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## Thank you for visiting CAE at the Meteorological Technology World Expo 2024 in Vienna

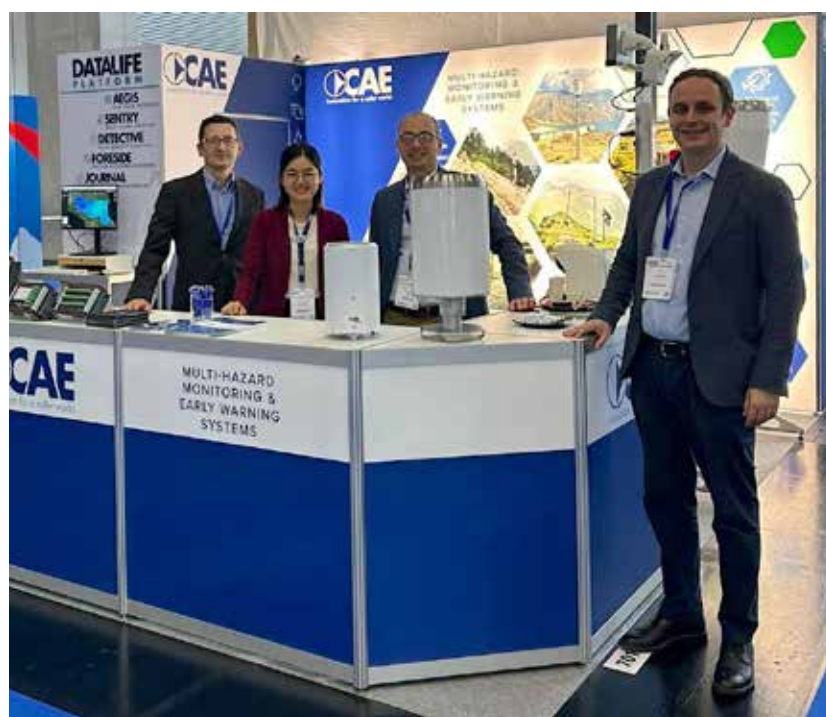
All CAE team appreciate the opportunity we had to show you our software, solutions and technologies at the service of the environment, such as DatalifePlatform, Compact datalogger and PG4i stand-alone rain gauge.

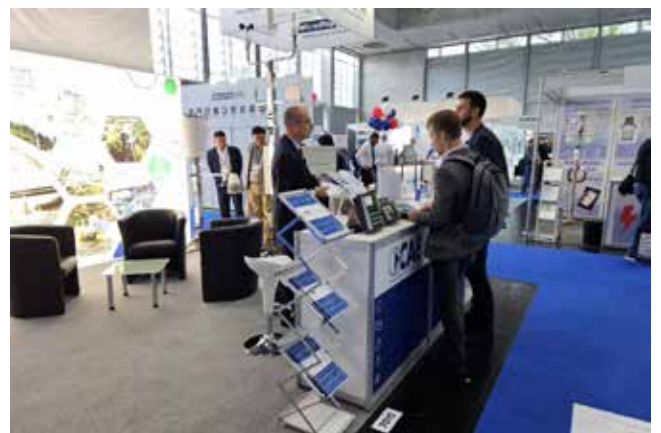
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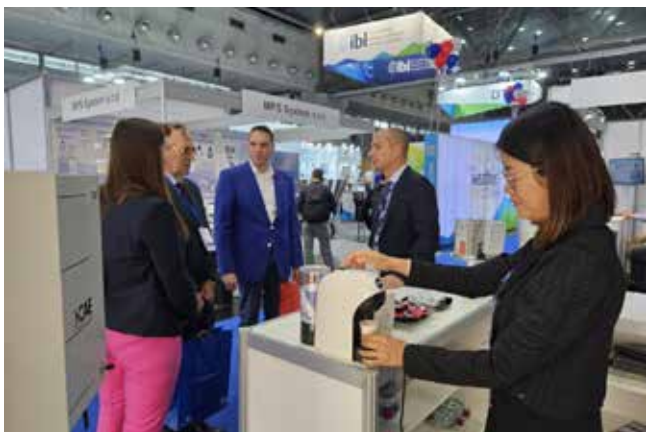
Now that you have got to know us, don't hesitate to contact our International Account Manager for any questions at [alberto.ber-tocco@cae.it](mailto:alberto.ber-tocco@cae.it)

We look forward to serving you!

CAE Team ■







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## CNR and CAE together against fires in the Arctic

In the Arctic, global warming leads to changes that are quicker than anywhere else on our planet and are more than ever evident. The changes, which have occurred and are taking place, have environmental, social and economic impacts, both locally and planet-wide, due to the role of the Arctic in the global climate system. As it is usually said: “what happens in the Arctic does not stay in the Arctic”. The main motivation behind **Arctic PASSION is the co-creation and implementation of a coherent and integrated Arctic observation system, adapted to the different needs of the users, ranging from local inhabitants and the academic world, up to the industry and decision-makers.**

The programme of the “Pan-Arctic Observing Systems - pan-AOSS” aims to overcome the known

flaws in the current observation system by refining its operation, improving and extending pan-Arctic scientific and community monitoring and integration with indigenous and local knowledge, simplifying access and interoperability of Arctic data systems and services, and ensuring the economic feasibility and sustainability of the observation system for years to come.

Pan-AOSS and the services delivered by Arctic PASSION intend to answer the demand for **better access to more reliable and more diversified data streams and observation services**, deriving from communities, economy, governments and others, to enable them to develop policies, investments, management and social decisions based on scientific evidence and accurate information.



## Develop an INTe grated Fire Risk mAnagement INFRA Pilot Service for Arctic Wildfires



# ARCTIC PASSION

The working team:



Arctic PASSION is a project **funded** by the European Union's **Horizon 2020** research and innovation programme and that leverage a broad mix of expertise that comes from as many as **43 partners from 17 countries**, including indigenous communities across the Arctic.

One of the specific themes addressed by the project is that of **wildfires**, which in recent years have seen a **dramatic increase** at high latitudes. Newspapers and television increasingly deliver us images of huge fires and clouds of smoke that cover vast regions of Asia and North America. **Rising temperatures in the Arctic have resulted in droughts during the spring and summer seasons in the Arctic tundra and the surrounding northern forest.** At the same time, warmer Arctic and sub-Arctic regions promote an **increase in thunderstorms and lightning**, the typical events that **trigger fires** in the Arctic. Human activities such as timber extraction and mining contribute to the impoverishment and drying up of the land.

So, **global warming in the Arctic helps to increase both the fuel to be burned and the opportunities**

**for ignition**, the two main ingredients (in addition to oxygen) needed to ignite a fire. The increase in the number and intensity of the events and the increase in human activities make it necessary to monitor the risk of wildfires well in advance before they get too close to infrastructure or settlements. This is a topic increasingly present. Just imagine that the Copernicus Atmosphere Monitoring Service (CAMS), engaged in monitoring wildfire emissions and the consequent spreading of smoke in the Arctic Circle, have reported fires of vast proportions in June 2024. Most of the fires are burning in the Sacha-Jacuzia Republic, which experienced extensive high-intensity fires in the summer of 2021. The set of the CAMS Global Fire Assimilation System (GFAS) data shows that **carbon emissions from June's wildfires are already the third-highest in the past two decades**, following the significant fire seasons of 2019 and 2020.

The Arctic region of the Sakha Republic experienced much higher surface air temperatures and drier than usual surface conditions for the time of year, providing the favourable environmental con-

ditions for wildfires after ignition. CAMS scientists monitored a significant increase in the total daily radiative power of fires (FRP), indicating the intensity of fires and smoke emissions across the region.

The **June's total monthly carbon emissions from fires**, estimated by CAMS based on FRP observations, are the third highest in the last two decades, with **6.8 million tons of carbon**, behind June 2020 and 2019, which recorded 16.3 and 13.8 million tons of carbon, respectively. To have a reference term, just imagine that the entire "Country of Italy" emits, on average, less than 30 million tons of CO<sub>2</sub> in a month.

The increase in the number, intensity and extent of fires is not the only problem to be addressed. These critical issues end up fuelling and increasing the natural conflict that always exists in the Arctic between local populations and the services that come from the central Country or from its Regions. Indigenous peoples complain of an exclusion from land management, and the abandonment of management practices that they have always applied. On the other hand, fire emergency prevention and management services are completely absorbed by emergency management and certainly have less time and resources to dialogue with the populations. The overall result is both a lack of preventive information and education of the local populations concerning this changed scenario regarding wildfires, and then a reluctance of communities and inhabitants to accept the provisions and requests that come from services considered wrongly or rightly distant and little interested in the real needs of people. With the aim of addressing this situation, **CNR and CAE are creating an integrated web-based system intended to summarise and simplify access to relevant information/products that come from different sources**, making it possible to manage, integrate, select and transform these sets of information. Focusing on the local scale, INFRA offers the possibility to generate and distribute

tailored messages for non-scientific end-users: individuals, communities and indigenous organizations, municipalities.

The National Research Council (**CNR**) has been engaged for decades, including through its specific Institute of Polar Sciences, in **understanding the climate changes taking place in the Arctic and Antarctic environments** and possible future developments both at the polar and global levels. In this project, the CNR brings not only the experience gained in polar activities, but also that of its Institutes with specific expertise in temperate areas such as the structure, operation and productivity of terrestrial and/or meteorological ecosystems and numerical forecasts, satellite observations and more.

**CAE** counts with 45 years of history in the creation **of real-time observation systems of natural phenomena**, with specific attention to civil protection and **risk mitigation applications for communities**. In this project, it brings both expertise in computer platforms, with extensive use of geo-referencing data, support to decisions and alert dissemination, and its specific experience in systems for the early detection of wildfires and their management.

The **Integrated Fire Risk Management Tool (INFRA)** is a service intended to address the **challenges of communities, municipalities, small organisations and individuals living in the Arctic who are affected by wildfires**. The INFRA service aims to improve the chain of fire information to non-professionals by providing intelligent tools to easily interpret/transform available data into customized products and messages based on users' needs, with an emphasis on local scale. **The novelty of the INFRA service lies on the attention to local scale, and in having developed suitable tools to generate useful messages for the category of users to be reached.**

INFRA is based on several IT modules and platforms, the most important of which are:

- **INFRA-AEGIS** - Web-GIS platform through which

ch it is possible to present, combine and integrate all the information layers produced by INFRA, or collected from many other sources and services;

- **INFRA-SENTRY** - Platform through which information and messages are distributed to users. Messages can be easily managed and tailored to specific needs and will be generated following the Common Alerting Protocol (CAP) standard.

The service is already implemented and works without constraints on three target areas of about 1500x1500 km: **Alaska-Canada, Fennoscandia, Sacha-Yakutia.**

A multi-layered approach has been applied to make the service operational while all functionalities are developed or different applications/users are identified/involved.

**Zero level:** INFRA-AEGIS allows you to see, combine and integrate selected information layers from different sources (in particular Global Wildfire Service GWIS) to get a picture of what is happening and possible developments. Level zero is **publicly** available.

**Level one:** password-protected, where dedicated **experts** (even local ones) can use zero-level infor-

mation to generate, thanks to INFRA-SENTRY, personalized messages (textual – textual with maps/graphs etc.) and distribute them to targeted end users. Wide flexibility is possible in end-user categories and messages produced. **Level 0 and level 1 are operational.** Other features are being developed and implemented only in test mode. A specific implementation in the cloud computing environment was carried out for the two test areas of Alaska-Canada and Sacha.

**It is an example of how Italian excellence can be useful to the world, how European funding can actually do something for the Arctic communities and facilitate the exchange of skills and knowledge between the many partners, from as many as 17 countries, of this project. Surely it is also a precious opportunity, provided by the European Union, addressed to our public and private excellence, which can improve the capacity and skills to be put at the service of our country and citizens for the reduction of the risk of wildfires.**

To learn more:

[Arctic PASSION](#)

[Copernicus: Large wildfires return to the Arctic Circle in June 2024 | Copernicus](#) ■

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## Miane and Alleghe: the mitigation of hydrogeological risk enters schools

The implementation of the **Citizens' Observatory in the mountain and foothill areas** began with the pilot cases of the **Municipalities of Alleghe** (BL) and **Miane** (TV).

It will be CAE, in RTI with ConIT and Softlab, to provide the **environmental monitoring network**, consisting of **physical and social sensors interfaced with a customised forecasting IT platform** that will allow the DAO to create and manage the Citizens' Observatory on two basins belonging to the mountain and foothill part of the **Eastern Alps District**.

Special attention has been given to **training and information for citizens, starting with schools**, who will be involved in various activities of the project, in order to transmit good practices to citizens and make them an active part in the mitigation of hydrogeological risk.

The environmental monitoring network will consist of **5 hydrometric stations, 3 rainfall stations and 3 stations equipped with a remote measurement/remote control camera** to be connected to a plant installed at the Basin Authority. The system also consists of **2 warning sirens** complete with flashing light. In particular, the goal of the system is to provide the Administration with a network for remote sensing of hydrological phenomena in the two basins mentioned belonging to the mountainous and foothill part of the Piave basin, which can **support the institutional functions of monitoring and studying the hydrological phenomena of the basins** themselves. Given the extent of the basins and the speed with which the phenomena that af-



fect them develop, it is necessary to increase environmental data in order to **guarantee an effective, safe and reliable warning and monitoring system for the territory.**

The project as a whole consists of:

- a **system for measuring hydrological and hydraulic variables on land**, formed by a hydro-thermal-rainfall monitoring network in remote measurement, complete with the necessary flow measurements for the characterisation of the outflow scales where required;
- an **IT platform at the service of the Observatory** in a cloud environment for mountain and foothill basins that must make flood **data accessible** to those involved in the Observatory's activities; **improving the exchange of communications between decision-making bodies and citizens**, who will no longer only be recipients of news and communications, therefore placed at the end of the information chain; **improving the exchange of communications between decision-making bodies and rescuers**, allowing the Authority to assign tasks to the teams operating in the territory;
- **training of the DAO personnel** and professional services for **routine and extraordinary maintenance** of the entire platform and monitoring network, including assistance to ensure the effi-



ciency of the system and its progressive improvement;

- **training and information campaign aimed at citizens**, with activities organised to involve adults and young people from different classes of the area's **primary and secondary schools**.

In particular, returning to the more purely technological aspects, the stations will be equipped with:

- > **dataloggers of the Compact line**;
- > **PG2R heated rain gauge**;
- > **THS thermo-hygrometer**;
- > **PLM piezometer**;
- > **WLR/S radar water level sensor**;
- > **VV20 anemometer**.

To learn about the other projects of the Observatory carried out by CAE, click [here](#), [here](#) and [here](#).

To learn more about CAE solutions for hydraulic and hydrological risk mitigation, [click here](#). ■



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## Hydraulic works and monitoring: retention basins increase the safety of the urban area of Pescara

The Pescara River is 170 km long, is fed by the largest river basin in the Abruzzo Region and over the years has suffered considerable anthropogenic pressure with the reduction of spaces useful for defence against hydraulic and hydro-geological risk. For this reason, the areas surrounding Pescara are sensitive to the effects of flooding, just remember the great flood of 1992, but also the most recent floods of December 2013 and May 2023. The memory of these catastrophic events must not be an end in itself, but must be an engine to bring to usefulness what experience has unfortunately taught, and that is what has been done. The Region, which took the first steps for this important work already in 2015, is today engaged in the completion of the most ambitious hydrau-

lic defence project ever carried out in Abruzzo, which has seen the creation of 5 retention tanks, capable of containing 5 million cubic meters of water.

The intervention, according to the designers, will reduce the areas subject to flooding by 40% and, in terms of socio-economic effects, the estimate of potential damage from flooding is reduced by €211,000,000 (-57%).

In this context, CAE, at the service of the RTI formed by Angelo De Cesaris S.p.A, ALMA C.I.S S.r.l. and Colanzi S.r.l. that is carrying out the works, will be responsible for providing, installing and activating **systems for the monitoring of retention works, of the Pescara River and its supply basin**, more specifically:



- 6 **thermal-hydro-rain gauge stations** for monitoring the climatic characteristics of the river basin;
- 4 **stations for hydrometric and flow rate monitoring**, for the definition of the hydrological regime of the Pescara River and the Nora Stream;
- upgrade of 2 existing hydrometric stations.

Both the new stations offered and those subject to updating will be equipped with **Compact dataloggers**, specially designed for monitoring and alerting in **multi-risk** contexts, to which several **meteorological** and **hydrological sensors** will be connected and which will interface with the **remote control system of the gates**, in order to obtain an integrated management mechanism of the regulation bodies on the basis of the regulation logics.

All the data produced by the new systems at the retention works, at the monitoring points along the Pescara River and at the feed basins, can be viewed and managed directly from the **new local control centre** at the hydraulic control building of the retention works (Surveillance House) and can also be visible at the headquarters of the Functional Centre of the Civil Protection Agency of the Abruzzo Region.

Once one or more **alert thresholds** have been defined, the system will be able to send **alert messages**

to a specially created addresses, even in the event of component malfunctions, according to which the so-called “*Operational Protocol for filling of the retention tanks*” will be activated.

With all this information available, the operator can intervene by remotely operating one or more gates of the **total of 34 gates** present in the plant, using devices for **remote control of the gates** at the 5 retention tanks and at the respective deviation and recovery works, also provided by CAE to the RTI formed by Angelo De Cesaris S.p.A, ALMA C.I.Sr.l and Colanzi S.r.l that is carrying out the works.

The project also provides for the supply of fundamental services, in particular:

- **maintenance;**
- **section survey activities;**
- **discharge measurements;**
- **modelling for the recovery of the flow rate variable and the calculation of the outflow scale.**

This ambitious project will be fundamental for the hydraulic defence of the Pescara territories and once again demonstrates the importance of integrating monitoring with structural interventions for flood risk mitigation. ■



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## Valle d'Aosta: the maintenance service for the weather-hydrographic network was renewed



The hydro-meteorological network of the Valle d'Aosta Autonomous Region was completely renewed in 2018/2019 with **open and latest generation technologies**; to make the 4 pre-existing networks homogeneous, all the components of the system can be replaced with interchangeable components from different manufacturers, which implement the same **standard** protocols and dialogue methods.

In 2024, CAE won the tender for the maintenance of the network which counts with about 100 installations, of which **28 are stations installed above 2000 m of altitude**. To work in these sites, also difficult to be reached, requires highly qualified personnel and **specific work techniques** to ensure the correct maintenance of the instrumentation. Extreme conditions and very low tempera-

tures, reaching down to -35°C, require sturdy and high-quality materials.

In addition to **corrective maintenance**, which includes, even in extreme situations, the timely intervention of CAE technicians, **preventive** maintenance activities are planned on all the components of the system: stations, repeaters and control centre, in order to minimise the risk of breakage or malfunction of the entire system and to keep the equipment and infrastructure in suitable conditions.

The service includes **continuous monitoring** of the network operation, data production and data quality, remote assistance, issuing of specific documentation and **24-hour availability**, in order to maximize the **reliability** of the system and the availability of data in the central office.

In addition to maintenance, some stations and technologies will be **updated**, to keep the network open and increasingly at cutting-edge status. Last but not least, where necessary, to make the hydrometric measurement process rigorous from

a topographical point of view, a service for the **determination of the hydrometric zero** and the execution of **surveys** is provided to characterize the hydrometric section and to make possible the discharge measurement in the sites of interest. ■

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## CAE MAGAZINE

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Per riferimento: <https://www.cae.it/eng/magazine-hm-30.html?mId=167>

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