

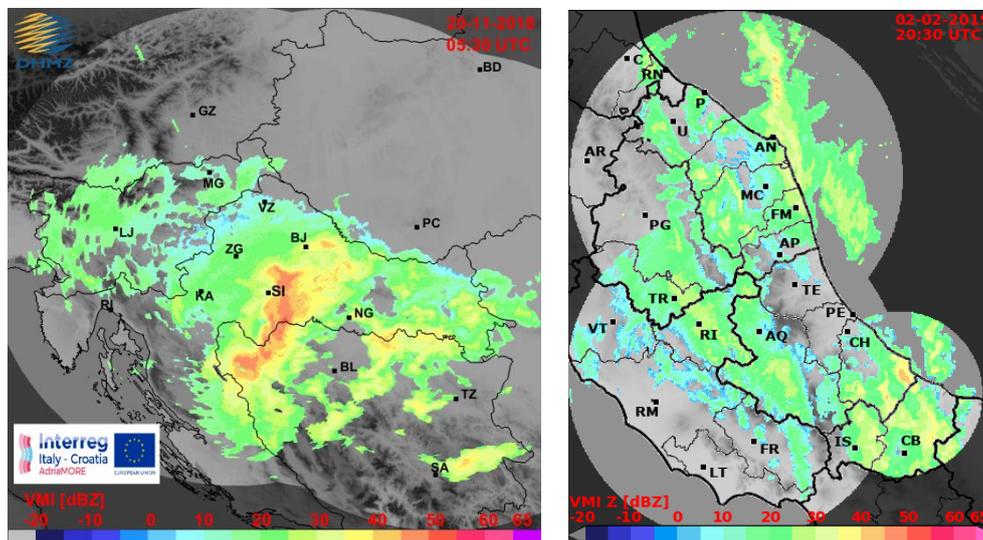
## The achievements of AdriaMORE project after a year from the beginning of the project implementation

The Italy-Croatia Programme-funded project AdriaMORE has moved forward in the first year since its launch on January 2018. The key objective is to **increase the management capacity** of responding to marine and coastal hazards in the Adriatic basin and to **mitigate the damage, impact** caused by increasingly frequent severe weather conditions along the coastal regions in Italy and Croatia.

Software developments, ad-hoc simulations, testing on relevant case studies and tenders for instruments' acquisition have been carried out to bring the project closer to its final goal, namely **capitalizing** on the 2007-2013 IPA Adriatic CBC programme-funded project ADRIARadNet. The latter **developed an integrated system** to observe and forecast possible scenarios at high hydro-meteorological risk for civil protection purposes.

The current AdriaMORE integrated system **is finalizing the development of new components**, with more details:

- **weather radar composite software** able to ingest and process data from systems with different features has been developed and the assessments of some different merging methods were conducted on case studies in diverse storm regimes. That to obtain a better rain estimation and nowcasting in Adriatic area. Preliminary results have been presented at the 10<sup>th</sup> European conference on radar in meteorology and hydrology, called ERAD 2018, which has been held in the Netherlands last July.



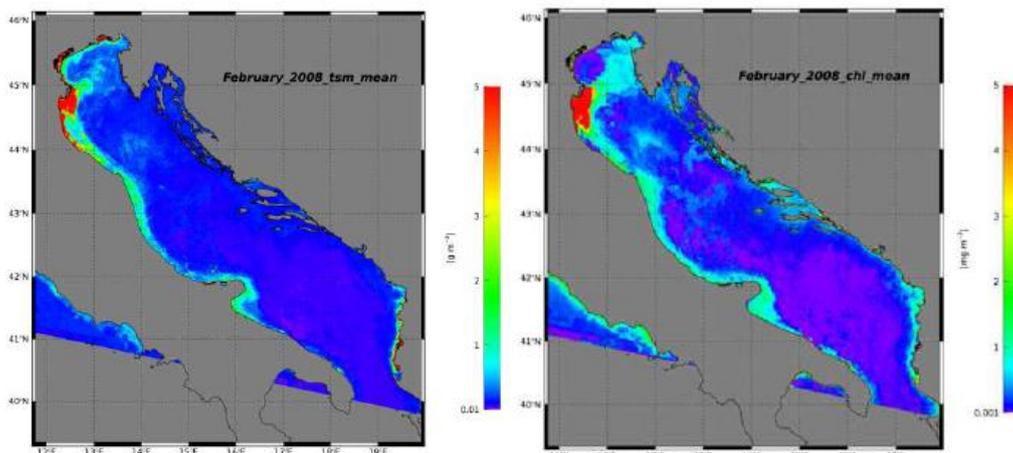
*Weather radar composites of the reflectivity VMI product in the Croatian (left panel) and Italian (right panel) domains*

- a new version of the **hydrological model (CHyM)**, to be used operationally for coastal flood prediction on the Pescara and Neretva rivers basins has been designed. The new feature of the model consists in the addition of a specific parameterization able to consider the interaction between the sea and the river flow at the river mouth: when the sea level reaches a critical threshold, a coastal flood

can result from the combination of two different and complex processes where the marine ingression could have a key role, even without heavy precipitation.

- **an air-sea coupled prediction system** was built on the Adriatic area that, previously tested on case studies, is now working in operational mode, allowing to forecast the most important meteorological and marine variables. In this system a procedure that "ingests" (by means of the so-called 3D-Var variational assimilation technique) surface and radio sounding data available in the area covered by the domain was also developed. The results obtained by this prediction system were also presented at the 1<sup>st</sup> AISAM National Congress held in Bologna last September.

- **satellite data processing procedure** to evaluate environmental bio-chemical indicators of coastal seawaters in the Adriatic Sea, like total suspended matter (TSM) and Chlorophyll content (CHL) has been performed. These indicators provided information about coastline morphology (erosion-sedimentation dynamical balance) and eutrophication trends of the marine coastal ecosystem which are crucial for coastal geomorphological maintenance.



*Maps of TSM concentration (left panel) and CHL concentration (right panel) for February 2008, these indicators highlight the high values of TSM and CHL concentrations off the Po River Delta due to sediment input of the river runoff and due to phytoplankton biomass, enhanced by the river inputs, which may bring to eutrophication*

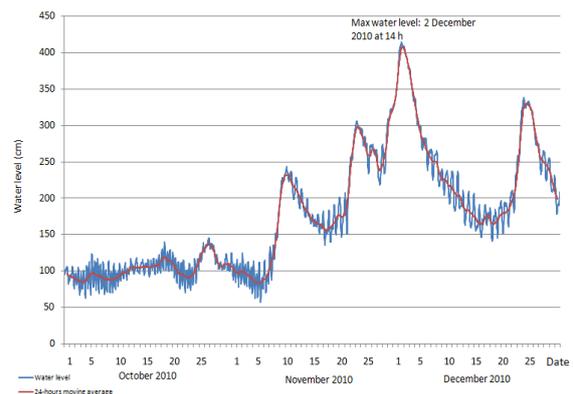
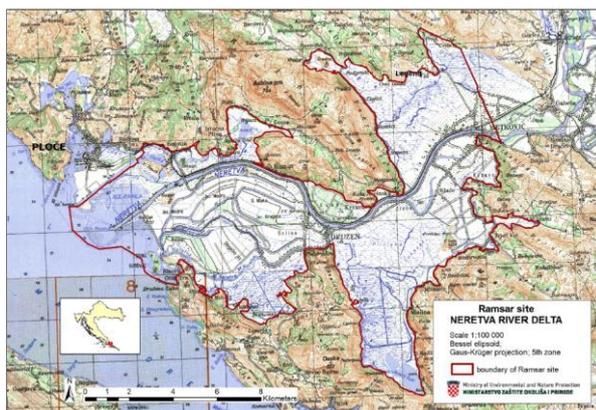
- **numerical models to simulate the transport and dispersion** of matter across the marine currents, both in the open sea and in coastal environment has been implemented. Large-scale simulations (open sea) allowed to evaluate the response of tracer dispersion to anomalous extreme meteorological forcing (e.g. Bora wind events) with respect to average climatological conditions. High-resolution simulations of coastal flows around the Pescara river mouth gave valuable preliminary indications about the interaction of river outflow, bathymetry and infrastructures in the harbor area.

- **the wind profiler** site has been chosen in the Dubrovnik area, the related infrastructures work planned and the public procurement for purchasing, installation and commissioning has been concluded. It will be used to improve wind monitoring and forecast.

## Preparatory activities for the pilot action in the Neretva basin

Among the 2 foreseen pilot actions in the WP5 of the AdriaMORE Project, the second one is devoted to the Neretva-Dubrovnik region near the estuary of the Neretva River. A case study has been selected in order to investigate how the AdriaMORE Decision Support System (DSS) may help local authorities to better forecast and manage critical events related to flooding and extreme weather.

At such extreme flooding event was happening at beginning December 2010 (the strongest during the period from 1<sup>st</sup> to 3<sup>rd</sup> December), near the estuary of the Neretva River i.e. in the area of Neretva River Basin from state border between Croatia and Bosnia and Herzegovina. It is one of the strongest floods appeared since 50 years ago. Among other areas two the biggest towns in the area i.e. Metkovic, near the state border, and Opuzen, in the central part of the area, have been flooded. Elevation of the plain is very low i.e. below 1 m above sea level, even in some part there are depressions.



*Map of the Neretva River near its estuary (left panel) and water level at Metkovic hydrological station (right panel)*

Hourly data on water level for the period October-December 2010 are considered for hydrological stations Metkovic and Opuzen, respectively. A maximum water level of 414 cm has been observed on 2<sup>nd</sup> December 2010 at 14 o'clock at hydrological station Metkovic and 12 hours latter a maximum of 382 cm, i.e. on 3<sup>rd</sup> December 2010 at 2 o'clock, has been observed at hydrological station Opuzen.

Both hydrological stations are under strong influence of tides, especially during low water levels and stronger at Opuzen than at Metkovic. As the tides are periodic signals then they can be removed by a 24-hour moving averages. The main reason why so strong flood appeared is a long-lasting wet condition during the whole year 2010 especially during autumn and the last decade of the November 2010. An additional reason for a strong flooding at the beginning of December 2010 was a problem of managing a big amount of water in hydropower plants upward from Mostar in Bosnia and Herzegovina. It is a real challenge to be solved between countries i.e. Croatia and Bosnia and Herzegovina.

## The second project meeting in Dubrovnik



As illustrated before, during the second implementation period of the project AdriaMORE (Adriatic DSS Exploitation for MONitoring and Risk management of coastal Extreme weather and flooding) led by the Abruzzo Region, Service of Territorial Cooperation, project partners continued with the implementation of their activities. The latter has been discussed during the second **Project and Steering Committee meeting** held

in Dubrovnik, Croatia, on November 6<sup>th</sup>, 2018. The partners reviewed the state of the art of the project, shared and discussed administrative and financial issues, outline the achievements over the first six-month period of implementation, as well as future works.

As a substantial part of project dissemination activities, a **public event** was organized with the participation of the DNR civil protection forces. Representatives in charge with fire-fighting in the Dubrovnik-Neretva Region, marine safety and civil protection in general attended the public event and gave extremely profitable contributions to the entire project.



The key point of the public event was procurement of a fire-fighting boat by the Dubrovnik-Neretva Region, which will increase the quality of the civil protection system in the most southern Croatian area and isolated part of the European Union.

The boat's length is 9,80 meters and width 3,20 meters with the engines of 275 kW. Delivery of the boat is expected

by March 1<sup>st</sup> 2019 – International Civil Protection Day.

The second Project and Steering Committee of the project, was followed on 7<sup>th</sup> November 2018 by a **press conference** that closed the two-day event.

The vice president of the Dubrovnik-Neretva Region Joško Cebalo, the director of CETEMPS Frank Marzano in representation of the Abruzzo Region, the deputy principal of the Croatian Meteorological and Hydrological Service Krešo Pandžić and the representative of the CNR Ismar Guglielmo Lacorata took the floor to present the scientific results achieved so far.



As mentioned before, through the AdriaMORE project, the Dubrovnik-Neretva Region is proceeding to **procure a fire-fighting boat**, which will greatly support the civil protection work in the southern Croatian area, especially in case of fire and sea pollution. In this respect, of greater relevance is the monitoring of the Neretva river estuary prone to coastal flooding, extreme weather which may cause problems to the

airport and ship traffic, as well as sudden fires intense winds may largely spread out. In addition, the Croatian radar network implemented by the partner Croatian Meteorological and Hydrological Service is essential and a great help to the AdriaMORE project as it will contribute to monitoring and providing data on extreme weather conditions useful to the project. Crucial is also the **wind profiler**, which will be installed in Dubrovnik – an innovative tool integrated in the joint monitoring platform useful for civil protection and prevention in both countries. It was announced that the observation capability and data collection from extreme weather monitoring from the Abruzzo Region, the Central Italy and the Croatian coastline will be strengthened as much as possible: This is surely one of the greatest networking achievements of AdriaMORE project.



These AdriaMORE achievements will be further adapted and tested in the next months with the aim to equip the involved territories and people **with effective tools to tackle severe weather events** and other marine risks triggered by hydro-meteorological events, thus reducing damage and increasing safety.

## About the Project

AdriaMORE is a project co-funded by the European Union through Interreg Italy-Croatia CBC Program. AdriaMORE is the acronym of the "Adriatic DSS exploitation for Monitoring and Risk management of coastal Extreme weather and flooding" and brings together 4 partners from Croatia and Italy: Abruzzo Region (LP), Dubrovnik-Neretva Region (PP1), Croatian Meteorological and Hydrological Service (PP2) and National Research Council (PP3).

**Acronym:** AdriaMore

**Title:** Adriatic DSS exploitation of Monitoring and Risk management of coastal Extreme weather and flooding

**Lead partner:** Abruzzo Region

**Total budget:** 1.150.000,00 €

**ERDF:** 977.500,00 €

**Duration:** 18 months

**Contact:** Ms. Paola Di Salvatore

**Project manager:** Diana Gracin Petrović

**Web site:** <http://www.italy-croatia.eu/>

