



THE

SCIPPER PROJECT

OBSERVATIONS AND 3D MODEL SIMULATIONS FOR POLLUTANTS DISPERSION IN THE HARBORS OF MARSEILLE AND TOULON IN 2021

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AtmoSud

Inspirer un air meilleur



ARISTOTLE UNIVERSITY OF THESSALONIKI



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Missions of the Observatory





International cooperation







Marseille Campaigns 2019, 2020, 2021





Modelling

Assessment of the impact of ship emissions on Marseille

I - Obs with AQ Campaigns

II - Obs Emissions & cadasters

III – Modeling – reference (2021)

IV – Modeling – Scenarios mitigations

Impacts Maritime mitigation Sol. On Air Quality











AtmoSud's Emissions Inventory



MÉTROPOLE D'AIX-MARSEILLE Emissions de nox



Marseille Maritime Emissions Tendencies



https://cigale.atmosud.org/



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Marseille Maritime Emissions Tendencies

AtmoSud's Emissions Inventory



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Marseille Maritime Emissions Tendencies

AtmoSud's Emissions Inventory

COVID Impacts



Many cruise ships stuck in port during the COVID Crisis







Marseille Air Quality background

N4CLIFE - SCIPPER µ - N'3- FORESTA

AtmoSuc

AtmoSud's AQ
operational
forecasting systems
need to be
confronted with
models from
academic research

Before SCIPPER Maritime Emissions were underestimated NO₂ : µg/m³ Annual mean 2020 SCIPPER p - N°1 SCIPPER p - N°2 SCIPPER-D, St André SCIPPER p - N° - College Arthur Rimbaud

SCIPPER - MOBILE STATIONS - PHARES ET BALISES Massal

CIPPER- D. Rhin-Fidely

ATMOSUD - VERNEUIL STATION SCIPPER - D. - Quai du Lazaret SCIPPER - D. - Verneuil

SCIPPER D. - MAJOR NORD SCIPPER - JOLIETTE - MOBILE STATIONS - SCIPPER-D.- Major Sud Merselle Eng Avenues SCIPPER-ord Nº4 - Mr E.

> Image © 2022 TerraMetrics Data SIO, NOAA, U.S. Navy, NGA, GEBCO



2654 m

16

40

60





Marseille Air Quality background

AtmoSud's AQ operational forecasting systems need to be confronted with models from academic research

Before SCIPPER Maritime Emissions were underestimated



July 2021, Parallel Modeling Spray System (PMSS) Plume Modeling SO_2 : μ g/m³







Port of Marseille

<u>In 2019</u>

- 2nd port in the Mediterranean
- 3.1 million passengers
- 9917 ship stopovers

Marseille - Port calls per month











Details of high-resolution model

- Passenger port of Marseille
- Ferry boat area
- La Major Cathedral area (2x1.3 km²)
- Study of ship emissions effect on urban area
- Measurement campaign timeframe (July 2021)









Demonstration of a real case study

- I. Le Champlain (small cruise vessel) MSD
- 2. Northwest wind
- 3. Departure phase (Main Engines start)
- 4. Distillate (MDO, MGO)
- 5. Effect on coastline (La Major Cathedral)
- 6. Effect in the city (650m from the vessel)









Effect on coastline (La Major Cathedral)









Effect on a dense built area







Prediction of concentration during an Engine Start event



Air Quality Station

Time = 0s Main engines start







Results from Mobile LAB (LCE, University of Marseille)









Simulation results rendered on Google Earth



Dispersion time: 5 min





TOULON MODELVALIDATION







MARITTIMO-IT FR-MARITIME

THE Scipper Project

EKC2U

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EKC2[



EKC







RUM

CAMPAIGN : Results from Mobile LAB (LCE, University of Marseille)

PLUME MODEL VALIDATION



EKC20

THE Scipper Project

Blue line = plume identification suspected



For each plume suspected, it's mean a plume has intersected the mobile lab under certains meteorological conditions.

🐠 Interreg I

ADDITTING IT ED-MADIT

We have access to wind speed velocity and direction in the mobile lab during these specifics events.









INTERCOMPARISON BETWEEN OBS AND MODEL



PLUME MODEL VALIDATION



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PLUME MODEL VALIDATION

THE Scipper Project

EKC2022

PLUME MODEL VALIDATION





EKC20

Study_{case}(i) = Simulation Fn (Emi Ship (i), VV(i), DD(i), Hum(i), T(i), Vejec(i), Hstack(i), DiamStack(i), Background pollution (i) Each Study Case corresponds to a simulation with PMSS or FLUENT.

🐠 Interreg I

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For Each Study case, we have :

- Different Met conditions
- Different background conditions
- Different IMO ships
- Different Emissions factors
- Different Hstack, Diam Stack



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Next steps

- II Campaign data analysis (2019, 2020 and 2021)
- II Modeling
- Reference run : Meteorology, emissions and observations of July 2021
- Intercomparison between operational system and academic research
 - PMSS versus FLUENT
- III Mitigations Scenarii Modeling
 - LNG
 - Electric connection
 - Particles filters















ports



C EXPLICIT



















Thanks

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