

## TNA PROJECT REPORT

### 1. Project Information

<b>Proposal reference number</b>	JN-CALL 1_1
<b>Project Acronym (ID)</b>	MAICA
<b>Title of the project</b>	Mediterranean Aerosol In Coastal Areas
<b>Host Research Infrastructure</b>	Acqua Alta Oceanographic Tower (AAOT)
<b>Starting date - End date</b>	02/03/2017 - 20/06/2018
<b>Name of Principal Investigator</b> <b>Home Laboratory</b> <b>Address</b> <b>E-mail address</b> <b>Telephone</b>	Jacques Piazzola University of Toulon - Mediterranean Institute of Oceanography (MIO) CS 60584 - 83041 TOULON CEDEX 9 piazzola@univ-tln.fr +33494142082
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### 2. Project objectives

This study focused on the sea-spray contribution and the anthropogenic influence in the coastal aerosol using measurements of aerosol size distributions acquired in the Northern Adriatic on board the Acqua Alta platform. Former results in the study area allowed comparison with data recorded in the Northwestern Mediterranean and showed a similar sea surface production of sea-spray aerosols issued from bubble bursting processes. In addition, the Adriatic experiments confirmed the occurrence of interaction processes between sea-spray and anthropogenic components (Piazzola et al., 2016). The objectives of the project was first to confirm the earlier results about the sea-spray source function and the sea-spray content of organic matter. In addition, this should allow implementation and validation of a nested model chain dedicated to the aerosol transport in coastal areas in the Northern Adriatic. To this end, we have addressed a more comprehensive understanding of the sea-spray production processes (jet, films and spume drops), with focus on their relationships with environmental conditions and the contribution of anthropogenic pollutants using a chemical analysis. This latter is particularly relevant to validate one emission inventory of the region used in the CTM models.

### 3. Main achievements and difficulties encountered

The first goal of the MAICA project was improve our knowledge on the sea-spray production mechanisms with emphasis on the generated particles issued from the surface tearing process. To this end, we used two Particle Measuring Systems: the active scattering spectrometer probe (ASASP) and the classical scattering spectrometer probe (CSASP), which were mounted on board the Acqua Alta platform. The objective was to record aerosol size distributions in the 0.1-40  $\mu\text{m}$  size range during preferentially high wind conditions. Unfortunately, the weather was calm most of the time and

we get a quite limited dataset. In addition the CSASP probe fails down in May 2018 and in spite of our effort, we did not succeed to repair before the end of the experiments. In spite of these limitations, the experiments allowed acquisition of about 1000 aerosol size distributions.

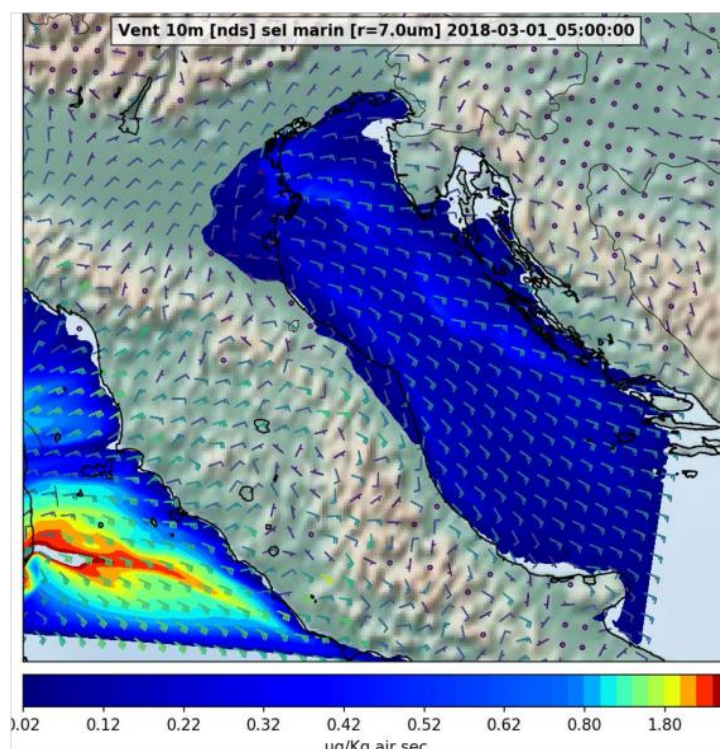
The second objective was to provide a chemical analysis of the marine aerosols on the whole size spectrum to study the contribution of the organic matter in the sea-spray function of different sizes. This was achieved using a chemical characterization of aerosols sampled through a low pressure cascade impactor Dekati.

#### 4. Dissemination of the results

Analysis of the data is still in progress, but it is clear that they will be published soon. In particular, the carbon analysis in the aerosol samplings and the results on sea-spray dynamics are promising. The data collected during MAICA will be stored and in free access via the web link <http://matrac.univ-tln.fr/> in construction.

#### 5. Technical and Scientific preliminary Outcomes

The MAICA experiments which took place in the ACQUA ALTA platform allowed acquisition of a large number of aerosol size distributions in the size interval covering 0.1 to 40  $\mu\text{m}$ . In addition, chemical analysis has been made to better understand the anthropogenic impact on the Adriatic. The analysis is still in progress, but the first results seem to show that the numbers of the sea-spray concentrations (acquired during long fetch conditions) are temperature dependant. The WRF-Chem model calculations using the sea-spray source function by Gong et al. (2003) suggest PM<sub>10</sub> substantially different concentrations from the ones measured using the probes the 01/03/2018 on board the Acqua Alta platform, as shown in Fig. 1.



*Fig. 1 Atmospheric Sea-spray concentrations calculated using the WRF-Chem model in the Northern Adriatic during the MAICA experiments*

As a comparison, we can see in Fig. 2 an example of aerosol size distributions measured on board the Aqua Alta at the same date as the results reported in Fig. 1, which correspond to a very cold episode in the Northern Adriatic resulting in low sea surface temperature and negative air temperatures.

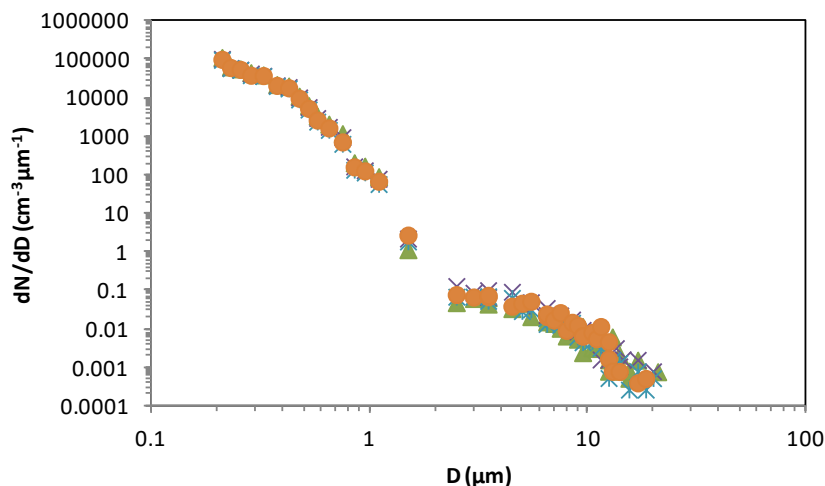


Fig. 2: Aerosol size distributions measured the 01/03/2017 for a cold temperature conditions.

Work is still on progress for a relevant data analysis.

## References

Gong, S. L. (2003), *A parameterization of sea-salt aerosol source function for sub- and super-micron particles*, *Global Biogeochem. Cycles*, 17(4), 1097, doi:10.1029/2003GB002079.