Emission & Dispersion of Forest Fires

Joint Research Centre

EFFIS Team

GOFC IT & GWIS 2017,
20th-23rd November 2017, London

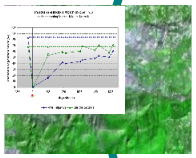
Forest fire events

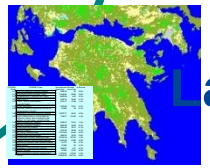
Fire Detection

Danger Forecast

Burnt area maps

Vegetation regeneration





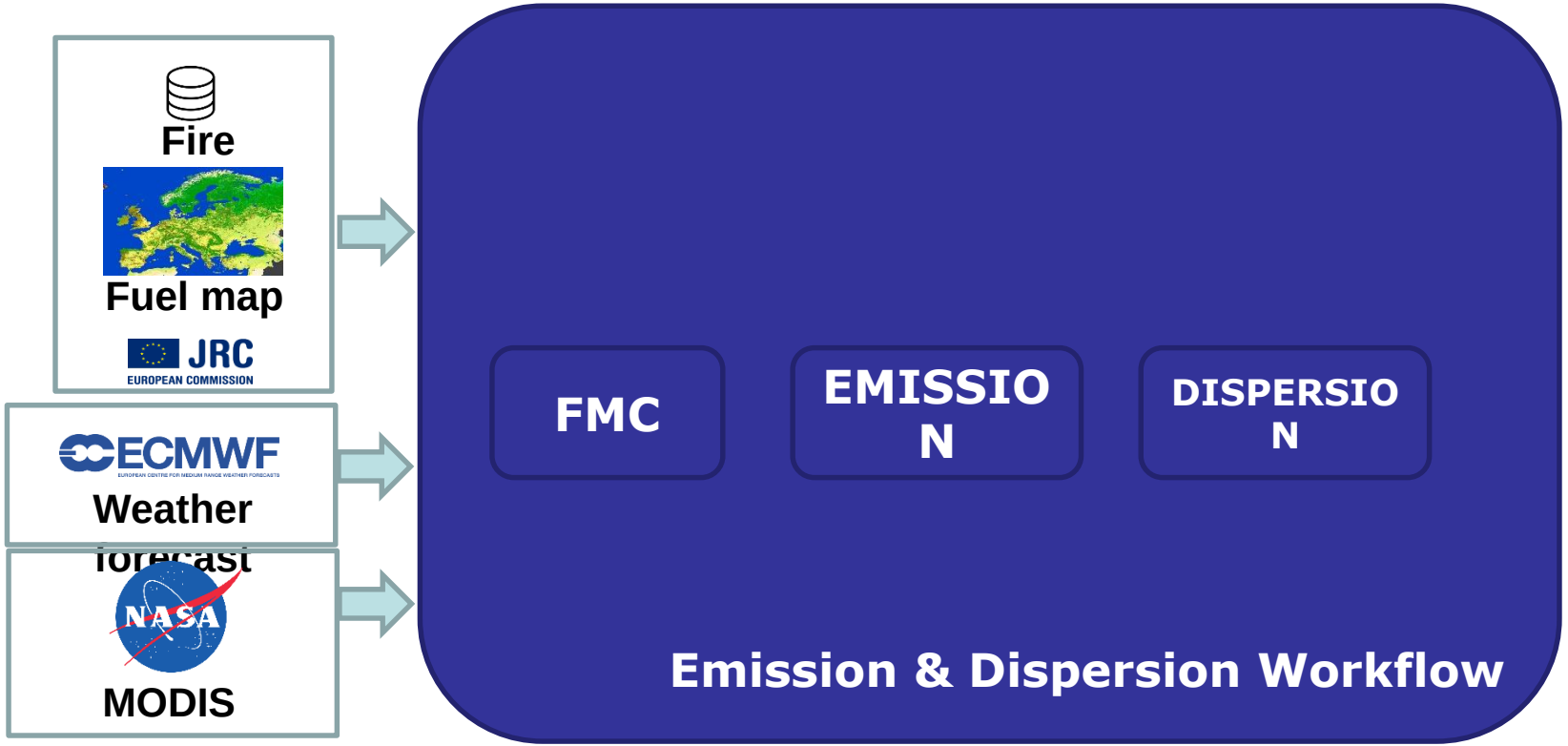
Land cover Damage assessment

Potential soil erosion estimates

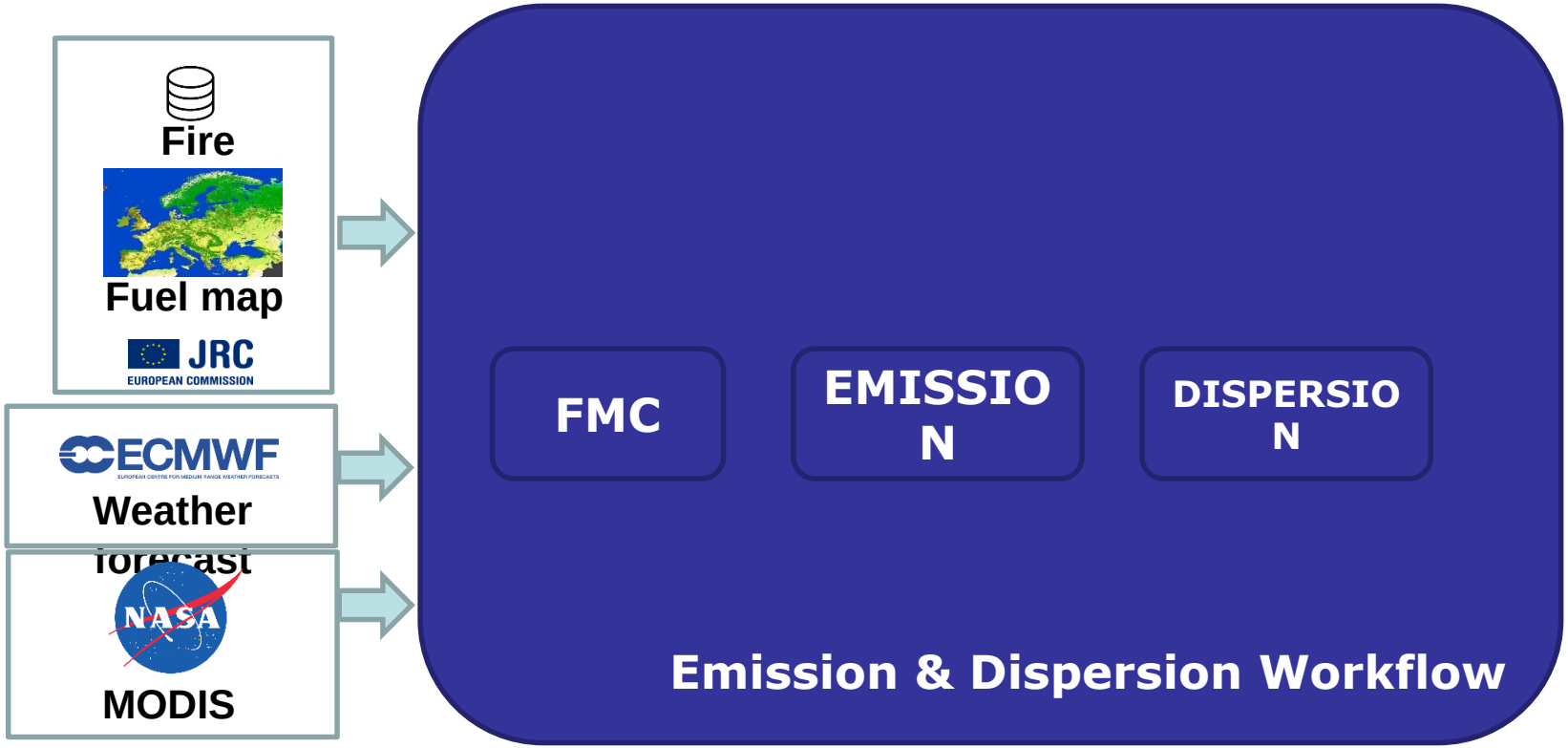
Emission assessment and smoke dispersion

Emission assessment and smoke dispersion

EFFIS – Emission & Dispersion



EFFIS – Emission & Dispersion

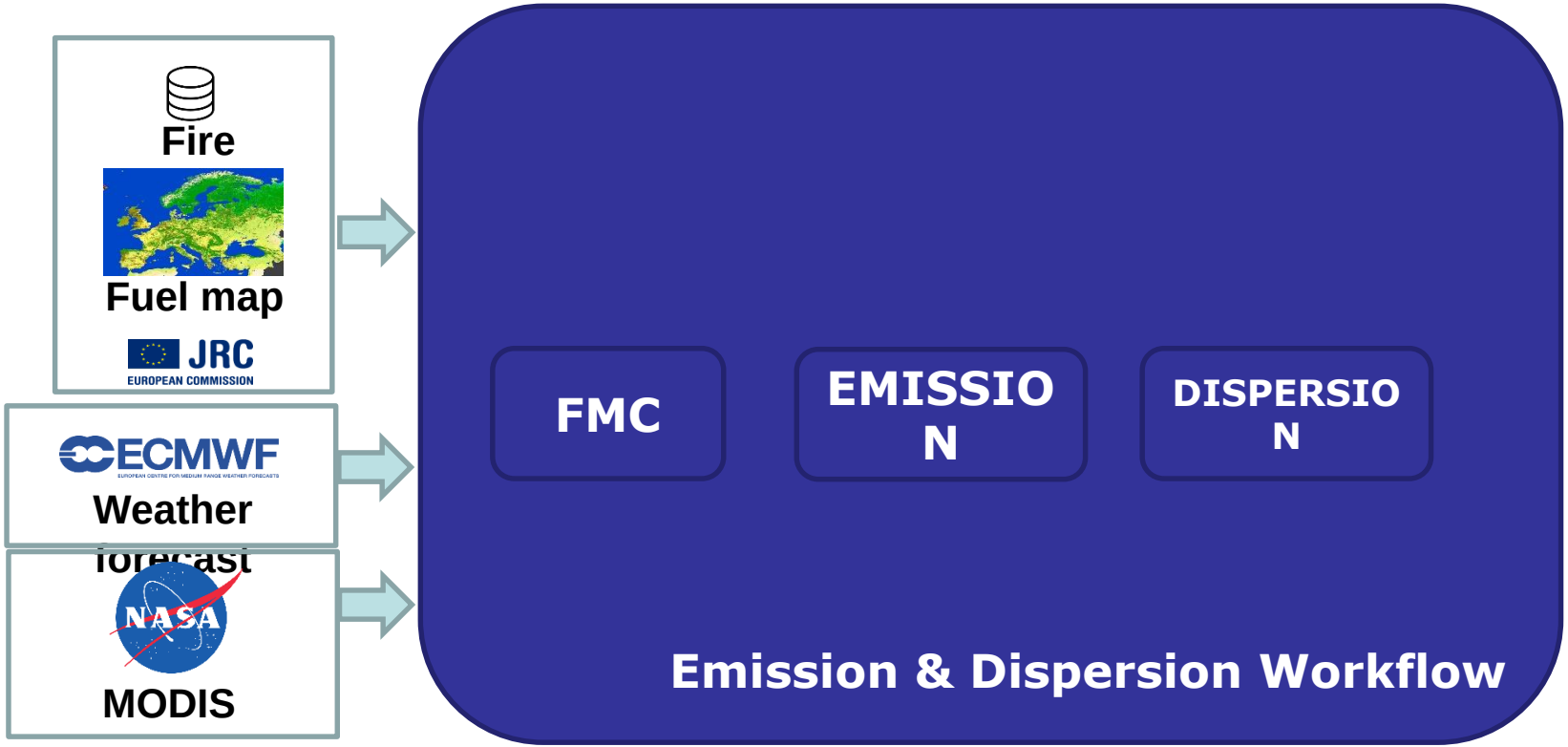


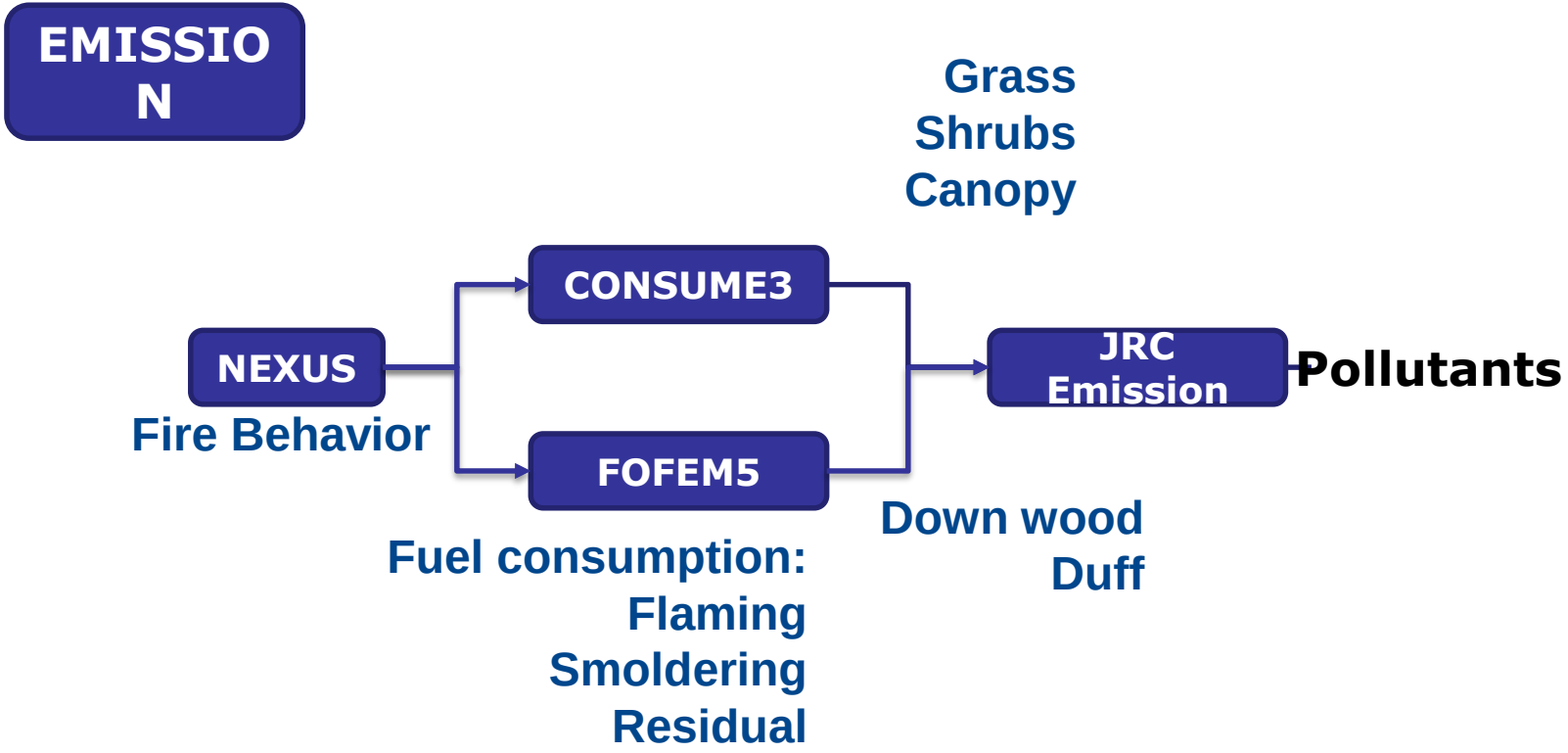
FMC Fuel Moisture Content

Estimation from MODIS (M. Yebra et al. 2008)

- Requires:
  - MODIS Collection 6
  - Fuel map
- Provides
  - Daily estimation of FMC based on RTM, PROSPECT and SAILH.
  - Vegetation indexes like NDVI, VARI and GVMI.

EFFIS – Emission & Dispersion




EMISSION
Grass
Shrubs
Canopy
CONSUME3
NEXUS
JRC Emission
Pollutants
Fire Behavior
FOFEM5
Down wood
Duff
Fuel consumption:
Flaming
Smoldering
Residual

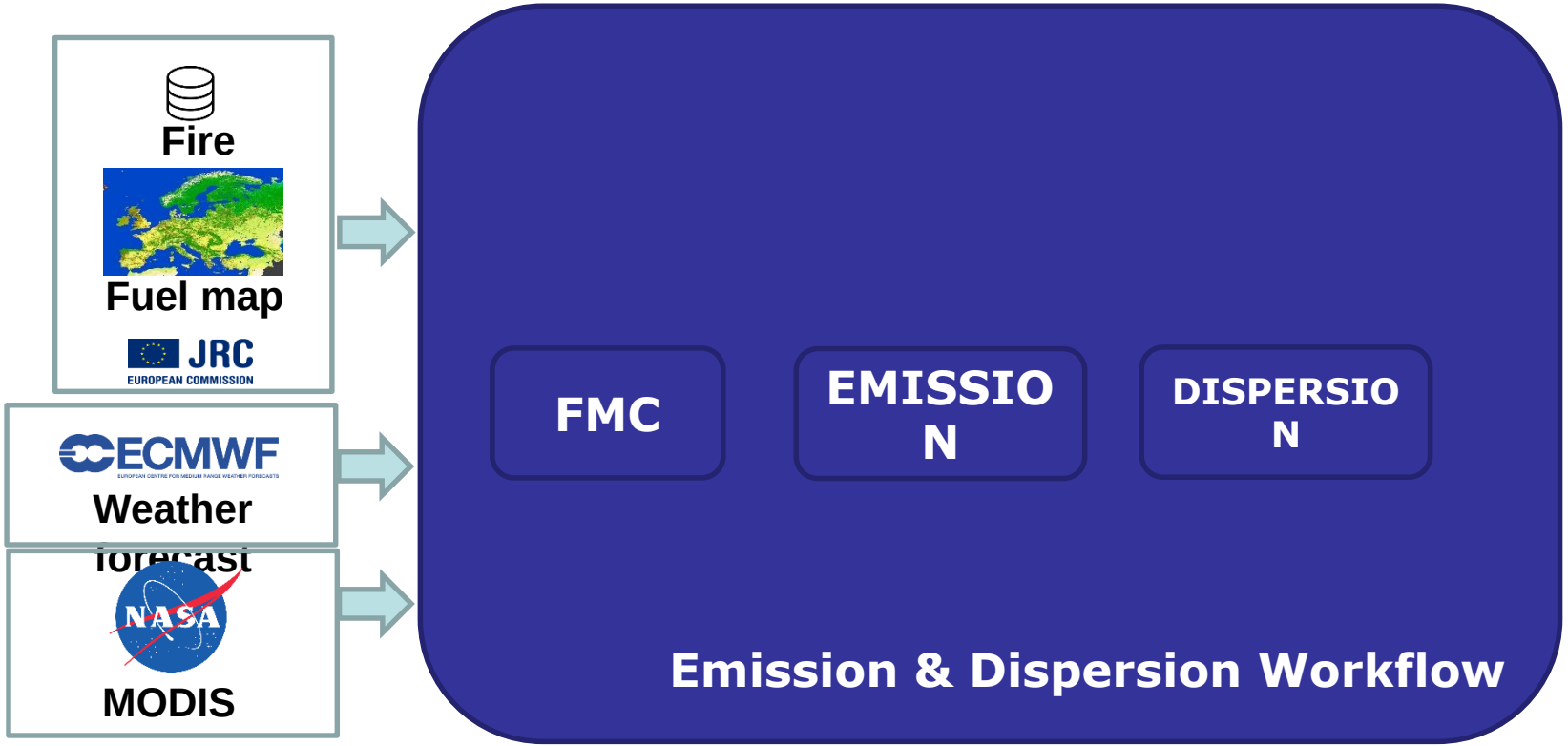
European Commission

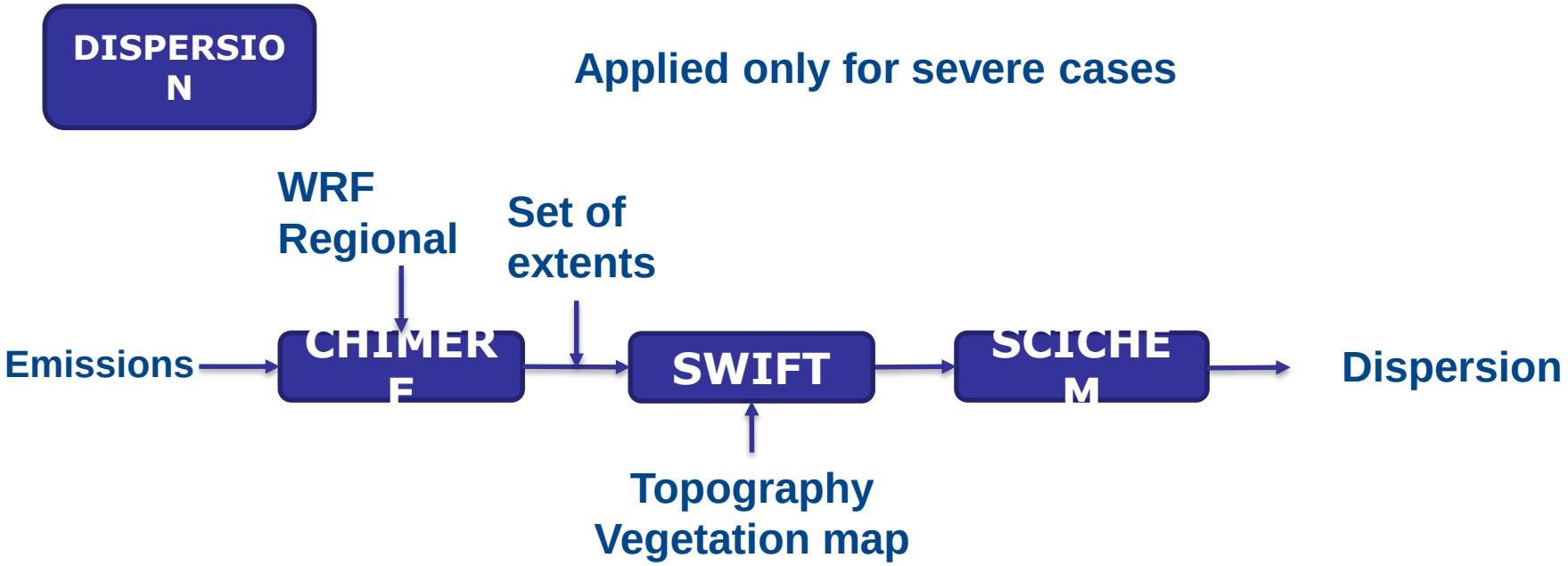
EMISSION

Requires:
Weather forecast
Fuel map
Topography
FMC
Vegetation indexes

Provides:
Fuel consumption
Pollutants for each daily burnt areas

EFFIS – Emission & Dispersion




DISPERSION
Applied only for severe cases
WRF Regional
Set of extents
Emissions
CHIMERE
SWIFT
SCICHEM
Dispersion
Topography
Vegetation map

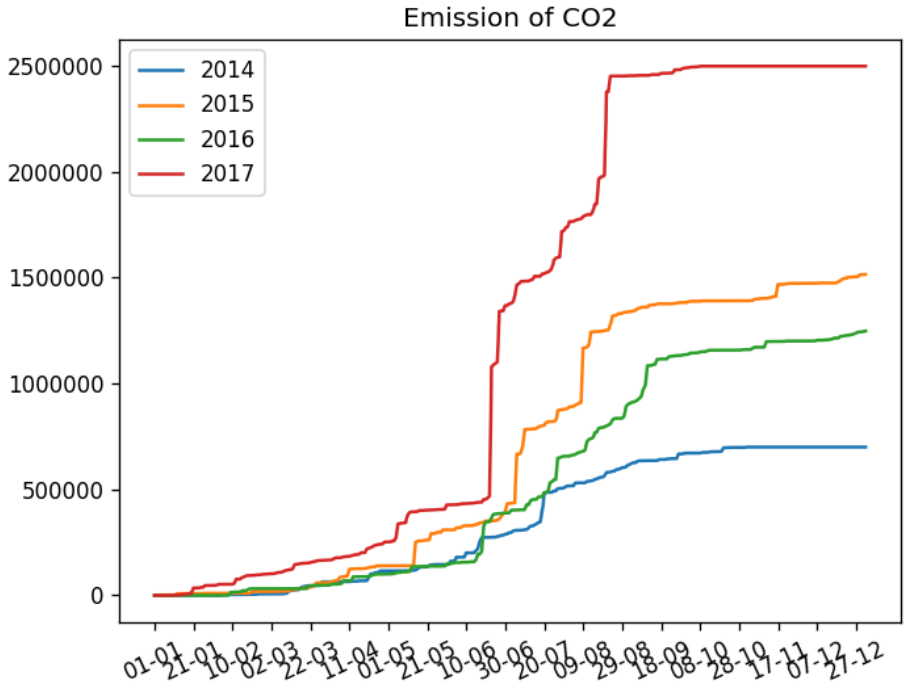
Emission & Dispersion Workflow

FMC and emission steps run daily automatically.

These two first steps of the workflow can run in historical mode allowing to update the emissions for cases which inputs are corrected (fire mapping, weather and satellite imagery).

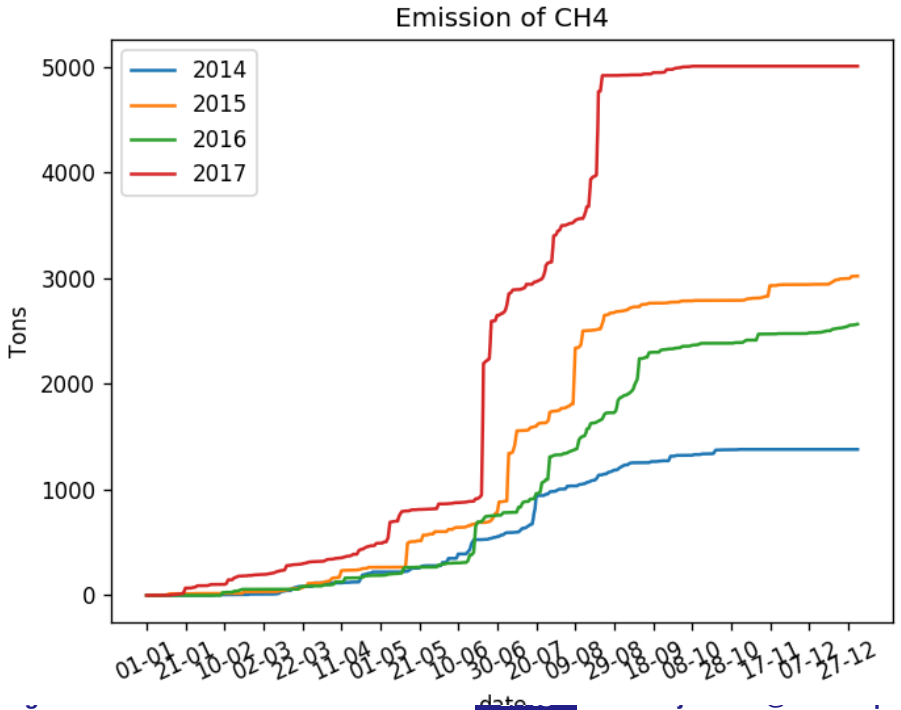
Emission & Dispersion Workflow

Carbon Dioxide CO2



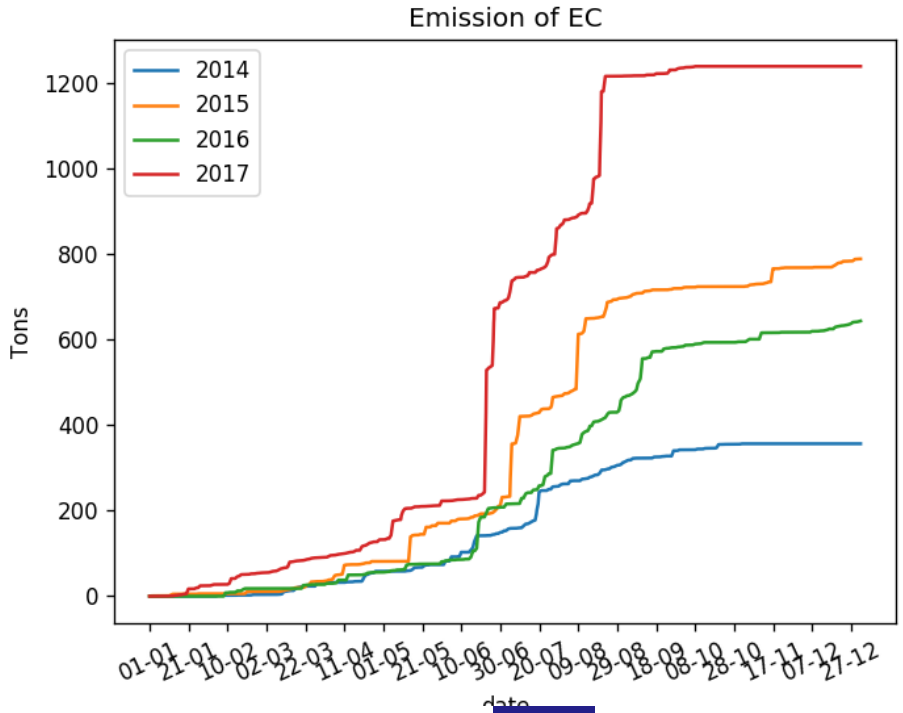
Emission & Dispersion Workflow

Methane CH4



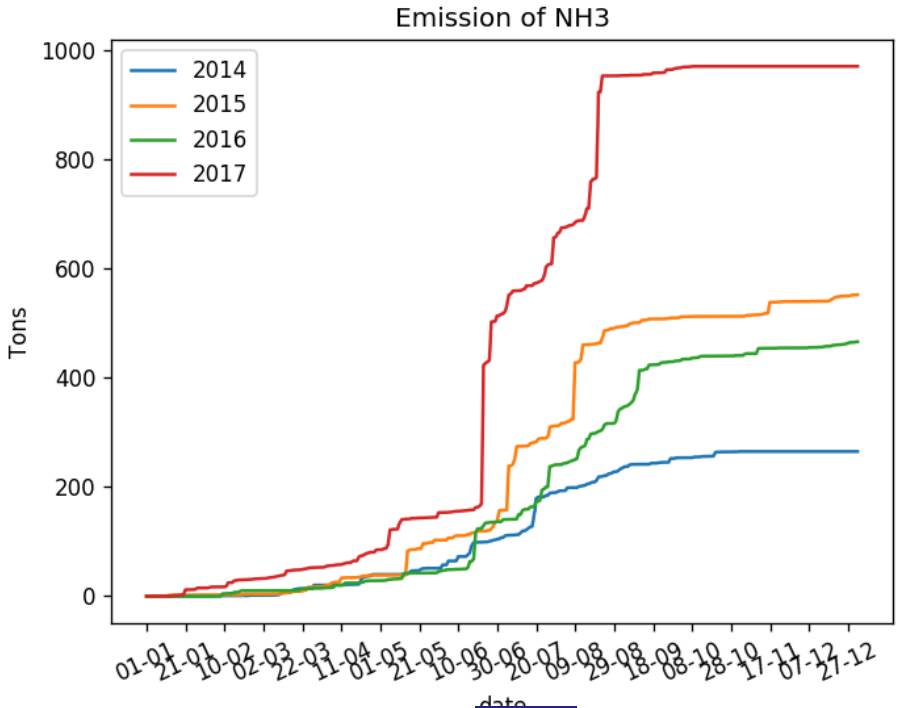
Emission & Dispersion Workflow

Elemental carbon EC



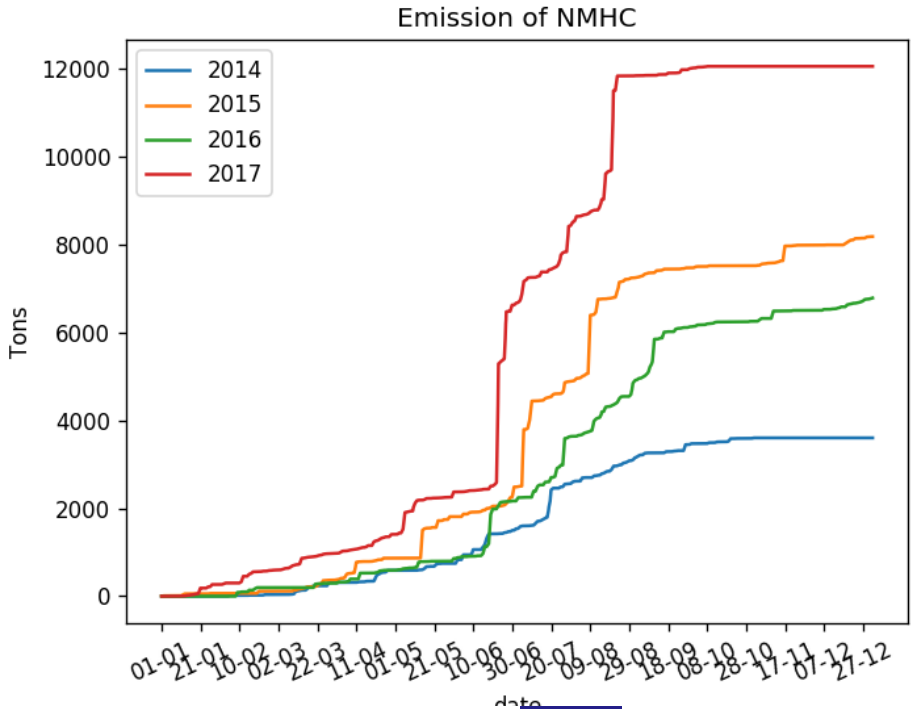
Emission & Dispersion Workflow

Ammonia NH3



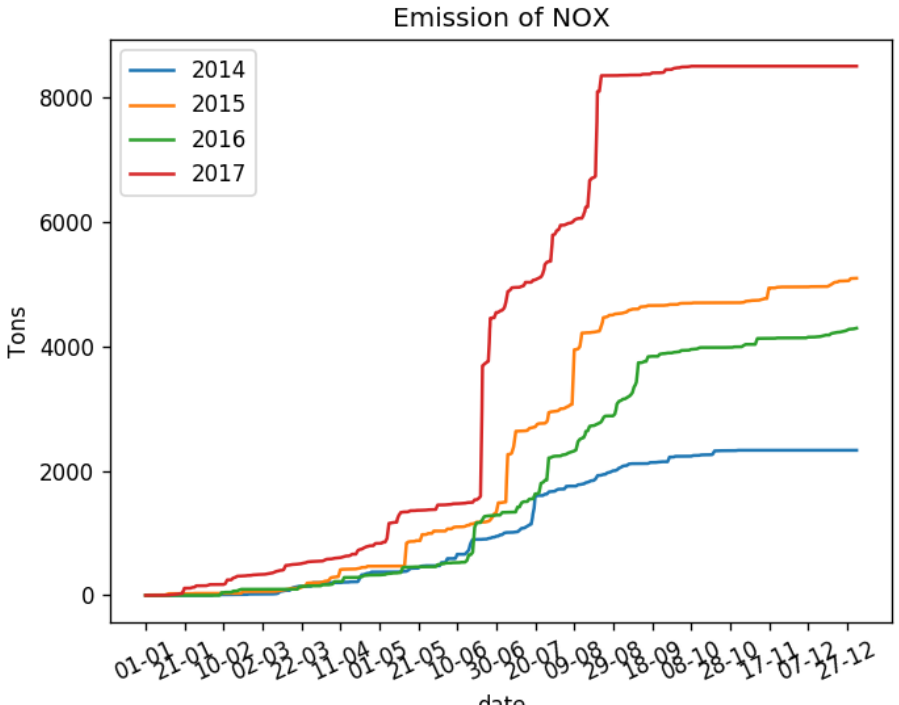
Emission & Dispersion Workflow

Non-methane hydrocarbons



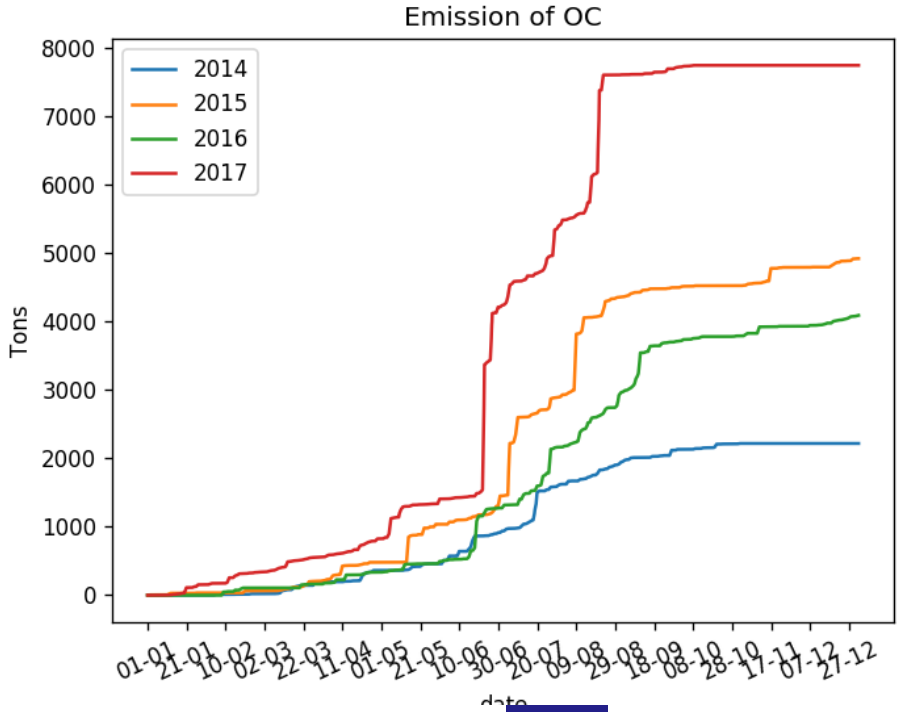
Emission & Dispersion Workflow

Nitrogen oxide



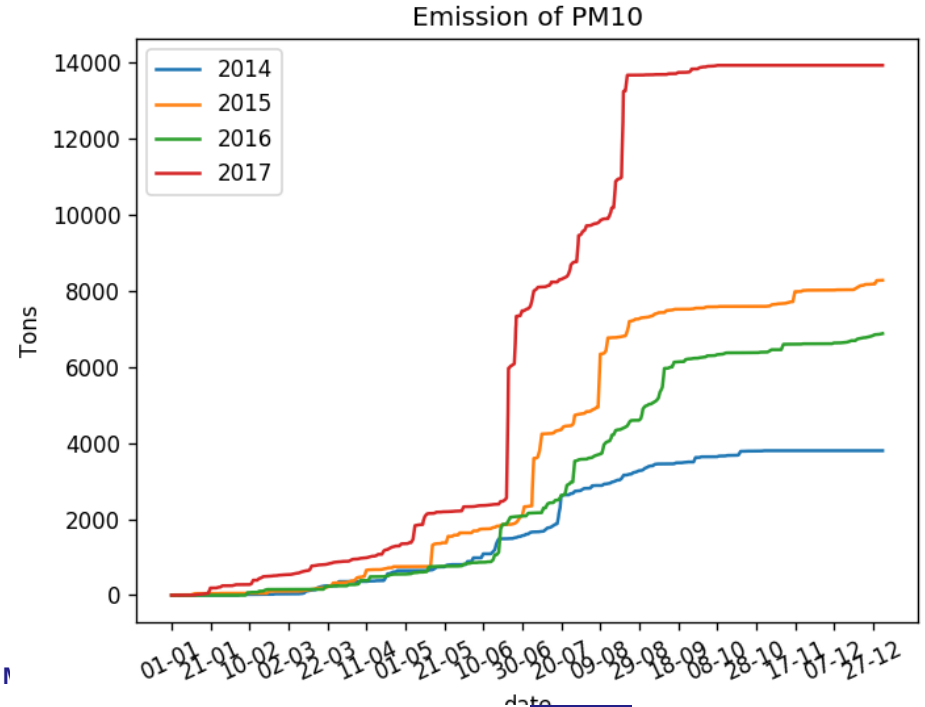
Emission & Dispersion Workflow

Organic carbon



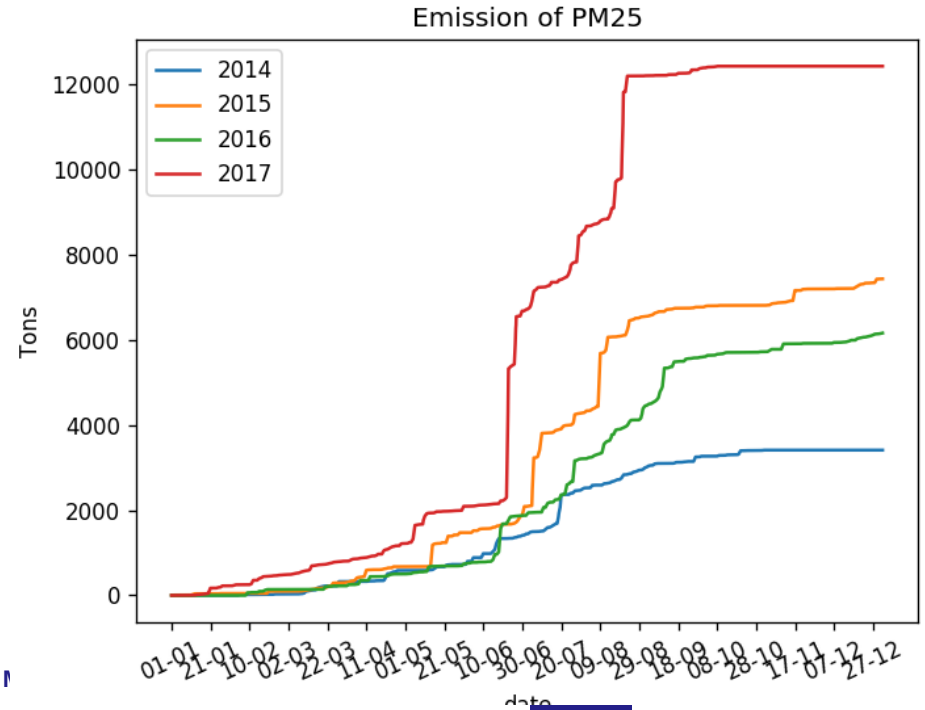
Emission & Dispersion Workflow

Particulate matter < 10 micrometers PM10



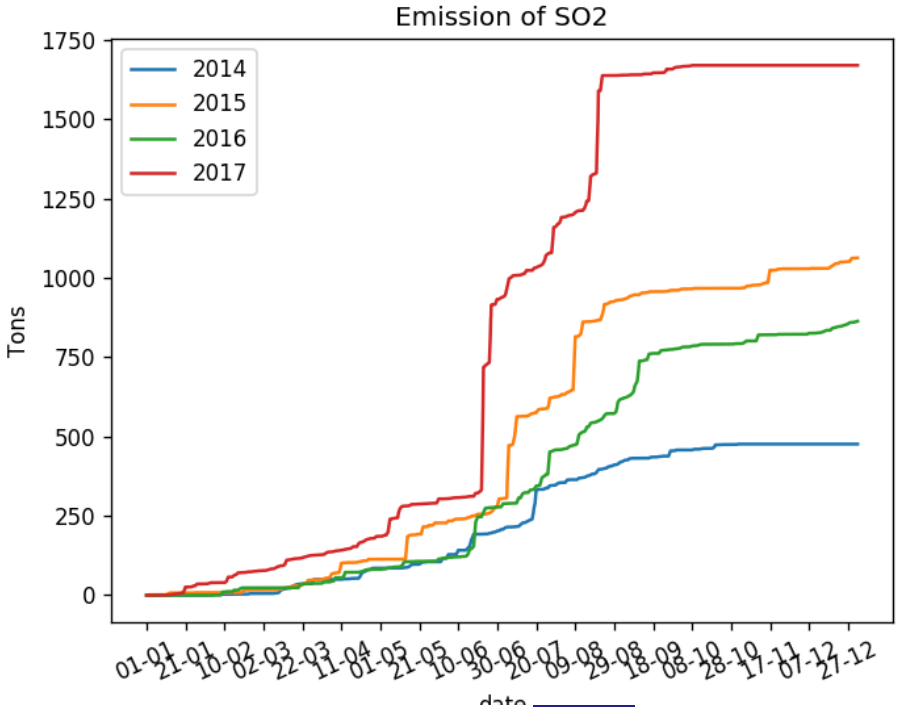
Emission & Dispersion Workflow

Particulate matter < 2.5 micrometers PM2.5



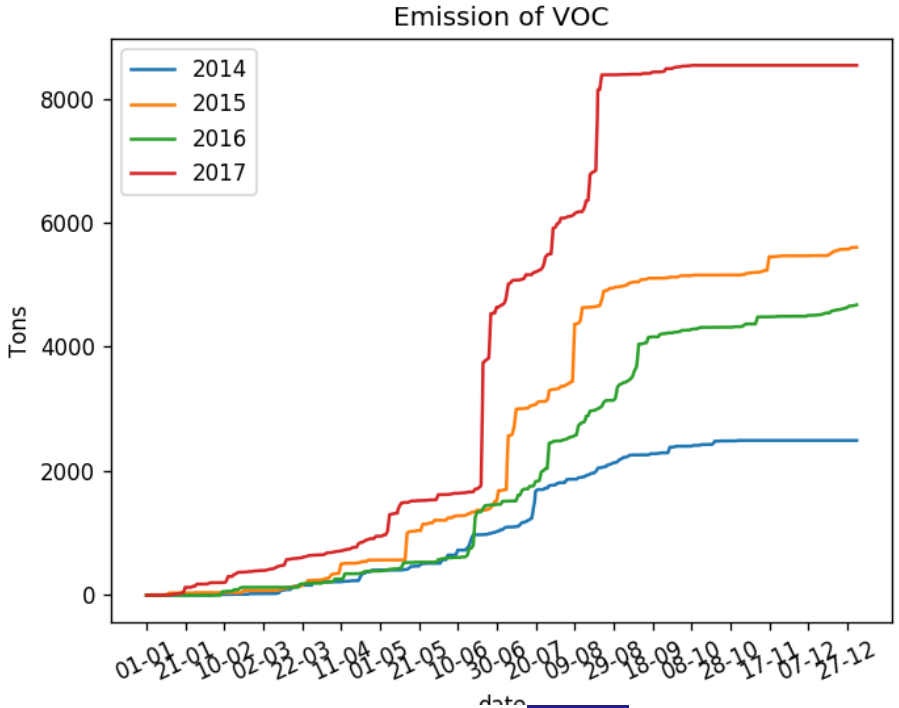
Emission & Dispersion Workflow

Sulfur dioxide SO2



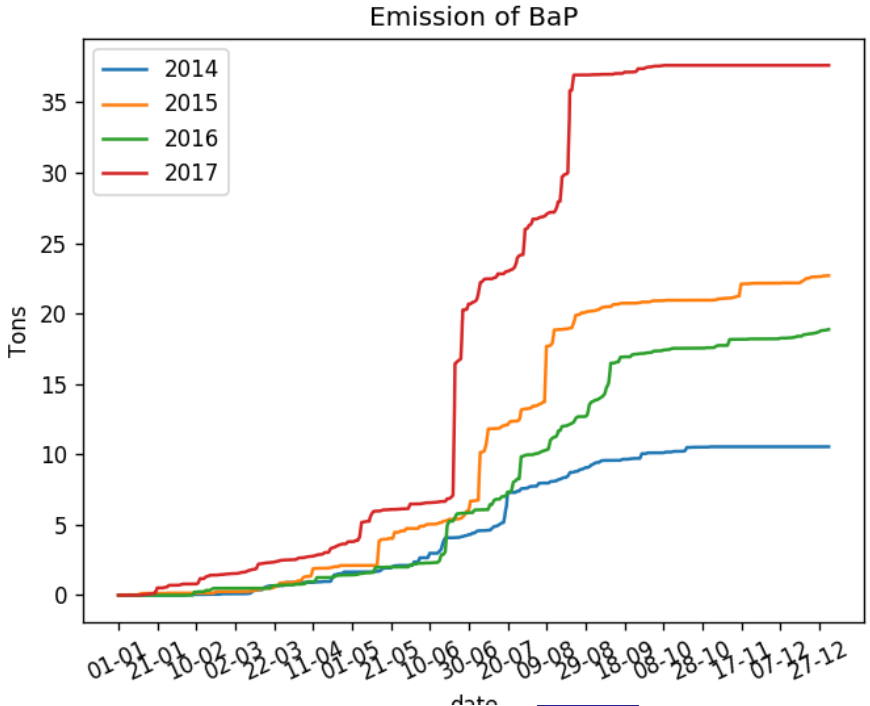
Emission & Dispersion Workflow

Volatile organic compounds VOC



Emission & Dispersion Workflow

Polycyclic aromatic hydrocarbon BaP



Emission & Dispersion Workflow

Next steps

- Validation of individual areas in collaboration with University of Aveiro, Portugal.
- Search for the most updated inputs like the fuel map.
- Compare results with other models.
- Improve the current method to compute the FMC with other sources.

Thanks