POLARIMETRY Training
SEOM program element

Yves-Louis DESNOS, Michael FOUMELIS, Peter REGNER, Claus ZEHNER, Steven DELWART, Marcus ENGDAHL, Jerome BENVENISTE, Ferran GASCON, Pierre-Philippe MATHIEU, , Bojan BOJKOV, Craig DONLON, Malcolm DAVIDSON, Benjamin KOETZ, Philippe GORYL, Simon PINNOCK

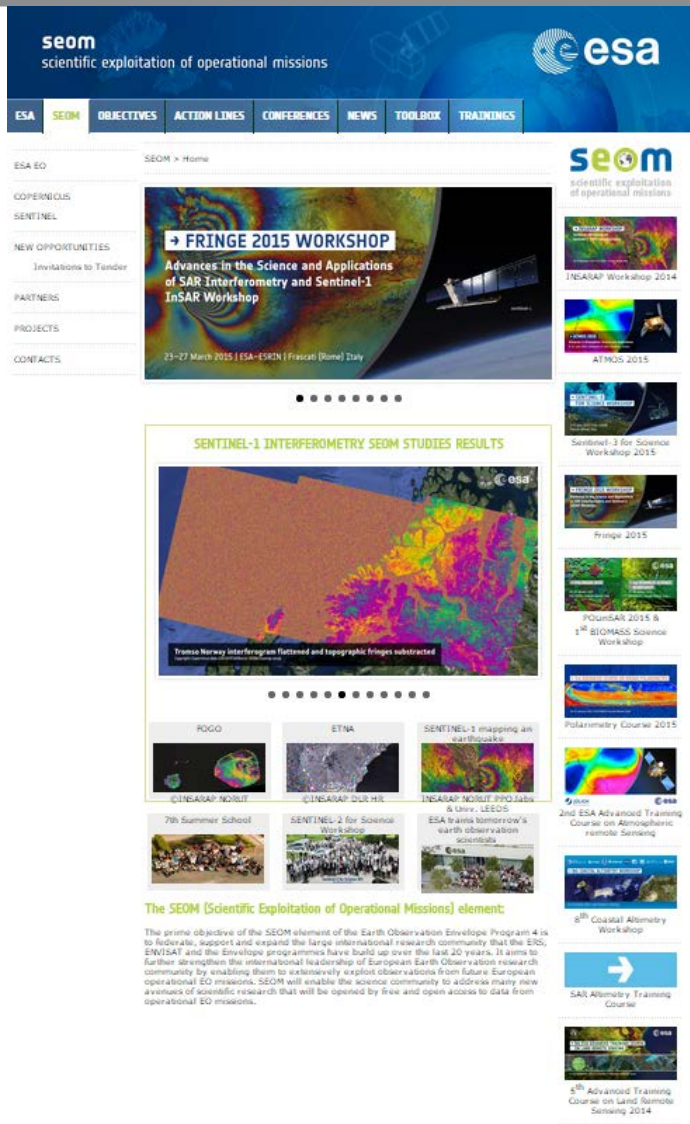
European Space Agency ESRIN/ESTEC/HARWELL

SEOM Element of EOEP4

SEOM objectives:

- Federate, support and expand the research community
- Strengthen the leadership of European EO research community
- Enable the science community to address new scientific research

Please visit SEOM.ESA.INT



Action Lines

Science Users Consultations

Organising a series of regular international **thematic workshops** for science users consultation and gathering users feedback

Scientific Toolboxes Development

Developing, validating and maintaining open-source, multi-mission, **scientific software toolboxes**

Research & Development Studies

Launching state-of-the-art **R&D studies** for scientific exploitation of operational missions

Training Next Generation of EO Scientists

Offering a multi-year programme of advanced international **training courses**, summer schools and educational materials

Promoting Science Data Use and Results

Promoting scientific use of data and ensuring a responsive ESA channel for regular, timely, high-quality **scientific publications**

Science Users Consultations

- **POLINSAR & 1st BIOMASS WS -** ESRIN 26-30 Jan 2015
  http://seom.esa.int/polinsar-biomass2015/
- **9th FRINGE WS** - ESRIN 23-27 Mar 2015
  http://seom.esa.int/fringe2015/
- **Atmospheric Science** – Sentinel 5P (Univ. of Crete, Greece 8-12 June 2015)
- **EO science 2.0 conference** (ESRIN 12-14 October 2015)
- **S3-Science WS –** VENICE , ITALY 2-5 June 2015
  http://seom.esa.int/S3forScience2015/
- **SEASAR** – ESRIN 25-29 January 2016

Science Users WORK PROCESS

International science **user consultations** are organized regularly

Science User recommendations are gathered

SEOM work plan approved at **PB-EO**

ITTs & Contracts are being placed

R&D-New Methods
Scientific Toolboxes
Trainings
Workshops Results

Reporting at next WS

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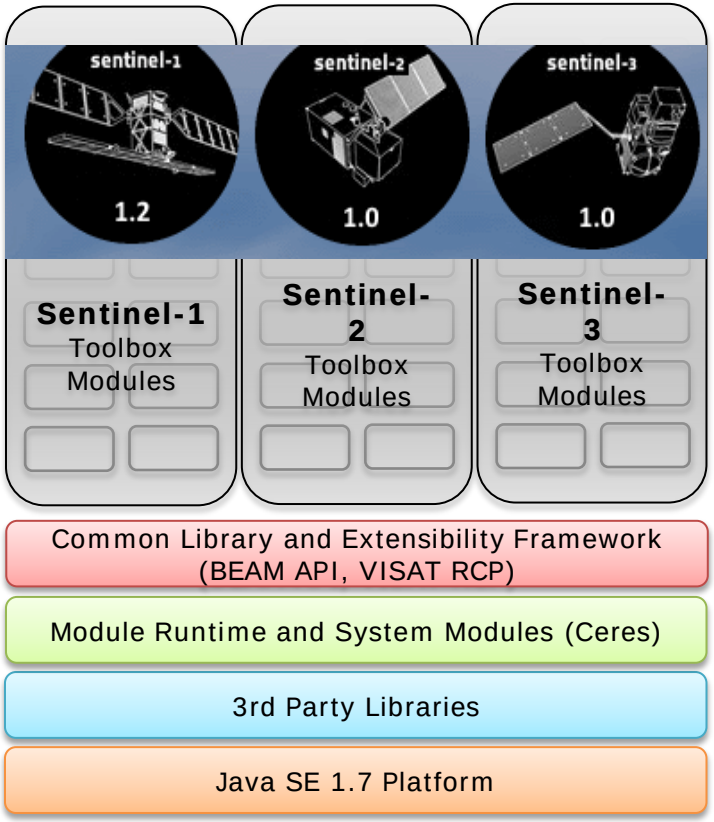
Scientific Toolboxes DEVELOPMENT

esa

Title	Subjet / Status	Cost (K€)	Team
S1-ToolBox	Multi-mission SAR TBX Kick-off Feb 2014 **1st Release Sep 2014**	530	**ARRAY (CAN)** DLR (D), Brockmann Consult (D) OceanDataLab (F)
S2-ToolBox	Multi-mission high-resolution multi-spectral TBX Kick-off Jan 2014 **1st Release Sep 2014**	550	**CS Systemes d'Information (F)** CS (RO) , Brockmann Consult (D) Telespazio Vega Germany (D), INRA (F), UCL (B)
S3-ToolBox	Multi-mission multi-spectral TBX Kick-off Feb 2014 **1st Release Sep 2014**	530	**Brockmann Consult (D)** CS (F), ACRI (F), Array (CAN), Univ. Reading (UK)
S5P-ToolBox	Atmospheric TBX for the S-5P Mission **1st Release Nov 2014**	250	**S&T (NL)**
Polsarpro Toolbox	SAR Full Polarimetry TBX new functionalities **V5.0 Next Release January 2015**	163	**SATIM Monitoring Satelitarny (POL)** & University of Rennes (FR)
S3-ALT – Toolbox	Scientific exploitation of SAR altimetry ITT issued Q3 2014	300	In preparation Kick Off January 2015
	Total	**2.323 M€**	

Sentinel1 / 2 / 3 Toolboxes

- Scientific Toolboxes facilitating the exploitation of Sentinel 1/2/3 data
- Developed as open source software
- The S1/S2/S3 toolboxes share a common architecture and are multi-missions
- Support ERS/ENVISAT and 3rd Party SAR & VIS/NIR/TIR imaging sensors
- Based on evolution of the ENVISAT-TPM toolboxes (BEAM/NEST/ORFEO)
- Sentinel toolboxes are specified to be portable to a Cloud infrastructure
- Three toolboxes developed in coordination by ESA with regular developer forums

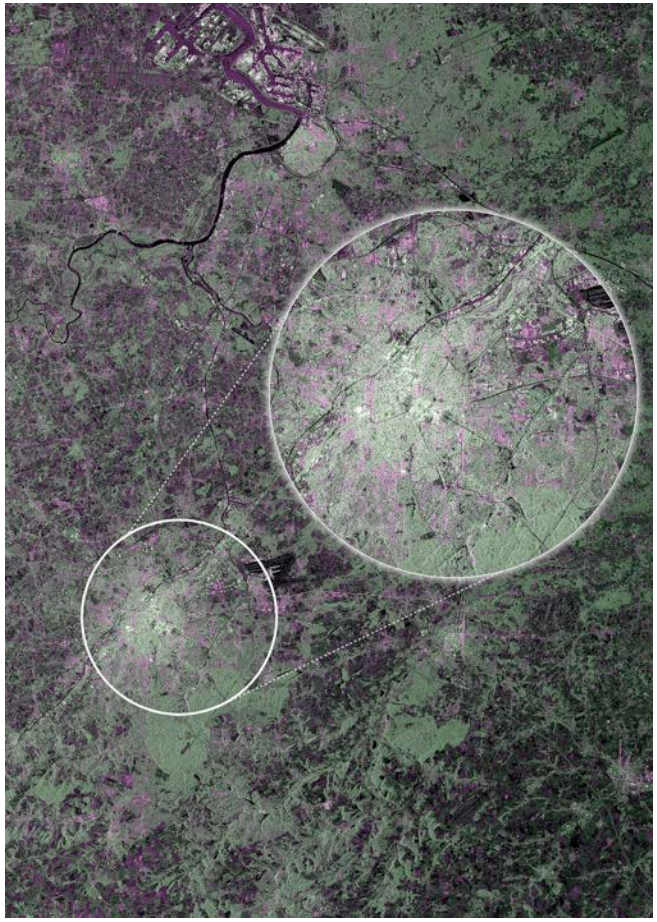


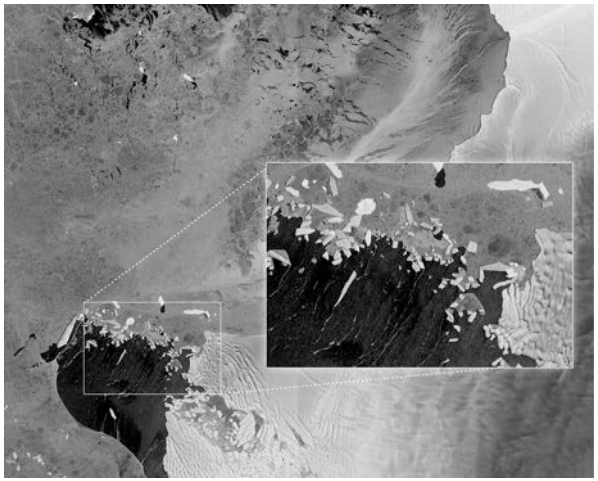
Available at https://sentinel.esa.int/

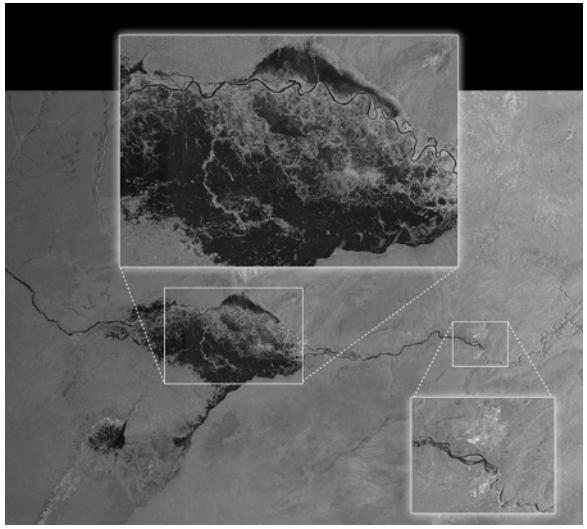
S1TBX: Array Systems Computing (CAN)
S2TBX: CS sytemes d'information (F)
S3TBX: Brockmann Consult (D)

Sentinel-1A *First images*

Post-Processing with S1TBX







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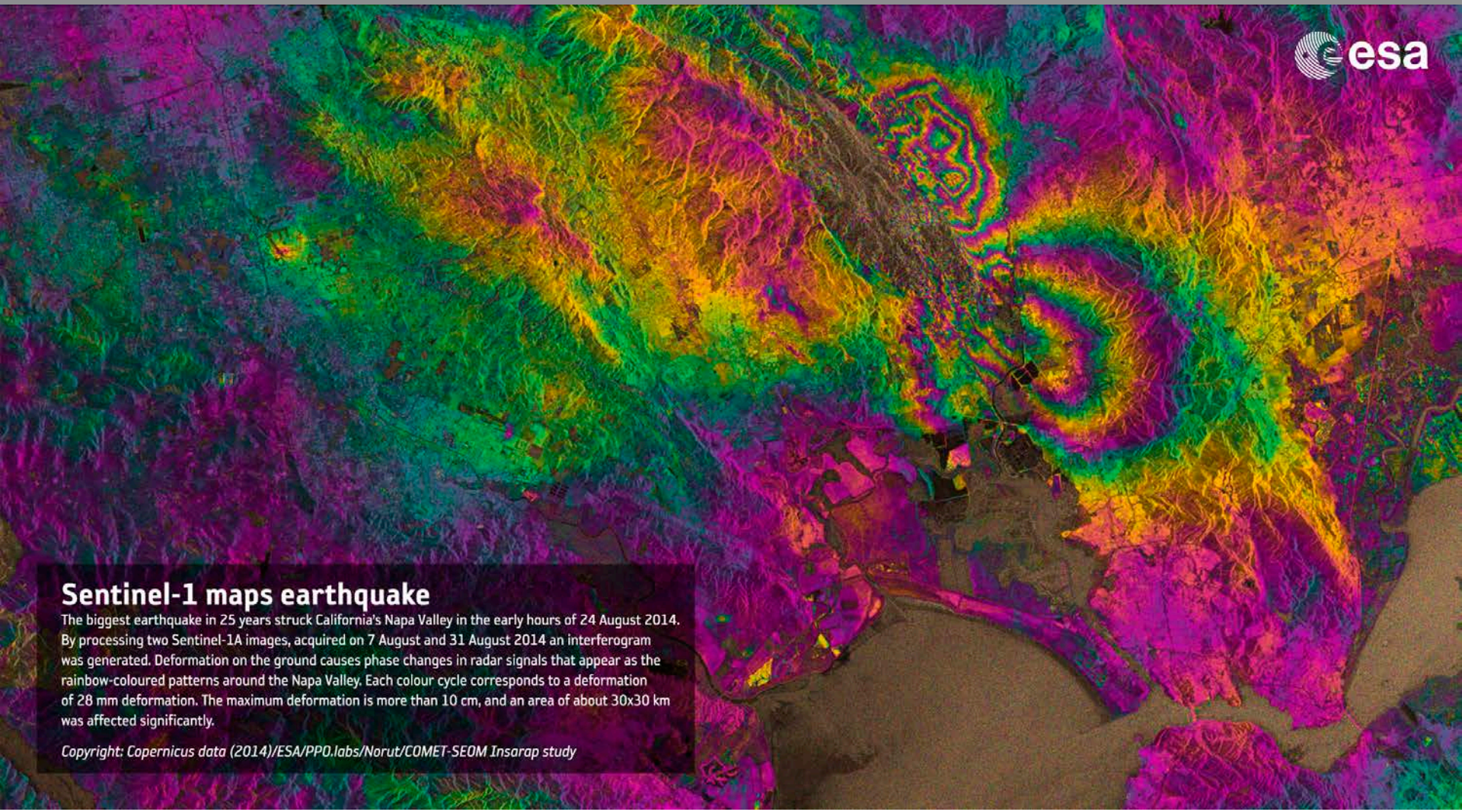
Research & Development Studies – Kicked Off

esa

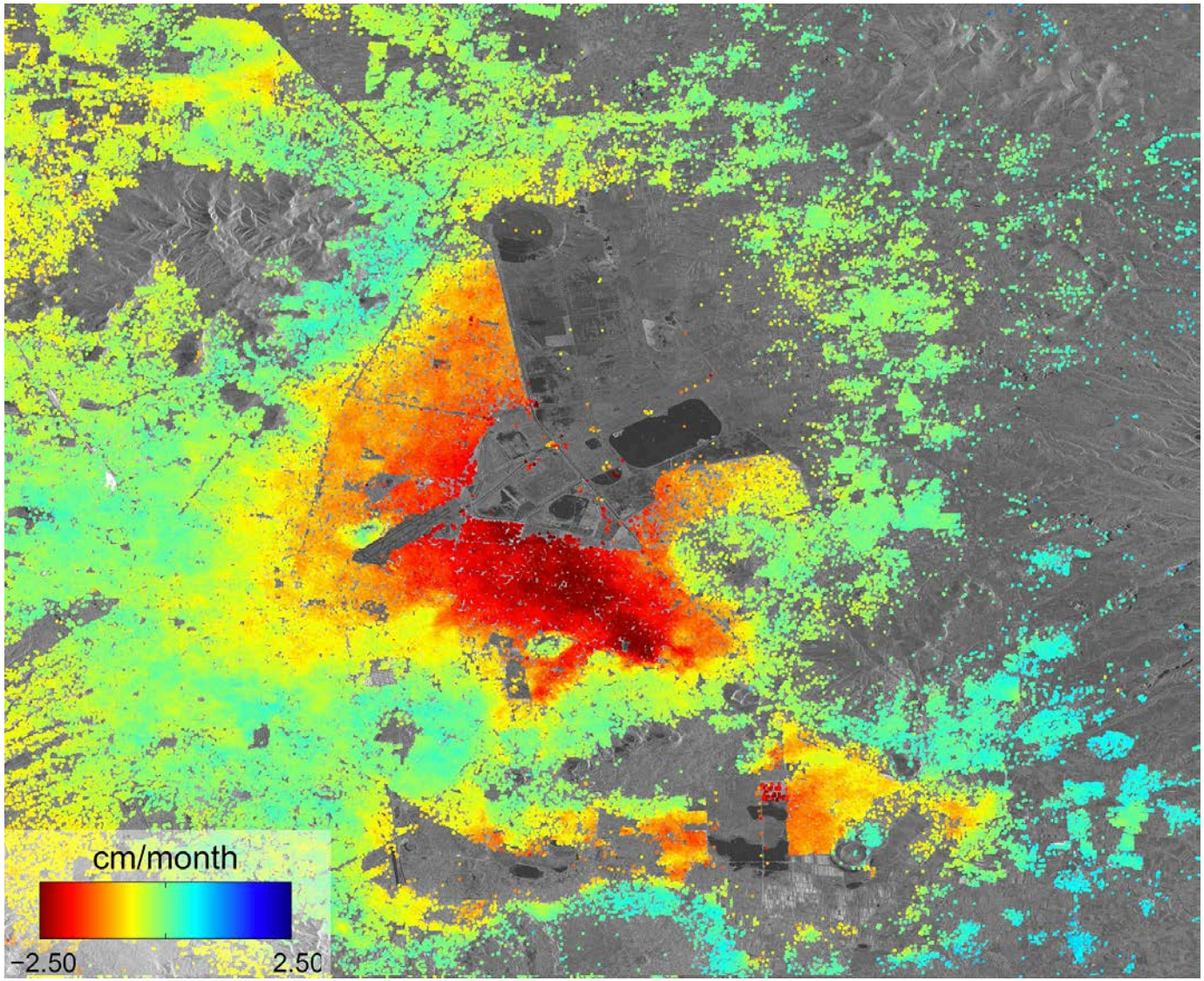
Title	Subject	Cost (K€)	Team
S1-INSARAP	SENTINEL-1 INSAR Performance study using TOPS data Two contracts kicked off in Mar 2014	250 250	**DLR (D)**; GFZ (D) e-GEOS (I), INGV (I) **NORUT (NO)**; University of Leeds (UK), PPO Labs (NL), Polish Geological Institute (PO), Geological Survey of Norway (NO)
S5P ISAS	Improved Atmospheric Spectroscopy Data-Bases (IAS) for S5-P Kick-off Jan 2014 1st PM June , Paris	530	**DLR (D)**, Karlsruhe Institute of Technology (D),URCA - Université de Reims (F),LIPhy - Laboratoire interdisciplinaire de Physique (F), SERCO (I)
S3-CAWA	Advanced **C**louds, **A**erosols and **WA**ter vapour products for Sentinel-3/OLCI Kick-off in July 2014, Berlin	350	**SpectralEarth (D)**, Brockmann Consult (D),Université de Lille (F), Catalysts (A)
EDUCEO	Pilot Projects Education for EO using Citizen science approach Kick-off in June and May 2014 respectively	150 150	**Geodan Holding b.v. (NL)** ,IIASA (A), Terranea UG (D), Sterrewacht Leiden (NL), KNMI (NL), ASTRIUM Ltd (GB) **VTT (FI)** , Pajat Solutions (FIN), PLAN Finland (FIN)
	Total	**1.68 M€**	

Sentinel-1A *Napa Valley Earthquake*
INSARAP (NORUT-PPO.labs-Univ. Leeds-COMET)



scientific exploitation of operational missions

Sentinel-1A *First subsidence monitoring with PS - INSARAP (DLR-HR))*



Five Sentinel-1A radar TOPS scans acquired between 3 October and 2 December 2014 were combined to create this image of ground deformation in Mexico City.
The deformation is caused by ground water extraction, with some areas of the city subsiding at up to 2.5 cm/month (red).

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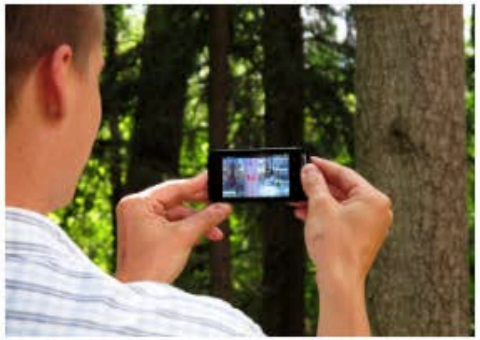
VTT, Pajat Solutions, Plan Finland



Pilot Project: Forest Biomass Analysis

PHOTO: UNICEF, JEOFFREY MAITERM

Pilot Project: Emergency Data Management

PHOTO: MARVIN G. BOYER

Pilot Project: Water Quality Monitoring

Geodan, IIASA, Astrium, KNMI, Leiden Uni, Terrenea

PILOT 1: AGRICULTURE

PILOT 2: LAND COVER

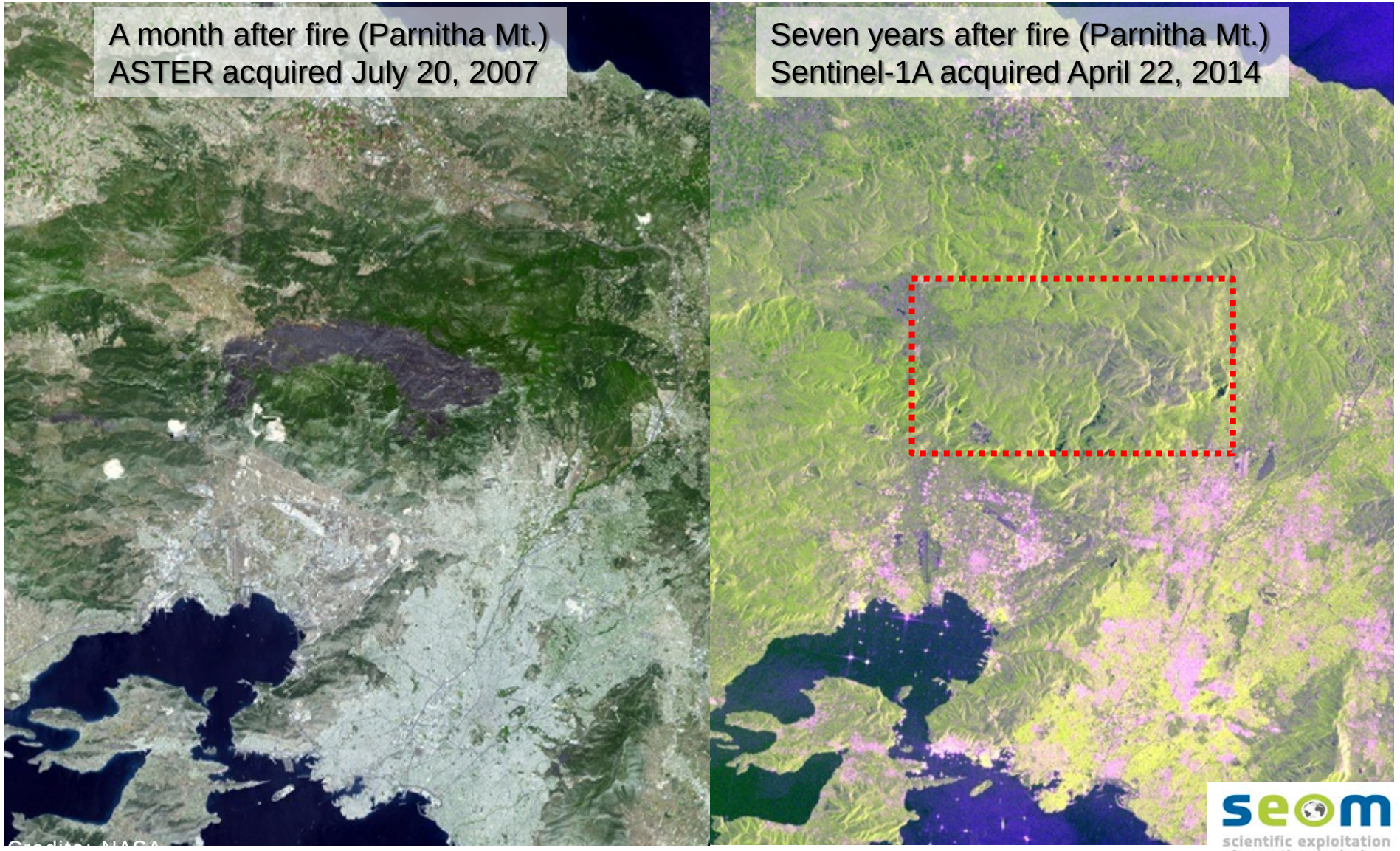
PILOT 3: FOREST MONITORING

Research & Development Studies – Kicked Off

Title	Subject	Cost (K€)	Team
SY-4SCI Synergy	**S1-S2 Land cover & agricultural mapping products** The project was successfully kicked off on October 23rd 2014.	250	***CLS/Altamira(F),*** *CNR IRPI(IT), EURAC(IT).*
SY-4SCI Synergy	**S2-S3** New type of **Vegetation products** The project successfully kicked off on 28 November 2014.	250	***Assimila Ltd (UK)****, UCL (Uk), ITC Uni Twente (NL)*
SY-4SCI Synergy	**S5P-S3 Phytoplankton Functional Types** (PFTs) The study has been kicked off on the 1st December 2014.	300	***Alfred Wegener Institute (AWI)*** *Helmholtz Centre for Polar and Marine Research (D), University of Bremen (D) and science support LOV(F) and PML(UK)*
SY-4SCI Synergy	**S1-2-3 Ocean virtual laboratory** The project successfully kicked off at ESTEC on 23-24th October 2014.	250	***Ocean Data Laboratories (FR),*** *NERSC (NO), IOPAN (PO), PML (UK), UPT (RO).*
	Total	**1.05 M€**	

Sentinel-1

Vegetation Regeneration – Burn Scar (Greece)



Credits: NASA

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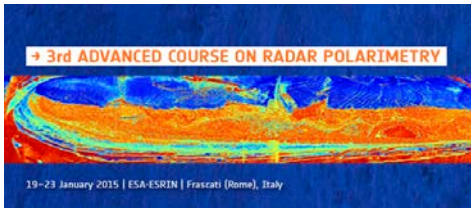
ITTs in preparation - Contracts to be awarded **in 2014/2015** (total of 6.35 M€) :

SEOM Call	Subject	Cost	ITT Status
S1-4SCI *Ocean*	* TOPS and Wave mode & Polarisation in C-band (wide swath wind, wave, and current retrieval)	0.35 M€	in preparation Q1 2015
S1-4SCI *Land*	* Land Cover * Vegetation * Snow * Soil Moisture	1.0 M€	in preparation Q2 2015
S2-4SCI *Land and Water*	Radiometric Validation * Atmospheric Corr. & Cloud * Classification * Multi-temporal Analysis * Coastal & Inland Water * Coral reefs	1.5 M€	in preparation Q1 2015
S3-4SCI *SAR Altimetry*	* Coastal * Hydro * Land * Altimetry-Echo	1.0 M€	ITT out September 2014
S3-4SCI *Land*	* Surface-Atmosphere retrievals * Fire * LST* Data scaling	1.0 M€	in preparation Q2 2015
S3-4SCI *Ocean Color*	* Carbon Pools in the Ocean * Integrated PAR * Extreme Case2 Waters	0.8 M€	ITT out July 2014 Under approval Kick Off Q1 2015
S5P-4SCI Atmosphere	* Volcanoes* Synergies UV-IR* Fluorescence & Cloud properties* Air Quality	1.0 M€	in preparation Q1/Q2 2015
	Total	**6.65 M€**	

Training Next generation EO Scientists: in planning

- **EO Summer School on "Earth System Monitoring & Modeling"** 4-14 Aug 2014, ESRIN
  200 applications; 70 selected
- **Land Remote Sensing** 8-12 Sep 2014, Valencia (E)
  173 applicants , 70 selected
- **SAR Altimetry**, 21-22 Oct 2014, Konstanz (D)
- **Atmospheric Remote Sensing**, 27-31 Oct 2014
  Research Centre Jülich, (D) ,41 Applications -35 selected
- **Radar Polarimetry** Training, 19-23 Jan 2015, ESRIN 70 Applications, 60 selected
- **Ocean Remote Sensing**, 7- 11 September 2015 IFREMER France
- **Land Remote Sensing** 14-18 September 2015,UASMV, Bucharest ROMANIA

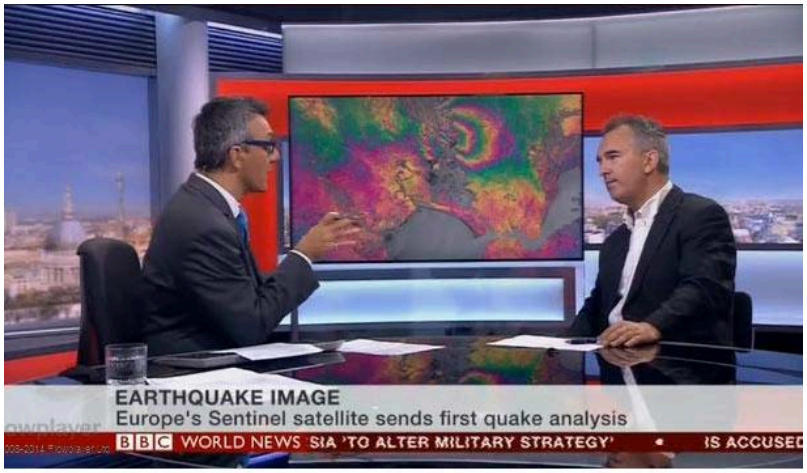


The ESA Living Planet Fellowship Scientific Exploitation of the Sentinels: Call for Research Proposals (closure end June 2014)

7 Post Doc grants for scientific exploitation of the sentinels

Title	name	surname	Host Institution	MS
OCEAN sUrface current reconstruction from the Synergy of SENTINEL 3 sensors.	Cristina	González Haro	Institut Mines Telecom - Telecom Bretagne	FR
Estimation of COastal BAthymetry from Wave motion using Sentinel-1 and -2	Danilo	Céline	University of Trento	IT
Automated avalanche debris detection using Sentinel-1	Markus	Eckerstorfer	Northern Research Institute (Norut)	NO
Improving ocean color data over icy Arctic waters using medium and high spatial resolution satellite images	Clemence	Goyens	Université du Quebec à Rimouski	CAN
Integrating SENTINEL time series products in agro-hydrological studies	Sylvain	Ferrant	CESBIO	FR
Integrating Sentinel-2 and Landsat-8 data to systematically generate value-added products at high resolution	Patrick	Griffiths	Humboldt-Universität	DE
Applications of satellite observations of tropospheric NO2 at hIgh Latitudes for Monitoring Air quality: preparing for TROPOMI data exploitation	Iolanda	Ialongo	Finnish Meterological Institute	FIN

Promoting EO Science Results : WEB news



Jonathan Amos @BBCAmos · 37m
It's not everyday you see interferograms on the TV, but you would have today
bbc.in/Z5tCQw #napaearthquake pic.twitter.com/HD2Ri52LBo
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Science correspondent
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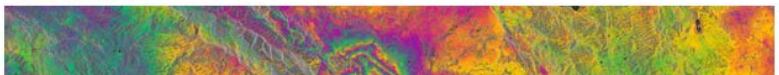
Sentinel system pictures Napa quake

COMMENTS (3)



sentinel-1 esa

ESA OBSERVING THE EARTH COPERNICUS SENTINEL-1

Sentinel-1 at a glance
- A new era in Earth observation
- Facts and figures

Applications
- Oceans and ice
- Changing lands
- Emergency response

About the mission
- Satellite constellation
- Radar vision

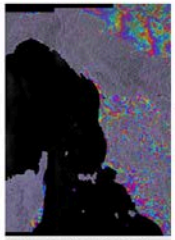
Sentinel-1 in orbit
- Launch
- Launch site

+ Meet the team

ESA > Our Activities > Observing the Earth > Copernicus > Sentinel-1

Search here

SENTINEL-1 POISED TO MONITOR MOTION


New views from Sentinel-1A

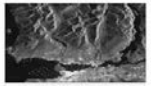
26 August 2014 Although it was only launched a few months ago and is still being commissioned, the new Sentinel-1A radar satellite has already shown that it can be used to generate 3D models of Earth's surface and will be able to closely monitor land and ice surface deformation.

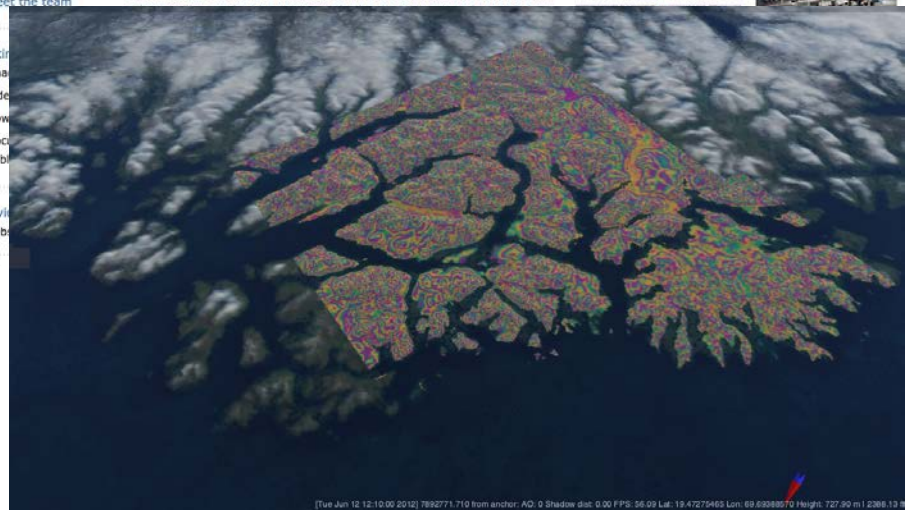
As the first in a fleet of satellite missions for Europe's Copernicus environmental monitoring programme, Sentinel-1A was launched on 3 April. It carries an advanced radar instrument to image Earth's surface through cloud and rain, regardless of whether it is day or night.

Among its many applications it will routinely monitor shipping zones, map sea ice and provide information on winds and waves for marine traffic, track changes in the way land is being used, provide imagery for rapid response to disasters such as floods, and monitor uplift and subsidence.


Sentinel-1

copernicus


Data access & technical information



Promoting EO Science Results : WEB news

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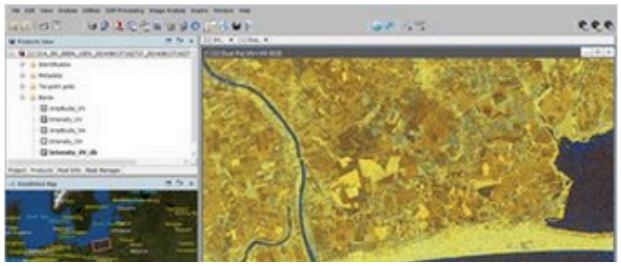
ESA > Our Activities > Observing the Earth > Copernicus

NEW TOOLBOXES MAKE USING SENTINEL DATA EASY



30 September 20
built primarily to
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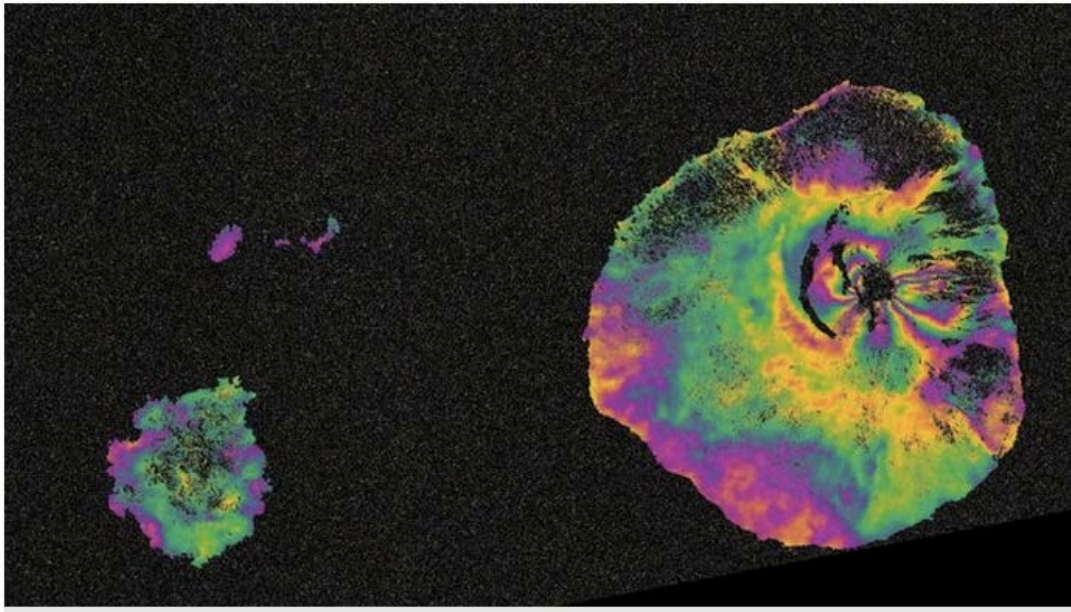
ESA > Our Activities > Observing the Earth

ESA TRAINS TOMORROW'S EARTH OBSERVATION SCIENTISTS

17 September 2014 World-renowned remote sensing experts gathered in Valencia, Spain, last week to train the next generation of Earth observation scientists in the exploitation of satellite data for land applications.

As part of the Scientific Exploitation of Operational Missions programme, ESA organises the advanced

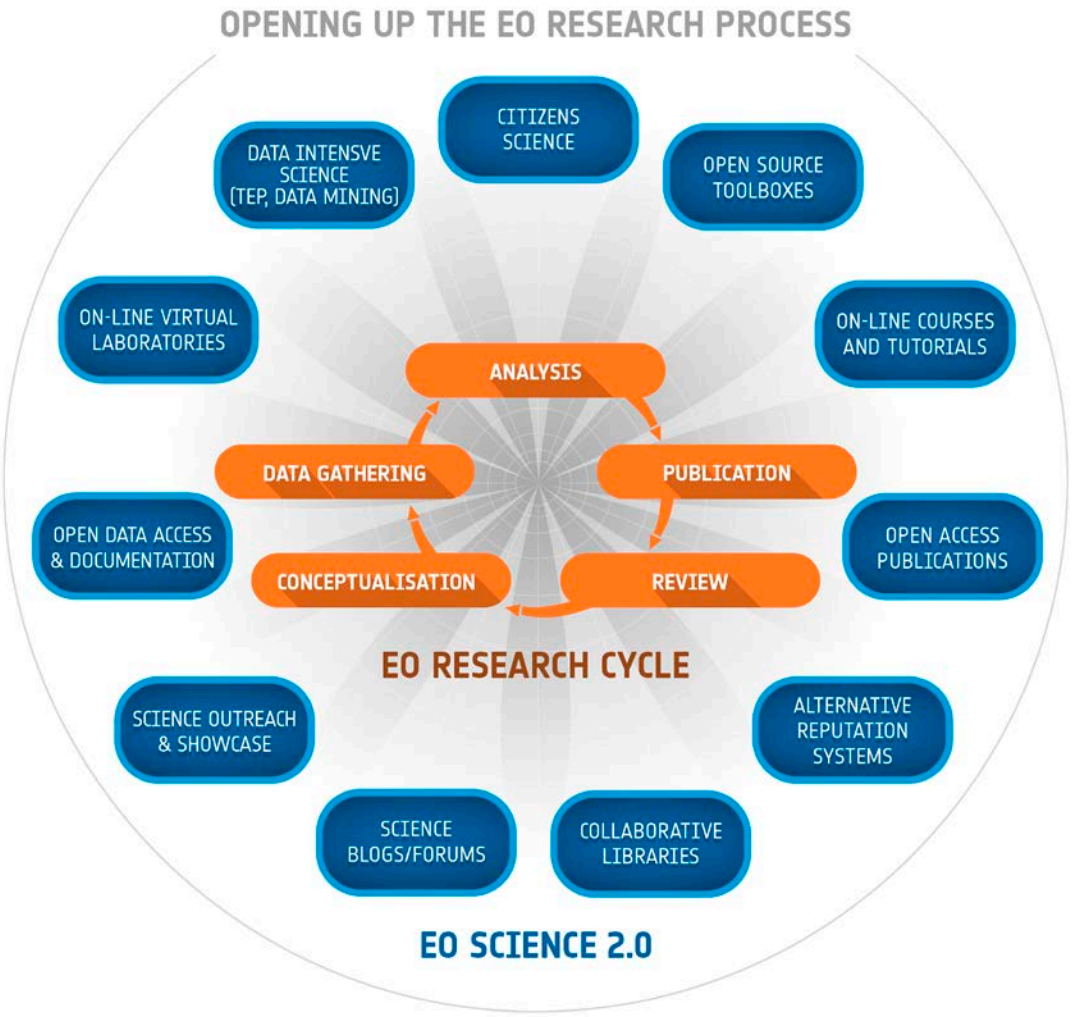


Sentinel-1 maps Fogo eruption

FOGO VOLCANO ON SENTINEL'S RADAR

2 December 2014 Radar images from the Sentinel-1A satellite are helping to monitor ground

PREPARING THE FUTURE :
ESA contribution to transformative Science 2.0



- Open data, Open API, Open Publications,
- Cloud-based data analytics, Open Source Toolboxes, libraries of workflows for EO processing,
- Virtual Living Labs, App camps, Hackhathons,
- Crowdsourcing & Citizens science activities,
- Advanced training of new class of data scientist,
- Scientific outreach on social media,
- E-learning, MOOC on EO for Climate,

Earth Observation Science 2.0 conference ESA, ESRIN, 12-14 Oct 2015

Conference website at http://congrexprojects.com/15c12/background

SUMMARY

1. New exploitation element focused on scientific exploitation (Sentinels)
2. Opportunities for R&D
3. Development of scientific toolboxes ongoing
4. Regular Training for next generation EO scientists
5. Regular Science users workshop consultations
6. Work plan based on science user recommendations and approved at PBEO (every year)
7. Preparation for future in exploitation -> EO Science 2.0

Visit http://seom.esa.int