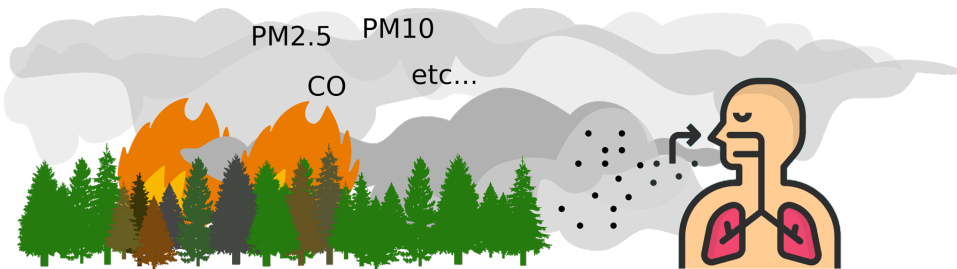


Development, Testing and Implementation of a Forecasting System for Forest Fire Smoke

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1 Background

Forest fires close to populated areas lead to very high exposures to air-pollution, often resulting in peaks of hospital admissions and **unhealthy cities**. In order to mitigate these effects **wildfire smoke forecasting** has been implemented in some countries, usually alongside daily air-quality forecasts. The **forecasts can be used by** stakeholders and the public to e.g. reduce outdoor activities or postpone events at critical moments. In this work **a new forecast system is described**.

2 Wildfire Smoke Modeling

To model wildfire smoke three phenomena have to be considered:

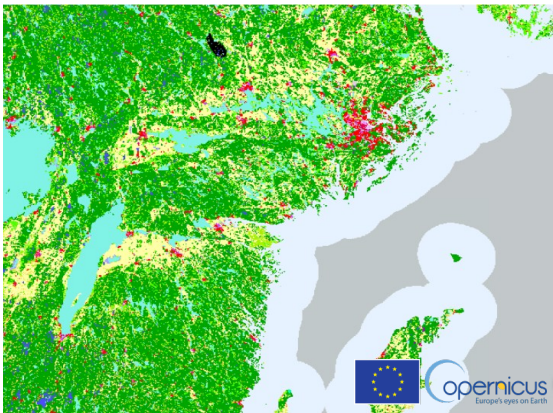
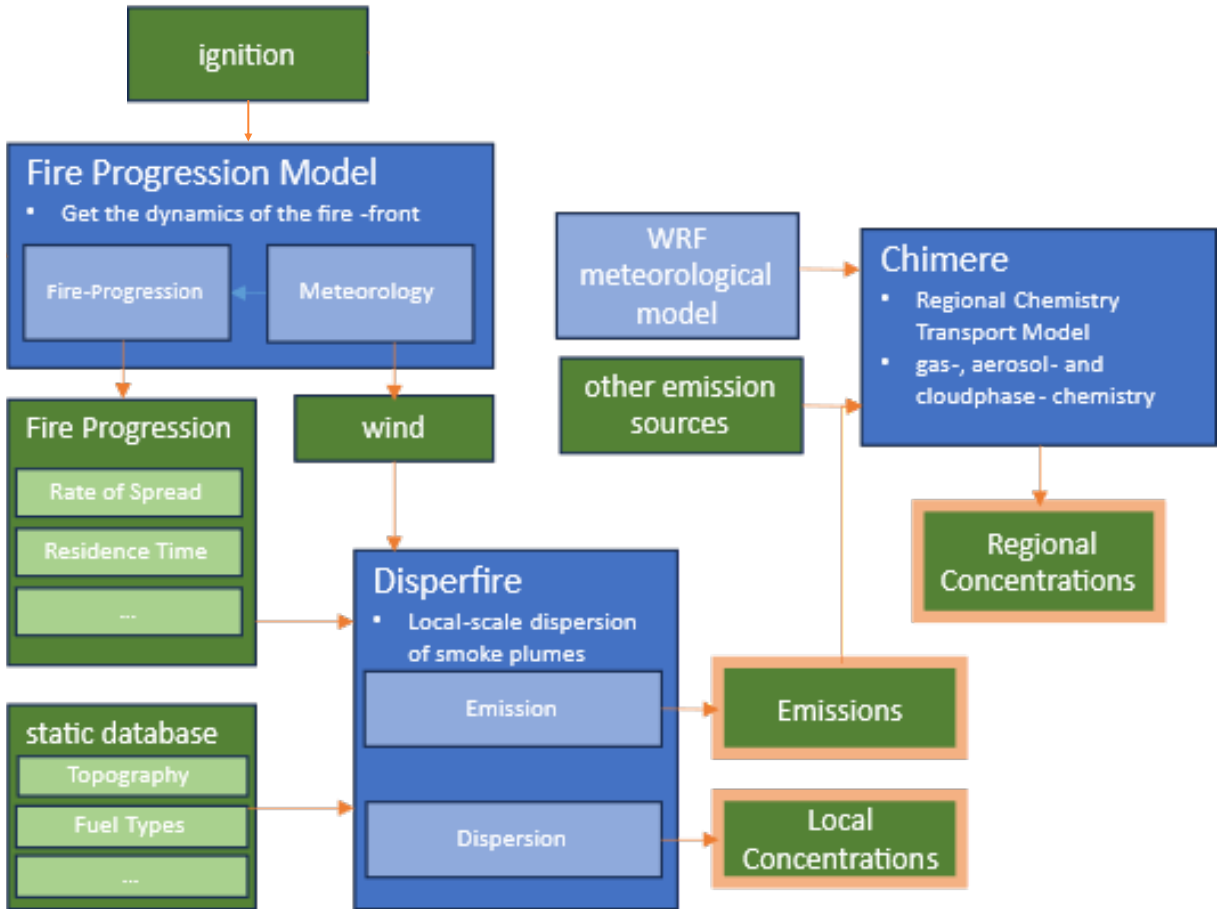
- 1) Wildfire ignition and progression
- 2) Smoke emissions
- 3) Smoke dispersion

The **developed system** works as depicted on the right:

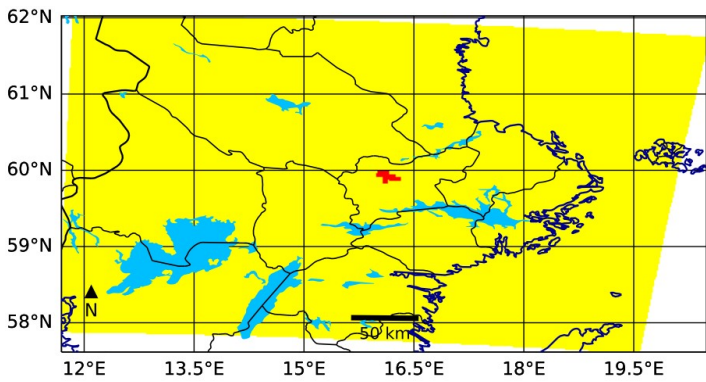
Another methodology (below) employs satellite products to estimate wildfire emissions.

3 Regional-scale application

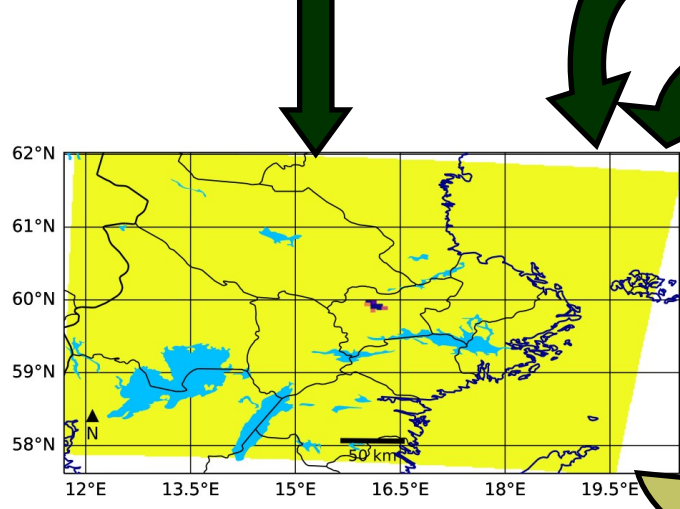
APIFLAME was used to estimate **emissions**, and CHIMERE for the **dispersion**. **Emission factors** are associated with land cover. **Figures** to the right show the 2014 **Västmanland wildfire** in Sweden.



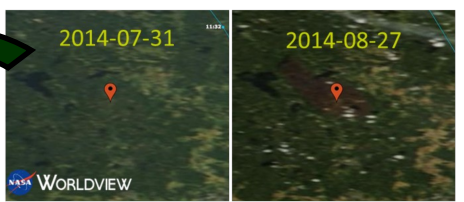
Corine Land Cover map of Stockholm and Västmanland (2018). Burnt areas are black.



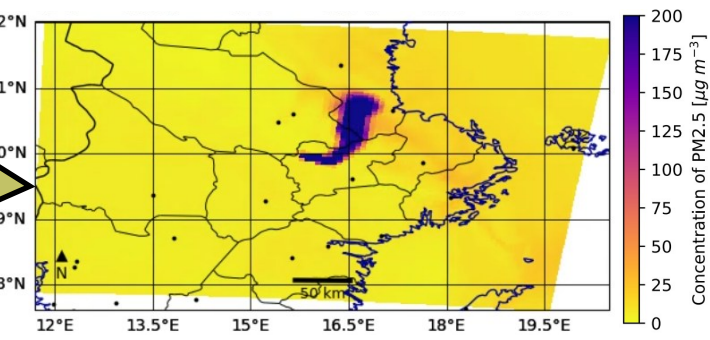
2014-08-06 Burned pixels. Estimated from MODIS FRP hotspots.



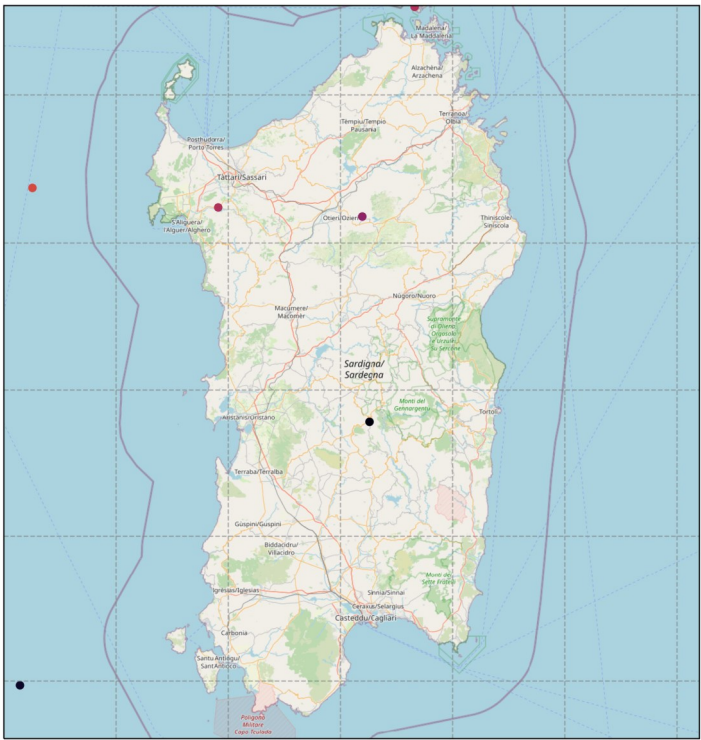
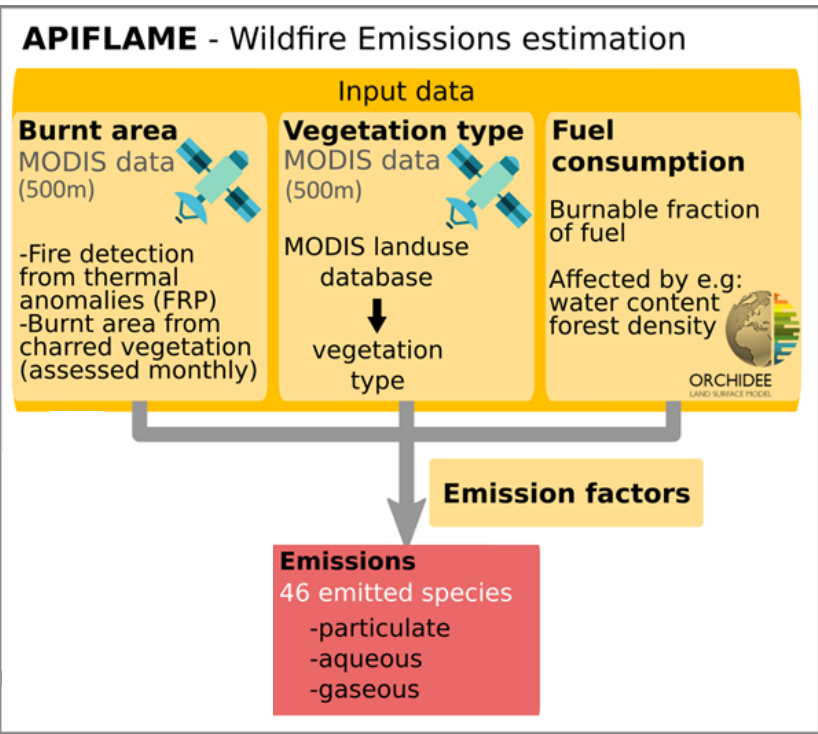
2014-08-06 Emissions from APIFLAME



Västmanland before and after fire. Charred land visible.



2014-08-06 19:00 Dispersion of a pollutant near ground from CHIMERE



2021-07-24 CrIs-TROPESS carbon monoxide over Sardinia, Italy. Lower resolution than TROPOMI.

4 Model Validation with Satellite Data

Several **satellite instruments** provide the total column of certain air pollutants:

- TROPOMI
- CrIs
- IASI

We **compare satellite** derived total column of air pollutants **with simulation** results to validate model results.

Figures to the left and right show the 2021 **Montiferru wildfire** in Sardinia.



2021-07-24 TROPOMI carbon monoxide over Sardinia, Italy. A wildfire was burning in the center-west part of the island.

5 Conclusion

Satellite data was used in two different ways during the development of the forecast system. As an input for the models, through APIFLAME and for the validation of concentration results.



Acknowledgements

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