



→ THE ESA EARTH OBSERVATION Φ -WEEK

EO Open Science and FutureEO

12–16 November 2018 | ESA-ESRIN | Frascati (Rome), Italy

SAMI: High Resolution 3D Visualisation of ESA EO Satellite Missions

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14/11/2018

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European Space Agency

Overview



What is SAMI ?

Application Interface

Where are the Satellites ?

Why SAMI?

Playback Scenario

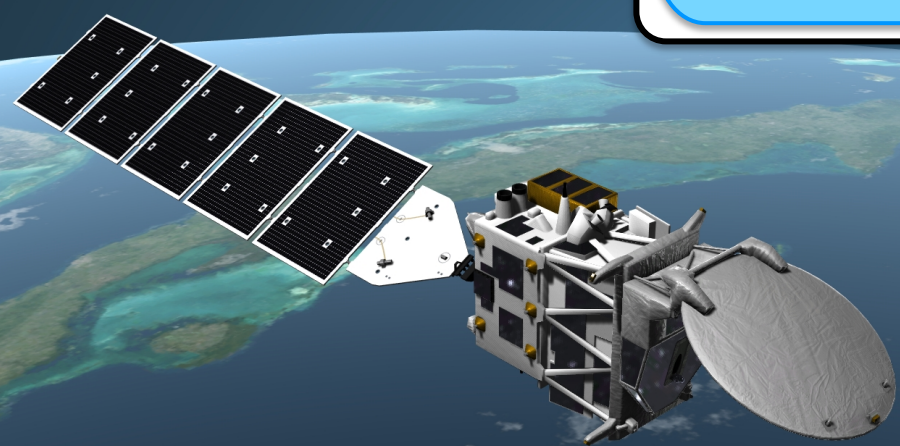
Supported Missions

Export Screenshots or Video

Download & User Support

Software Aspects

Illustrate Mission Concepts



What is SAMI ?



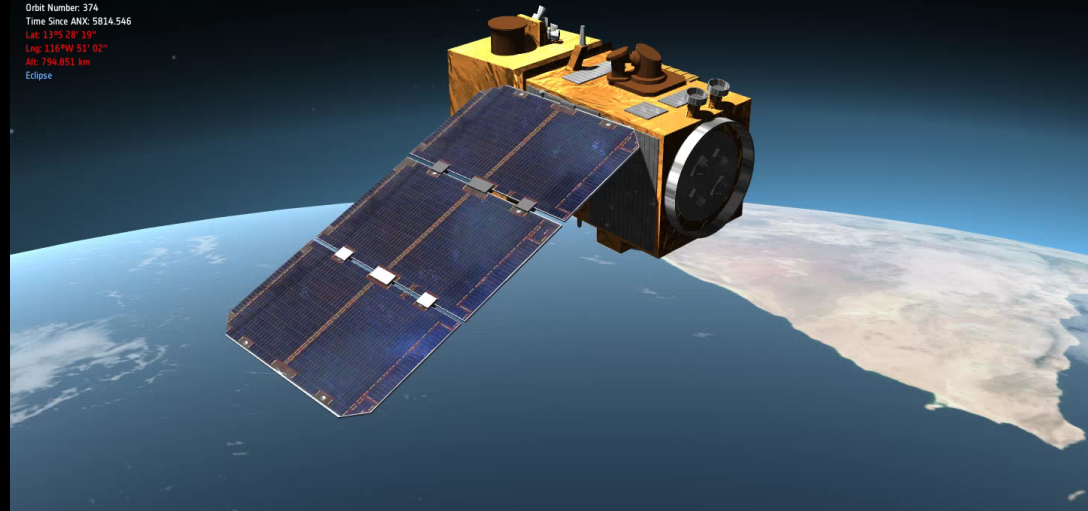
Application **freely**
available
Displays **high-definition**
3D and 2D scenarios of
ESA Earth Observation
satellites

Scenarios can be
synchronized with
real-time
scene set to the
past or the **future**

SENTINEL-2A
Orbit Number: 9283
Time Since ANX: 2791.482
Lat: 13°N 20' 27"
Lag: 83°E 09' 15"
Alt: 790.586 km
Daylight
SENTINEL-2B
Orbit Number: 376
Time Since ANX: 5814.546
Lat: 13°N 20' 19"
Lag: 116°W 51' 02"
Alt: 796.851 km
Eclipse



UTC: 2017-04-02 06:25:35.511
Speed: 20x



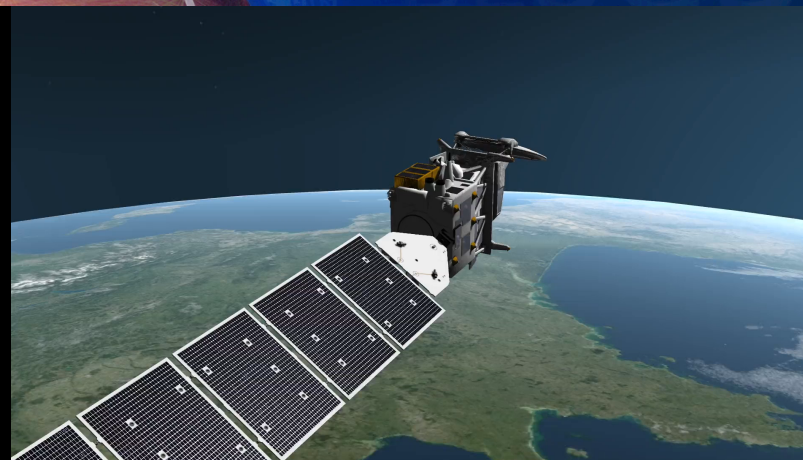
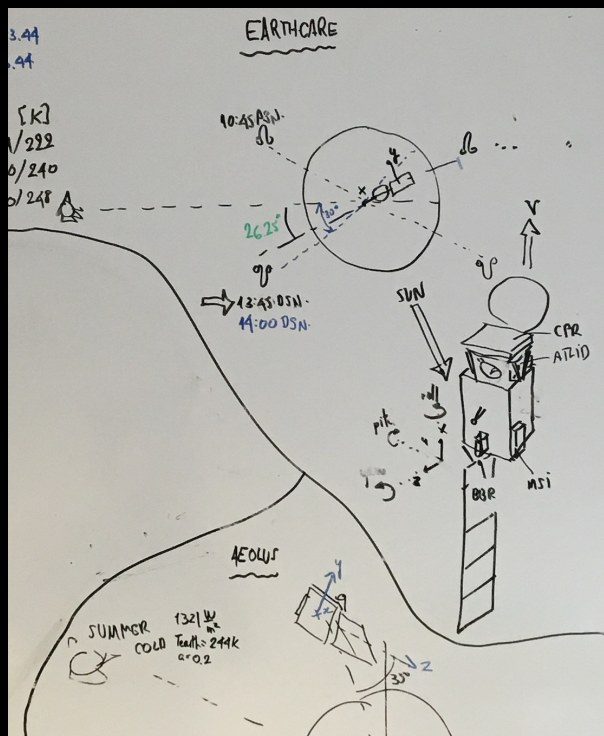
Why SAMI ?



Need to visualize ESA EO missions in a **realistic** way

Satellite **3D model**

Elements of mission scenario: orbit, attitude, swath, stations, Sun illumination



Supported Missions



Sentinel-1A/B

Aeolus

"Dummy" satellite

Sentinel-2A/B

Cryosat-2

Sentinel-3A/B

EarthCARE

Sentinel-5P

SMOS

Sentinel-6

Swarm-A/B/C

MetOp-SG-A/B



Where are the satellites ?



Display **where**
are the ESA
EO satellites

In mission
control room
or for **PR**
purposes

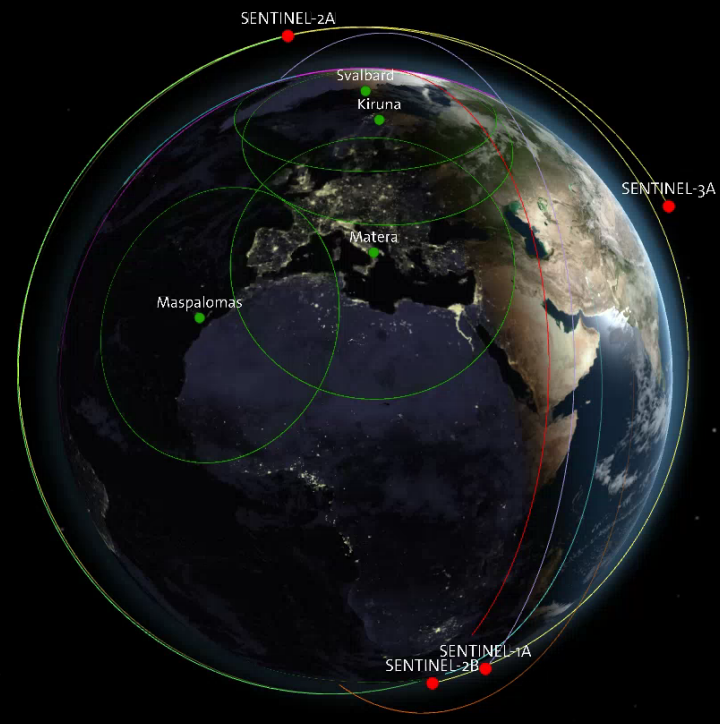
SENTINEL-1A
Orbit Number: 18176
Time Since ANX: 3446.068
Lat: 29°5' 28" 14"
Lng: 35°E 39' 56"
Alt: 707.281 km
Daylight

SENTINEL-1B
Orbit Number: 7193
Time Since ANX: 528.783
Lat: 31°N 56' 46"
Lng: 145°W 01' 11"
Alt: 699.394 km
Daylight

SENTINEL-2A
Orbit Number: 11455
Time Since ANX: 1304.313
Lat: 75°N 13' 39"
Lng: 107°W 03' 51"
Alt: 880.979 km
Daylight

SENTINEL-2B
Orbit Number: 2546
Time Since ANX: 4327.377
Lat: 75°S 22' 19"
Lng: 72°E 31' 59"
Alt: 817.133 km
Daylight

SENTINEL-3A
Orbit Number: 8019
Time Since ANX: 2500.447
Lat: 30°N 57' 34"
Lng: 105°E 16' 16"
Alt: 806.149 km
Daylight



esa
UTC: 2017-09-01 03:19:42.216
Speed: 50x



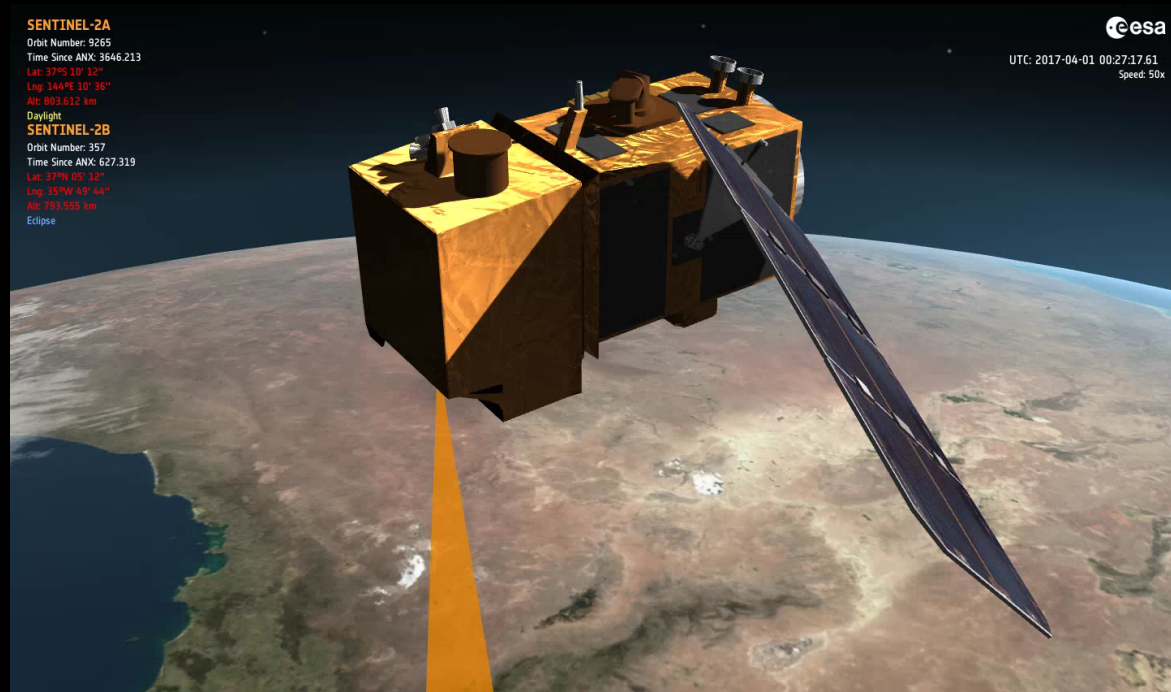
Playback Scenario



Playback of a scenario within a given time window to observe a particular satellite geometry

Inspect solar illumination on satellite part at a given time

SENTINEL-2A
Orbit Number: 9265
Time Since ANX: 3646.213
Lat: 37°5' 10" 12"
Lng: 144°4' 10" 36"
Alt: 803.612 km
Daylight
SENTINEL-2B
Orbit Number: 357
Time Since ANX: 627.319
Lat: 37°4' 49" 12"
Lng: 152°19' 49" 44"
Alt: 793.555 km
Eclipse



Export Screenshots or Video



Export screenshots or HD video to be used as media content

Display solar array deployment, a manoeuvre sequence or a timeline of events



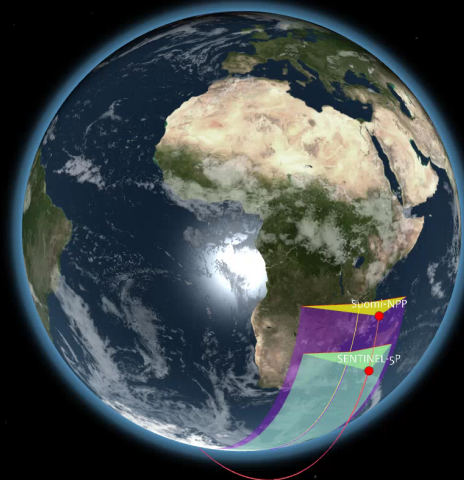
Illustrate Mission Concepts



Offset time between satellites for constellations or **tandem** missions

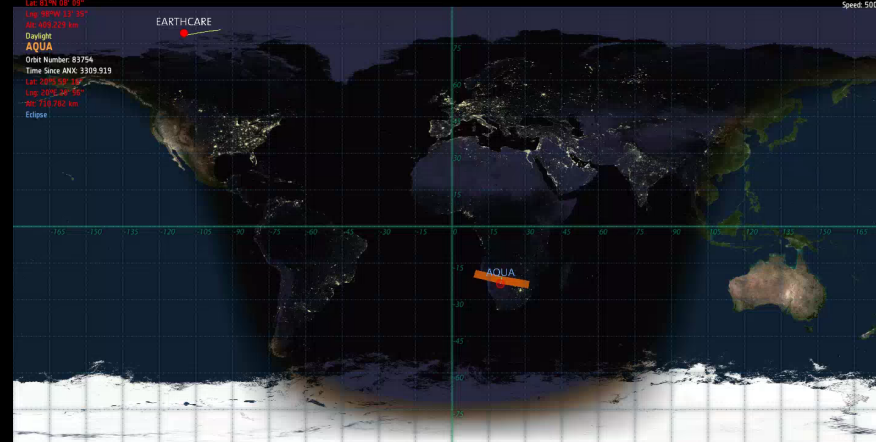
Instruments **swath overlap** for **synergetic** missions

SENTINEL-6P
Orbit Number: 661
Time Since ANX: 5701.204
Lat: 21°5' 38" 00"
Long: 23°5' 03" 00"
Alt: 817.851 km
Daylight
Suomi-NPP
Orbit Number: 31213
Time Since ANX: 5916.236
Lat: 18°5' 12" 30"
Long: 28°5' 58" 50"
Alt: 831.956 km
Daylight



ESA
UTC: 2017-11-09 11:07:35.056
Speed: 50x

EARTHCARE
Orbit Number: 15
Time Since ANX: 1470.755
Lat: 83°38' 02" 00"
Long: 88° 22' 23" 00"
Daylight
AQUA
Orbit Number: 83754
Time Since ANX: 3309.919
Lat: 20°52' 36" 50"
Long: 20°E 34" 50"
Alt: 715.762 km
Eclipse



ESA
UTC: 2018-02-01 00:00:51.596
Speed: 500x



Software Aspects



SAMI is built making use of existing toolkits and libraries

Unity 3D Game Engine

graphical toolkit

Earth Observation CFI SW libraries

satellite orbit

satellite attitude

swath footprint

Earth, Sun, Moon

Supported Platforms



Application Interface



The screenshot shows the SAMeEdit application window with a menu bar (Application, Project, Simulation, Cameras, Ground Stations, Satellites, Export) and a toolbar. The main area is a 3D scene display of Earth. A yellow box labeled "Main Menu" points to the top-left corner, and another yellow box labeled "Scene Display" points to the Earth scene. A yellow box labeled "Time Control" points to the playback controls at the bottom of the scene display. A yellow box labeled "Timeline Editor" points to a small table below the scene display.

CAMERAS	Time
EARTH	
SATELLITES	

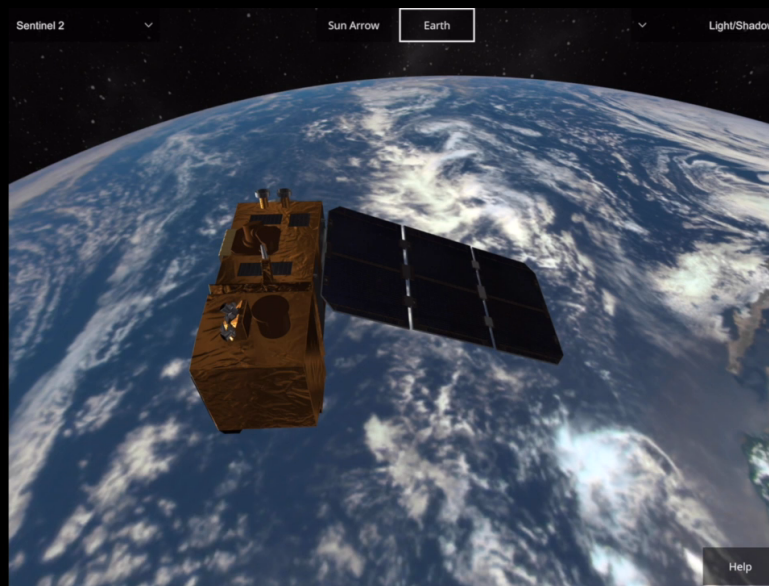
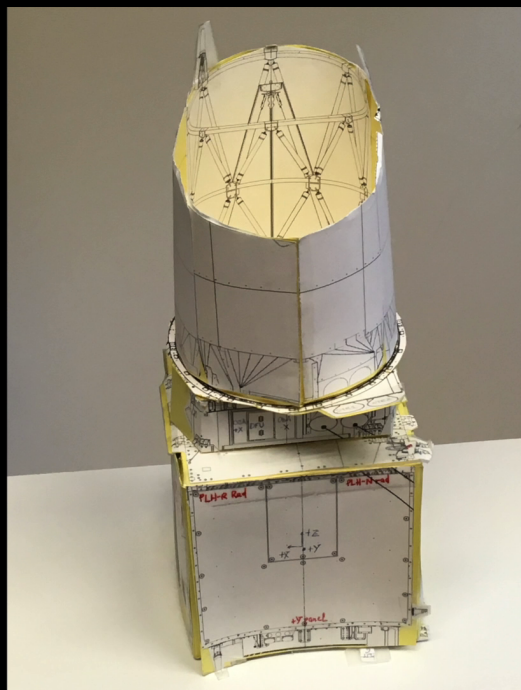
The screenshot shows the SAMeEdit application window with a detailed timeline editor. The timeline is divided into sections for CAMERAS, EARTH, SATELLITES, and GROUND STATIONS. The SATELLITES section is expanded to show two Sentinel-3A satellites (SENTINEL_3A) and their instruments (MWR, OLCI, SIF_OLCI_S3, SLSTR_B, SLSTR_N, SRAL). The timeline shows various events and data points for these satellites and instruments, with a vertical red line indicating the current time. A blue arrow points from the "Timeline Editor" box in the previous screenshot to this detailed view.



SAMIView



New member of SAMI family:
SAMIView



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M. Pinol Sole, M. Zundo | ESRIN | 14/11/2018 | Slide 12



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Download & User Support



Software & documentation available in EOP System Support website
<https://eop-cfi.esa.int/index.php/applications/sami>

Questions & suggestions
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