**SMOS: 10 years in orbit**

**SMOS has been in orbit for a decade. This remarkable satellite has not only exceeded its planned life in orbit, but also surpassed its original scientific goals. It was designed to deliver data on soil moisture and ocean salinity which are both crucial components of Earth’s water cycle. By consistently mapping these variables, SMOS is not only advancing our understanding of the water cycle and the exchange processes between Earth’s surface and the atmosphere, but is also helping to improve weather forecasts and contributing to climate research as well as contributing to a growing number practical everyday applications.**

10:00:00

ESA leader

10:00:10

Title: **SMOS, 10 years in orbit**

• 10:00:10:00

• EXT. SMOS Launch – Plesetsk Cosmodrome, Russia – 2009/11/02 – ESA

• INT. SMOS cleanroom – Thales-Alenia, France – 2009 – ESA (3shots)

• ANIMATION. SMOS unfolding instruments in orbit – 2009 - ESA

• ANIMATION. Earth water cycle – 2019 – ESA/planetary visions

• INT. Weather studio –unknown date - videoblocks

• INT. Israel desert fields –unknown date - videoblocks

**On November 2nd, 2009, SMOS was launched from the Plesetsk cosmodrome on top of a Rockot launcher.**

**SMOS is one of ESA’s Earth Explorer missions that address key scientific challenges and demonstrate new technology in space. Carrying a novel instrument to return information on soil moisture and ocean salinity, both key components of the Earth’s water cycle, SMOS is advancing our knowledge of how water is cycled between the Earth’s surface and the atmosphere. Understanding these exchange processes is crucial for understanding climate change, for improving weather prediction and, for example, helping to optimise water consumption when growing crops.**

• 10:00:54:11

• EXT. ESRIN grounds – Frascatti, Italy – 16/10/2019 – ESA

**ITW Yann Kerr, Principal Investigator SMOS programme, CNES**

SMOS measures directly the surface soil moistures. So this is really kind of the rain gage of the atmosphere so we collet the rain and we store it. Measuring surface soil moisture gives us a hint on the rainfall so we can partition the rainfall. But also looking at its evolution we can link it to different other things. One of them is of course dryness or wetness of the soil. So floods or droughts But also the fact that the impact of other events such as el nino or el nina, and its impact on the rainfall distribution and the wetness. So it is used to infer or monitor the droughts but also for food security in many regions to anticipate crop yields, especially in areas which are limited by rainfall.

• 10:01:47:24

• ANIMATION. SMOS 360° in orbit – 2009 – ESA

• INT. SMOS cleanroom – Thales-Alenia, France – 2009 – ESA (2shots)

• GRAPH. SMOS timeseries – 2018 – ESA

• ANIMATION. Rotating globe with ESA Climate Change Initiative examples – Unknown date – ESA

• ANIMATION. Cryosat 360° in orbit – Unknown date – ESA

• ANIMATION. Sea ice thickness change – 2019 – ESA/planetary visions

**This research satellite was originally planned to be in orbit for five years, but thanks to Europe’s technological excellence, it has already doubled its life on orbit, providing a time series data for a variety of applications. For instance SMOS data is used for ESA’s Climate Change Initiative through which data are compiled to understand how climate variables are changing over time. Its data are also combined with data from other satellites such as CryoSat to map the thickness of sea-ice, a crucial climate variable.**

• 10:02:22:15

• EXT. ESRIN grounds – Frascatti, Italy – 16/10/2019 – ESA

**ITW, Lars Kaleschke, Climate Researcher, Alfred Wegener Institute**

The artic is warming twice as fast as the global average and this is also reflected in the sea ice. We see the sea ice shrinking and this is known for many years from other satellites. But now with SMOS we have the possibility to measure the sea ice thickness. In particular the thickness of thin ice we can measure with SMOS. We have also the companion the ESA Earth Explorer Cryostat. This was specifically designed to measure ice thickness and Cryostat is great to measure the thickness of thick ice from the freeboard. But with SMOS we can accurately measure the thin ice. Thin ice is really important for the energy exchange between the ocean and the atmosphere above so this heat transfer from the ocean to the atmosphere depends on the thickness of the thin ice.

• 10:02:53:22

• ANIMATION. Soil moisture data – 2019 – ESA/planetary visions

• EXT. aerial Svalbard landscape – Spitsbergen, Norway – 2018 – ESA

• ANIMATION. Atmospheric Carbon Dioxide data – unknown date – ESA

• ANIMATION. Sea ice change – unknown date – ESA

• ANIMATION. Sea temperate and chlorophyl – unknown date – ESA

• ANIMATION. Microwave emissions from sea measuring winds – 2019 – ESA/Planetary visions (2shots)

• ANIMATION. SMOS orbiting the earth scanning – unknown date – ESA

• EXT. ECMWF grounds – ECMWF, Reading, UK – 2018 – ESA (2shots)

**SMOS data are also used to map the freezing and thawing of soil. This is important because frozen soil and in particular permafrost acts as a carbon sink. When permafrost thaws, carbon is released back into the atmosphere amplifying the greenhouse effect. By comparing data over several years, SMOS helps us to better understand variables affected by and affecting climate change.**

**Over the years SMOS has proven to be a versatile satellite going way beyond its original scientific goals. Today, SMOS data are even used operationally for weather prediction by organisations such as the European Centre for Medium Range Weather Forecasts.**

• 10:03:38:10

• EXT. ESRIN grounds – Frascatti, Italy – 16/10/2019 – ESA

**ITW Patricia De Rosnay, Senior Scientist, ECMWF**

SMOS is very important for weather prediction. Because Weather is related to forecast of the atmospheric variables but it is also related to land surface forecast, ocean forecast, river forecast and for this, for weather prediction our strategy is to develop an earth system approach where have a consistent forecast for the different components of the earths system. And in this context variables which are at the interface between land surface and atmosphere or ocean and atmosphere are very important to ensure the consistency of the across the different earth system components. And SMOS is exactly that, it is providing information at the interface between the different earth system components.

• 10:04:28:17

• ANIMATION. SMOS fly-by – Unknown date – ESA

• ANIMATION. SMOS data rotating globe – Unknown date – ESA

• ANIMATION. Change in sea ice thickness – Unknown date – ESA

• ANIMATION. SMOS fly-by – Unknown date – ESA

• INT. Female employees looking at screen – ESCAT, Harwell Campus in Oxfordshire, UK - ESA

• INT. Sentinel-6 in cleanroom – Airbus, Ottbrun, Germany – oktober 2019 – ESA (2shots)

**Over the course of a decade SMOS has given the scientific community an unprecedented wealth of data. And while it has long surpassed it intended lifespan SMOS remains hard at work while new missions are being studied and prepared to ensure continuous datasets with even higher resolutions and improved technology.**

**10:04:57:01**

**B-roll**

**10:04:57:01 à 10:09:54:02 B-roll 001**

**10:09:54:02**

**ITW,Yann Kerr, Principal Investigator SMOS programme, CNES – English**

• What is SMOS

• Why is SMOS important

• SMOS Time series and future of SMOS

• Practical applications of SMOS

10:12:57:11

**ITW,Yann Kerr, Principal Investigator SMOS programme, CNES – French**

• What is SMOS

• Why is SMOS important

10:14:10:04

**ITW, Lars Kaleschke, Climate Researcher, Alfred Wegener Institute - English**

• What is SMOS - cryosphere

• Why is SMOS important for the cryosphere

• future of SMOS

• Technical explication why SMOS is important

10:18:24:12

**ITW, Lars Kaleschke, Climate Researcher, Alfred Wegener Institute - German**

• What is SMOS - cryosphere

10:19:52:06

**ITW Patricia De Rosnay, Senior Scientist, ECMWF – English**

• What is SMOS

• Why is SMOS important for weather prediction

• SMOS timeseries and as an operational satellite

10:23:39:01

**ITW Patricia De Rosnay, Senior Scientist, ECMWF – French**

• What is SMOS

• Future of SMOS

10:25:20:04

**ITW Jacquelline Boutin, Research Director, CNRS – English**

• What is SMOS

• Why is SMOS important

• What can you measure with SMOS

• SMOS Time series

• SMOS and Climate applications

10:30:04:09

**ITW Nicolas Reul, Laboratory of Spatial Oceanography, IFREMER – English**

• What is SMOS

• Why is SMOS important

• SMOS Heritage and future

10:33:34:19

**ITW Nicolas Reul, Laboratory of Spatial Oceanography, IFREMER – French**

• What is SMOS

10:34:49:07

**Animated SMOS-data**

**Sea ice**

**Soil thaw**

**Cryosphere (antartic)**

**ESA/Planetary Visions**

10:40:24:03

**SMOS in cleanroom**

**Thales-Alenia**

**France**

**ESA**

10:42:08:00

**SMOS Animation**

**ESA**

10:44:14:21

**SPACE 19+ Credits**

10:44:23:01

. **END**