

EO-ALERT

Next Generation Satellite Processing Chain for Rapid Civil Alerts

Newsletter

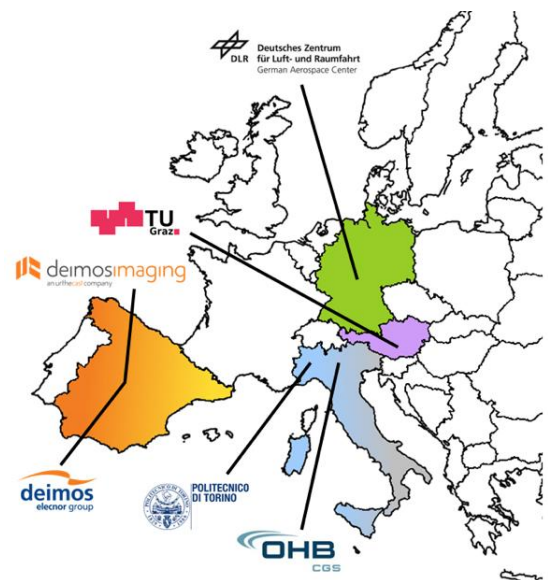
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EO-ALERT at a glance

The EO-ALERT project is an H2020 European Union research activity coordinated by Deimos Space. Started in January of 2018, and lasting three years, it aims at achieving very high throughput and very low latency (< 5 minutes) in the delivery of Earth observation images and products. The partners of the project are Deimos Space, DLR, Technische Universität Graz, Politecnico di Torino, OHB Italia and Deimos Imaging, with the participation of the Spanish State Meteorological Agency (AEMET) as a third party. The consortium covers the full R&D cycle, from university to industry, and over the full EO value chain, facilitating the maturation of the innovative concepts, to enable their rapid exploitation in upcoming EO missions.

EO-ALERT proposes the definition and development of the next-generation EO data and processing chain, based on a novel flight segment architecture that moves optimised key EO data processing elements from the ground segment to on-board the satellite, with the objective of providing the EO products to the end user with very low latency (enhanced-NRT) for increased throughput.

The main objective of EO-ALERT is that of developing, in a fully integrated approach, the technological building blocks required to achieve the primary goal of a next-generation EO data and processing chain, to provide enhanced EO products and services in terms of high availability rate and very low latency (e.g. rapid meteorological and civil security image products and warnings).



EO-ALERT identifies two main scenarios for testing high-speed data chain

Ship detection

A deep analysis of the most common needs of maritime users has been performed in order to detect the specific needs. The most important aspects are to have a pixel size as small as possible, at least 1m and a low revisit time. SAR satellites are the most suitable for ship detection, whereas very high-resolution



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optical imagery reduce false positives and allow ship identification. Key needs for the project have been identified in **flexibility**, in order to mitigate risks and choose the image acquisition target date; **responsiveness**, in order to make last minute changes to the image request, one hour is the target; **revisit**, a constellation with less than 6 hours between satellites.

Deimos-2 and TerraSAR-X have been selected for the optical imagery and radar data respectively. Sentinel-2 and Sentinel-1 are included as backup missions.

Taking into account the user needs and in order to develop the most suitable technology, the following tests are proposed in the Mediterranean Sea: **Ship Monitoring**, the objective is focused on illegal fishing and cargo monitoring between 10–20 meters. TerraSAR-X will be used for ship location and detection, and Deimos-2 for ship identification to confirm the SAR detection; **Coastal Monitoring**, the objective is focused on maritime safety and illegal migration. TerraSAR-X will be used for ship location and detection, and Deimos-2 for ship identification to confirm the SAR detection.



Extreme weather monitoring

Another field where EO-ALERT technology can be very helpful and beneficial is meteorology. Very early alerts for some meteorological phenomena that are hard to forecast in space and time, like convective storms, are very useful for the forecaster's nowcasting tasks. This kind of information can reduce the negative impact of these kind of hazardous phenomena. On the other hand, NRT information on surface winds can be very profitable for offshore wind farms.



Two meteorological phenomena are going to be detected in this scenario: **convective storms** and **surface winds overseas and oceans**. In case of convective storms, four stages of convection should be detected: preconvective environments, convection initiation, and mature and dissipation stages of the storms. Special attention will be given to storm detection and monitoring, providing specific information on individual storm location, trajectory and characteristics. Information on overshooting tops detection will also be provided. Convective storm detection will be mainly based on Geosynchronous Equatorial Orbit (GEO) platforms data.



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SAR data will be used for surface wind speed estimations overseas and oceans. OPERA weather radar network products have been chosen as the ground truth for convective storm detection over continental areas. Weather radar on-board a ship will be used for storm detection overseas and oceans. Wind speed detection buoys with anemometers and/or anemometers on-board ships will be used as the ground truth for surface winds alerts.

EO-ALERT organizes first Technology Workshop

The EO-ALERT Technology Workshop, scheduled for the end of 2019, will be held at DEIMOS Space premises in Tres Cantos, Madrid. It will focus on the results of the technologies analysed and developed in the frame of the project. The main objectives are to promote the interaction with external representatives of the industry and the innovation achieved in the project, with a focus on the project results accomplished and further exploitation. The workshop will provide a forum firstly for the detailed dissemination of the results of the project, and its dissemination as a collective group. The activity will include inviting keynote speakers and it is directed mainly to the relevant scientific-industrial communities, including also end users of the technology developed during the EO-ALERT project.

Upcoming Events

IAC 2019

The International Astronautical Congress (IAC) is the annual meeting of the International Astronautical Federation, which this year will be held at Washington, D.C., from 21 to 25 October 2019, to celebrate the 50th anniversary of a feat once thought impossible: humans walking on the moon. Otto Koudelka (TUGRAZ) will give the presentation “A High-Performance Low-Cost Communications System for LEO Satellites” in the Satellite Communications and Navigation symposium.



ESA Phi-week 2019 in ESA-ESRIN

The European Space Agency (ESA) is organising a Φ -week event, from 9 to 13 September 2019 in Frascati (Rome), Italy, focusing on EO Open Science and FutureEO – to review the latest developments in Open Science trends and to explore how EO Open Science and innovation can benefit from the latest digital technologies, helping shape FutureEO missions and services. Murray Kerr (Deimos), EO-ALERT coordinator, will participate and present the current status of the EO-ALERT project to multi-disciplinary communities.



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United Nations/Austria Symposium: "Space: a Tool for Accessibility, Diplomacy and Cooperation"

The UN/Austria Symposium is one of the long-standing activities that are performed under the Programme of Space Applications of the United Nations Office for Outer Space Affairs. This year the symposium is organized in Graz from 2 to 4 September 2019. Murray Kerr (Deimos), EO-ALERT coordinator, is an invited speaker, and will present on the innovations and paradigm changes offered by EO-ALERT, especially for

developing nations. EO-ALERT enhances space accessibility, by answering to the end users the need of providing EO products with very low latency (enhanced-NRT) for increased throughput and proposing a cutting-edge solution. This also provides the flexibility of space service targeting to developing nations.

Past Events

International Workshop on On-Board Payload Data Compression (OBPDC2018)

EO-ALERT was in Matera, Italy, at the On-Board Payload Data Compression Workshop organized by ESA and CNES on 20 and 21 of September 2018. The workshop covered several aspects of on-board data compression, including applications, algorithms, implementations, and security, bringing together all the professionals working in the field. Enrico Magli (POLITO) gave an overview of the EO-ALERT project, presenting preliminary project results on the development of a flexible and reconfigurable data handling architecture integrating different on-board technologies.

European Workshop on On-Board Data Processing (OBDP2019)

Initial results of EO-ALERT activities were presented at OBDP2019, co-organised by ESA, CNES and DLR and hosted at ESTEC in the Netherlands, from 25 to 27 February 2019. The workshop covered topics related to on-board data processing for space applications, aiming to provide an interface between on-board processing equipment manufacturers and data processing users. Juan Ignacio Bravo and Murray Kerr (Deimos) presented the preliminary on-board image processing solution developed for EO-ALERT, providing examples of its performance on DEIMOS-2 and Meteosat Second Generation payloads, the first



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confirmed indications on the achievement of the EO-ALERT concept, for the provision of EO products with very low latency (< 5 minutes). Enrico Magli and Diego Valsesia (POLITO) discussed the application of CCSDS compression standard to SAR raw data and introduced a simplified on-board compression solution with high throughput based on pre-quantization and on-ground post-processing via a convolutional neural network.



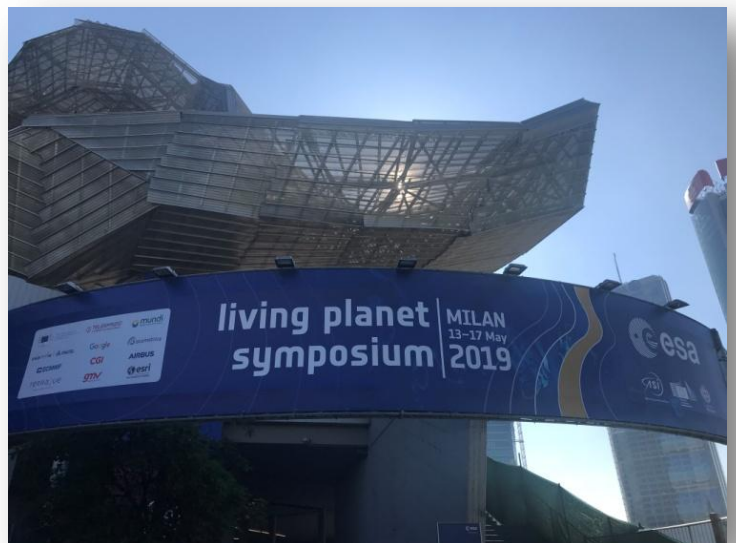
European Nowcasting Conference 2019

Between 24 and 26 April 2019 EO-ALERT was at the European Nowcasting Conference organized in Madrid under the umbrella of the EUMETNET Nowcasting Programme. The conference discussed recent advances in the theory and practice of nowcasting in Europe and other parts of the world, welcoming participants from operational, research

and forecast user communities. Aniello Fiengo (Deimos) presented on-board processing solutions developed in EO-ALERT to achieve on-board storm detection in support to nowcasting.

Living Planet Symposium 2019

EO-ALERT was recently in Milan at the European Space Agency's 2019 Living Planet Symposium. The event took place from on 13-17 May 2019, focusing on how Earth Observation contributes to science and society, and how disruptive technologies and actors are changing the traditional Earth Observation landscape. Stefania Tonetti (Deimos) introduced the activities performed during the first part of EO-ALERT, focusing on the user requirements for the EO-ALERT data processing chain, which are based on the identified market needs for the ship detection and extreme weather monitoring application scenarios. A high-level mission analysis for the above assets, encompassing coverage analysis, ground station contact analysis and data latency, was presented.



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