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# EUROPEAN METEOROLOGICAL SERVICES NETWORK





Eumetnet is a grouping of 31 European National Meteorological Services that provides a framework to organise cooperative programmes between its members in meteorology and related fields. These activities include observing systems, data processing, basic forecasting products, research, development and training. Eumetnet's mission is to support its members to develop and share their individual and joint capabilities through well-established cooperation programmes. In addition, Eumetnet collaborates to enable enhanced networking, better and more robust interoperability, efficiencies and optimisation of infrastructure costs, together with a higher level of integration and complementarity within Europe.

The instruments through which this vision is realised are the programmes, projects and networking activities that Eumetnet carries out and supports. They are undertaken with funds coming mostly from the members but are also open to non-member cooperating institutes.

Eumetnet is managed by governing bodies and supported by an Executive Director and a small Secretariat team who handles the funds for all activities undertaken by Eumetnet. The Secretariat also acts as a figurehead for the community with regards to external stakeholders such as the EU. It coordinates programme management, financial management, reporting and the procedures of the governing bodies.

## OBSERVATIONS PROGRAMME

The Eumetnet Observations Programme Management's main aims are to design and coordinate the evolution of the ground based Eumetnet Composite Observing System (EUCOS) with a view to improving the observational database for weather forecasting and climate monitoring over Europe. This is achieved through effective management of the fully integrated components E-AMDAR, E-ASAP, E-GVAP, E-PROFILE, E-SURFMAR and OPERA. These Operational Services and Projects deliver meteorological observations from the free atmosphere and near the Earth's surface including marine areas.

The Observations Programme Management also helps Member State activities to design, coordinate and operate observing networks to reach the common goal of assisting general forecasting and climate monitoring. This is done by facilitating international collaboration, e.g. through information exchange and multi-lateral discussions.

In addition, it provides representation on observational matters on behalf of and supporting the interests of Eumetnet members within international fora including those relating to WMO (World Meteorological Organization) and Copernicus, previously known as GMES (Global Monitoring for Environment and Security). It also supports the evolution of European and national observing network design through a studies programme.



## EUCOS

### **Eumetnet Composite Observing System**

The Eumetnet Composite Observing System, EUCOS, is the ground-based or non-satellite observing system designed for Eumetnet members to serve the needs of the Eumetnet Forecasting (including general numerical weather prediction) Programme and Climate activities and those of the members across Europe.

Meteorological observations are provided from several networks of all National Meteorological (and Hydrological) Services participating in Eumetnet and from six fully integrated Operational Services and Projects.

The Eumetnet Observations Programme Management Team is responsible for the

EUCOS coordination and monitoring. One of the main deliverables is to provide statistics summarising the performance of each component of EUCOS.

The Eumetnet Observations Programme Management is coordinated by DWD, the German National Meteorological Service.



European radiosonde stations contributing to the Eumetnet Composite Observing System EUCOS

## **OPERA**

### **Operational Project for the Exchange** of Weather Radar Information

The OPERA Project aims to harmonise European radar data and products, through the provision of a European platform wherein expertise on operationally-oriented weather radar issues is exchanged.

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**OPERA** manages and develops the Odyssey data hub, which collects and distributes radar volume data and produces quality controlled radar products. Odyssey generates and archives composite products from raw single site radar data. There are three composite products: Instantaneous Surface Rain Rate. Instantaneous Max Reflectivity and 1 hour Rainfall Accumulation. The composites cover the whole of Europe and are updated every 15 minutes.

OPERA aims to enhance expertise in the field of weather radar within Eumetnet and the whole weather radar community, providing support to its members in environmental and societal issues related to weather radars, offering a forum for exchange of experience and for capacity building and informing the wider operation and research community of its activities.

The OPERA Project is coordinated by FMI, the Finnish Meteorological Institute



## **E-PROFILE**

### **Eumetnet Ground-Based Profiling**

E-PROFILE manages the European networks of wind profilers, automatic lidars, ceilometers and other ground-based equipment for the monitoring of vertical profiles of wind and aerosols including volcanic ash.



Aerosol layers measured above Payerne, Switzerland, with a ceilometer

Wind shear measured with a radar wind profiler at Zurich airport

E-PROFILE provides the infrastructure for an effective and transparent data exchange in real-time and compiles comprehensive monitoring information of the network performance. The E-PROFILE expert teams build the link between the user, operator and scientific communities to guarantee an optimal and professional service. This operational service actively promotes the use of wind and aerosol data in numerical weather prediction, now-casting, aviation and air quality.

E-PROFILE is coordinated by MeteoSwiss, the Swiss National Meteorological Service.





## E-AMDAR



## **Eumetnet Aircraft Meteorological Data Relay**

E-AMDAR works in collaboration with European airlines to collect real-time, in-situ atmospheric observations generated by commercial aircraft, quality control them and then make these data available to national meteorological service and prediction centres via the World Meteorological Organization (WMO)



This activity has grown over 20+ years to now include 13 European airlines which provide more than 1200 aircraft capable of reporting meteorological data. On a daily basis more than 600 aircraft are reporting, providing 60,000+ high quality observations of atmospheric temperature and wind in a timely manner from airports and cruise level flights.

The programme is an operational service that contributes to the World Weather Watch of WMO, constituting a regional component of the WMO Global AMDAR Programme.

In recent years E-AMDAR has been developing the capability to also observe atmospheric humidity from aircraft. At present there are now 9 E-AMDAR aircraft fitted with humidity sensors, forming a trial for what is hoped to become an expanded operational capability in the future. E-AMDAR is coordinated by the Met Office. the UK National Meteorological Service.

## E-ASAP

## Eumetnet Automated Shipboard Aerological Programme

The main objective of E-ASAP is to coordinate and optimise weather balloon observations (so called radiosoundings) over the data sparse ocean regions in the EUCOS area of interest. Most of these observations are performed by the crew members on board merchant vessels in regular service between Europe and North America.



One of E-ASAP's tasks is to design the E-ASAP Operational Service to meet the requirements, and in particular identify suitable merchant ships. It also negotiates and concludes contracts with the shipping companies and procures the necessary equipment or reimburses NMSs (National Meteorological Services) for the procurements. As well as ensuring proper installation, training and logistics for the supply of consumables, the Operational Service also has to establish means of communication. insertion on the Global **Telecommunications System** (GTS) and monitoring of performance whilst liaising with the other components of the Eumetnet Composite Observing System and with the ASAP Task Team of the WMO. E-ASAP is coordinated by

DWD, the German National Meteorological Service.



E-SURFMAR

### Eumetnet Sea Surface Observations

E-SURFMAR coordinates, optimises and progressively integrates European activities for surface marine observations in support of Numerical Weather Prediction and climate monitoring.



Shared activities include common procurement of observing equipment, coordination of deployments through voluntary ships, data processing and delivery, and reviewing best practices between one another and with international coordination bodies. These actions support the maintenance and enhancement of the in situ surface marine observing component of the European Meteorological Infrastructure.

Observing platforms of interest include buoys and voluntary observing ships (VOS). All mooring, drifter, or ship data collected are freely exchanged on the Global Telecommunication System, feeding observation databanks and operational weather and climate services and applications.

E-SURFMAR is coordinated by Météo-France, the French National Meteorological Service.



## E-GVAP

## **Eumetnet GNSS Water Vapour Project**



E-GVAP started in 2005. It collects and distributes GNSS based delay estimates, providing information about humidity to computer weather models and meteorologists.

The signals between navigation satellites (GPS, GLONASS, Galileo, BeiDou) and ground-based satellite receivers are delayed by the atmosphere. The size of this delay is related to the amount of water vapour in the atmosphere above the receivers. There is a strong lack of humidity observations in meteorology. Use of delay estimates from the already existing GNSS

GNSS receiver antenna with GNSS receiver antenna mounted on building on pillar attached to solid earth



6 European Meteorological Services Network

(Global Navigation Satellite System) receiver networks operated by geodetic institutions can help fill that gap. Most of the GNSS sites included in the E-GVAP service are European, but E-GVAP also has a global perspective, since several Eumetnet members run global models. E-GVAP is coordinated by DMI, the Danish Meteorological Institute.

The Eumetnet Forecasting Programme supports the weather prediction processes of its members. Cooperation to improve these processes is promoted across six separate projects: coordination of numerical weather prediction (NWP) consortia, very short range forecasting ('nowcasting') in which the forecaster plays a central role (ASIST), issuing weather and hydrological warnings, and training of forecasters. We are in close contact with the Heads of Forecasting of the national weather services and between the forecasters themselves through the Working Group on Cooperation of European Forecasters which is the main forum for operational meteorologists in Europe.

### meteoalarm



## EMMA PROGRAMME

## **Weather Warnings and Alerts**

The EMMA (European Multi-Services Meteorological Awareness) Programme's main aim is to display the alerts and warnings of Eumetnet member countries and Programme partners in an understandable way by professionals and the public through a dedicated website called Meteoalarm (www.meteoalarm.eu).

The EMMA Programme manages the online collection and publication of warnings for the next 48 hours from 35 different partners, carries out the technical quality control of the incoming messages and displays this information on maps with European, national and regional levels. The static part of this information is displayed in 31 languages and the dynamic warning texts in the languages are provided by the NM(H)S, which is usually the local language and English.

Research and Development aims to harmonise these warnings towards impact oriented warnings

Organisation.

## Veather warnings: Europe 1 2 9 9 1 1 1 1 = O MD . e 11 = 1 at 12 1 3 4 6

and achieves this through networking and coordination with relevant organisations such as **Civil Protection Organisations and** the ERCC (Emergency Response and Coordination Centre) of the European Commission.

EMMA also coordinates with the Task Team of the WG on Service Delivery of the World Meteorological

EMMA is coordinated by ZAMG. the Austrian National Meteorological and Geophysical Service.

They are supported in PR activities by KNMI, the Royal Netherlands Meteorological Institute.

## EMMA-H

## Hydrological Warnings

EMMA-H runs technically as an addon to the EMMA/Meteoalarm system and relies on its infrastructure. Its aim is the online collection and publication of flood warnings for the next 48 hours, technical quality control of the incoming messages and display of this information on maps with European, national and regional levels.

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There is harmonisation of the flood warnings as much as national procedures allow. The technical and organisational solution found by the EMMA/ Meteoalarm system will also be used by Hydrological Services and Met Services which provide flood warnings to publish these warnings. This is particularly welcomed by users from the Civil Protection, the ERCC and the public. EMMA-H is coordinated by ZAMG, the Austrian National Meteorological and Geophysical Service.

## C-SRNWP

### **Coordination of Short Range Numerical Weather Prediction**

The C-SRNWP (Coordination of Short Range Numerical Weather Prediction) Project was created in 2000 to continue the existing close collaboration with the EWGLAM (European Working Group on Limited Area Modelling) network.



- Aladin: Algeria, Belgium, Bulgaria, France, Morocco, Poland, Portugal, Tunisia, Turkey
  Seecop: Albania, Bosnia-Herzegovina, The FYROM, Montenegro, Serbia
  Cosmo: Germany, Greece, Israel, Italy, Poland, Romania, Russia, Switzerland
- The C-SRNWP project is the main vehicle for the cooperation between the European limited area modelling consortia which develops and exploits short range numerical weather prediction models: ALADIN, COSMO, HIRLAM, LACE, SEECOP projects and the UK Met Office.

It enhances the exchange of C-SRNWP related information and knowledge between members, represents the interests of the community to other organisations (e.g. ECMWF), liaises between Numerical Weather Prediction users and developers in order to maximize the benefits of the NWP forecasts and performs other support functions such as maintaining and making available data bases used in NWP. C-SRNWP is coordinated by OMSZ, the Hungarian National Meteorological Service.

• Hirlam: Denmark, Estonia, Finland, Iceland

Ireland, Lithuania, Netherlands, Norway, Spain, Sweden

• Lace: Austria, Croatia, Czech Republic,

Hungary, Romania, Slovakia, Slovenia



Visualisation of the output of the ALADIN limited area NWP model

## SRNWP-EPS

### Project

The Eumetnet SRNWP-EPS (Short Range Numerical Weather Prediction – Ensemble Prediction System) project has one main aim: to contribute to the building of very high-resolution ensemble systems in Europe, resolving the convection-permitting scale phenomena.



EUMETCAL

**Eumetnet Education & Training Project** 



This activity is organised as two complementary tasks. Firstly an application task, where new products and methodologies for calibration of LAM (Limited Area Model) ensembles for extremes and for probabilistic prediction of thunderstorms are developed. Secondly a research task, where the sensitivity and complementarity

of the models to soil conditions and Planetary Boundary Layer are studied on the basis of the forecast of selected phenomena (identified in the application task), on different areas with different LAM ensemble systems. SRNWP-EPS is coordinated by AEMET, the Spanish National Meteorological Service.



Short Range Ensemble Forecasts: 20 members of the gSREPS Ensemble forecasts for Temperature at 2m and Wind at 10m over the Iberian Peninsula

The objective of this Eumetnet project is to facilitate cooperation on training in Meteorology and the development, exchange and delivery of learning opportunities with the support of advanced training methods and techniques.

EUMETCAL serves as the European virtual training organisation by supporting Eumetnet NMSs and international organisations in developing and delivering learning opportunities in the field of meteorology in response to the needs of Eumetnet NMSs. In this context EUMETCAL relies on a reliable technical infrastructure and well established collaboration with international organisations and other non-Eumetnet countries. EUMETCAL contributes to increase the capabilities of Eumetnet NMSs to plan and deliver training activities for internal purposes and to develop the capacity of their training staff. EUMETCAL is coordinated by FMI, the Finnish Meteorological Institute.

## ASIST

## Application Oriented Analysis & Very Short Range Forecast Environment

ASIST (Application oriented analysis and very short range forecast environment) is a Eumetnet project that began in 2015 and which continues former initiatives in the field of short range weather forecasting, extending its scope from pure nowcasting (usually 0-6 h lead time) to a seamless prediction from a few minutes up to 12 hours lead time (very short range forecasting).



Example of a nowcasting webportal providing high resolution analyses and nowcasts for forecasters and end users

The principal goals of ASIST are the exchange of knowledge and experience and the coordination of research, development, evaluation and training among Eumetnet members and other groups or programmes. The ASIST project aims to provide a platform which enhances the capabilities of each participant to tackle the challenges in nowcasting and very short range forecasting. Besides the actual development of systems, this involves the exchange of experience with end users, promoting data exchange (in cooperation with the Observation Programme), guidance in evaluation and verification, building networks of experts, liaising with experts on probabilistic forecasting and coordination in the acquisition of externally funded projects.

ASIST is coordinated by ZAMG, the Austrian National Meteorological and Geophysical Service.

Eumetnet runs two Activities related to climate. Climate monitoring and research is essential for understanding both past and future climate's variability and expected changes.

### Support to Members Activity

The Support to Members activity aims to coordinate climate monitorina. climate data management, data recovery and standardisation of climate observation practices and quality management.

It also helps to enable capacity building across Eumetnet in the field of climate data and monitoring through the organisation of workshops and conferences focusing on scientific/ operational topics within climatology, best practices in climate services and data management. A dedicated expert team on data rescue and recovery has been set up, with the main task to collect and share information and to produce an overview of the situation within the Eumetnet community.

The Coordinating Member of the Support to Members activity is ZAMG, the Austrian National Meteorological and Geophysical Service.

12 European Meteorological Services Netwo



and Dataset (ECA&D) and PEP725 data set.

**Operational Services Activity** 

# ecipitation over the Elbe and Danube catchment areas causing large scale flooding in June 2013 (ECA&D)

ECA&D is the backbone of the WMO RA-VI Regional Climate Centre data node, by processing, providing and analysing pan-European climate data including a set of derived indicators to monitor the European climate.

The other data set is related to a traditional activity, the observation of the seasonal cycle of plants and animals known as phenology. The goal of the PEP725 activity is to establish and provide access

First climate sheet of Kremsmünster, the oldest Austrian climatological station with the longest uninterrupted series



to an open pan-European phenological database, thus facilitating climate impact research on plant phenology. So far 27 European meteorological services and 7 partners from different phenological network operators have joined PEP725.

The ECA&D activity is coordinated by KNMI, the Royal Netherlands Meteorological Institute and the PEP725 by ZAMG, the Austrian National Meteorological and Geophysical Service.







SESAR (Single European Sky ATM Research) is a vital and important part

of the European aviation Single European Sky (SES) initiative to meet future capacity and air safety needs. Recognising the critical role SESAR will play in defining how Aviation Meteorology (MET) service provision in Europe will evolve to support Air Traffic Management (ATM) effectively, Eumetnet has been actively involved since 2009.

Phase 1 of the SESAR programme included a dedicated Work Package which addressed the critical dependency between weather, the environment, and the operational solutions of the SESAR Programme. It ran from 2012-

WG AVIMET

Aviation, consisting of a wide spectrum of aeronautical stakeholders, is a high priority customer group for most Eumetnet members. Via cooperation, Eumetnet members strive to improve the value and efficiency of aeronautical meteorological services to ensure performance benefits for the aviation industry as well as to reduce the negative impact of adverse weather conditions on the daily operations.

AVIMET is a Working Group of Eumetnet

### **Aviation Support Programme**

A number of developments on both global and European level are on-going and are changing the way Meteorological Service Provision to Air Navigation will be organised in the near-future. Eumetnet has an important role in helping its members influence these changes, assist them in adapting to these changes and to ensure that their impact on members is managed

Eumetnet's aviation programme exists to support its members in improving the value and efficiency of meteorological services. In addition, we also aim to ensure a consistent and coordinated approach towards future transformation of aviation meteorology in Europe by building on our positive relationships with industry stakeholders, governing bodies and the European Commission.

Programme, it ensured consistency and coordination of the MET architecture, systems and services, utilised by all SESAR projects and solutions. The new services and delivery (MET-GATE) which Eumetnet designed, developed, demonstrated and validated in SESAR1 have been awarded EU grants to deploy to the stage of operational readiness. These deployment projects are being coordinated by Eumetnet in partnership with the SESAR Deployment Manager (SDM).

that was created to address issues of

common interest within the aeronautical

meteorological (MET) domain, especially in

relation to the ongoing development of the

political, technical and regulatory landscape

under a Single European Sky (SES). In addition

to this, the WG AVIMET aims to facilitate the

exchange of information between members

developing common position statements of

on aviation meteorological issues whilst

Eumetnet on aviation-related issues.

2016 and aimed to better integrate new MET

enhance the performance of ATM.

information services and delivery functions, to

As the MET Federating Project within the



On behalf of its members, Eumetnet maintains and develops close links with the EU Institutions, mainly the European Council, the European Parliament, the European Commission and its Agencies. This contributes to an increased awareness of the existing capabilities of the European meteorological infrastructure (EMI) among the EU Institutions. The core activities of Eumetnet, performed through our cooperative programmes, are highly relevant to a large number of EU policies.



The purpose of the Joint Liaison Office is to represent the combined interests of Eumetnet, WMO, ECMWF and EUMETSAT ("Parties") to the European Union (EU),

### Copernicus

Eumetnet is involved with the EU's flagship Copernicus programme which represents a set of major stakeholders for our community. As a result of a bidding process held in 2016, Eumetnet has a unique arrangement with Copernicus through the European Environment Agency (EEA) which is the delegated operator of the In-Situ Coordination Component of Copernicus. Along with consortium partners EUROGOOS and ICOS, we provide leading expertise to advise the EEA in the areas of in-situ meteorological

### Joint Liaison Office - EUMETRep Activity

European Commission (EC) and other European institutions, providing the European Institutions with a Brussels based single entry point to the Meteorological community.

This activity delivers valuable and timely availability of information and analyses on EU initiatives, plans, programmes and decisions to Parties, their members and relevant bodies

In addition, it provides awareness to EU bodies of the responsibilities of Eumetnet/ EUMETSAT/ECMWF/WMO and of the relevant capabilities of the European Meteorological Infrastructure (EMI) as well as the implementation of EU policies and programmes such as Copernicus and Horizon 2020, in accordance with directives from the Eumetnet Assembly.

EUMETRep is handled directly by the Eumetnet Secretariat.

and ocean observation networks, climate datasets, atmospheric chemistry observation and data management. Eumetnet members are also very much involved in many activities related to the delivery of the Copernicus Climate Change Service (C3S) where their knowledge of climate sciences, their modelling capabilities and their experience in climate data management are recognised and used extensively. In addition, Eumetnet members are also active within the Copernicus Atmosphere Monitoring Service (CAMS).