOMER
 - esov@eopp.esa.int
 - ✓ SAMIEdit
 - sami@eopp.esa.int

THANK YOU !