A decade of observations and achievements of the MOOSE observatory in the Northwestern Mediterranean Sea

Anthony Bosse (MIO), Laurent Coppola (IMEV-LOV), Pierre Testor (LOCEAN), Dominique Aubert (CEFREM), François Carlotti (MIO), Pascal Conan (LOMIC), Xavier de Madron (CEFREM), Fabrizio D'Ortenzio (IMEV-LOV), Wolfgang Ludwig (CEFREM), Laurent Mortier (ENSTA), Patrick Raimbault (MIO)

affiliations:
MIO : Aix Marseille Univ., Universite de Toulon, CNRS, IRD, MIO UM 110, Marseille, France
IMEV-LOV : Sorbonne Universités, CNRS, UMR 7093, Laboratoire d'Océanographie de Villefranche, Villefranche/mer, France
LOCEAN : Sorbonne Universités, CNRS-IRD-MNHN, UMR 7159, Laboratoire d'Océeanographie et de Climat, IPSL, Paris, France
CEFREM : Laboratoire CEFREM - UMR 5110 CNRS-UPVD 52, avenue Paul Alduy, Perpignan, France
LOMIC : Sorbonne Universités, UMR 7621, Laboratoire d'Océanographie Microbienne, Observatoire Océanologique, Banyuls/mer, France
ENSTA : ENSTA-Paristech, Palaiseau, France

Introduction
Considered as a "hot spot" of climate change, marine biodiversity and human activities, the Mediterranean Sea shows trends toward drier and extreme weather causing important human and economic losses. The health of the Mediterranean Sea undergoes important modifications, eventually damaging its unique ecosystems.

Methods
To monitor the effect of climate change and anthropogenic effects on the dynamical NW Mediterranean basin, the Mediterranean Ocean Observing System for the Environment (MOOSE) was established in 2010 (https://www.moose-network.fr/). It integrates numerous platforms: river and atmospheric sites, research vessels (basin-scale cruise and open-sea stations), Eulerian observatories (mooring, weather buoys), HF radars and autonomous platforms (gliders and Argo floats).

Results
MOOSE collects multi-disciplinary data to monitor long-term environmental trends and define effective health and climatic indicators. It is associated with several EU programs: EuroSea (carbon audit), JERICO-s3 (NW MedSea coastal SuperSite), GROOM-II (glider community) and MONGOOS (GOOS's regional alliance). MOOSE is importantly linked to Research Infrastructures: French seashore and coastal RI (ILICO); deployment reference sites and machine learning methods (Euro-Argo); fixed-point climatic trends (EMSO); description of biological diversity of plankton assemblages (EMBRC); air-sea CO_2 fluxes (ICOS). It also contributes to GOOS's OceanGliders (endurance lines) and OceanSites (moorings).

Conclusion
We here give an overview of the MOOSE observatory, as well as important achievements of the decade since its establishment.