Simulation du transport et diffusion atmosphérique du panache de Lubrizol et prévision de panaches d'incendies de végétation

35èmes journées du Groupe du RésoFeux
10 et 11 juillet 2025
ASNR, Fontenay-aux-Roses

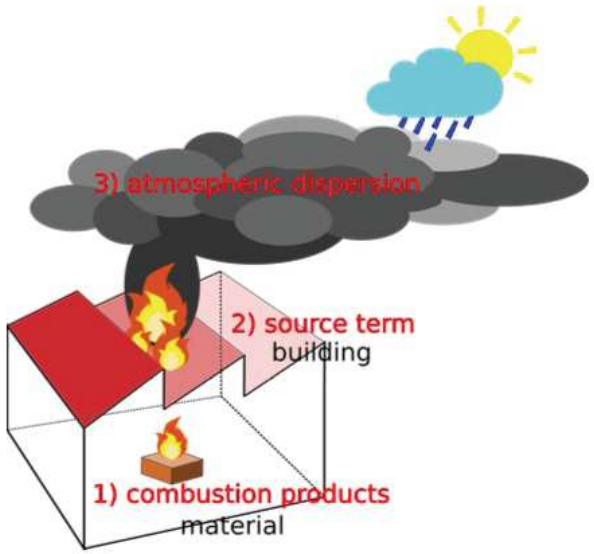
Jean-Baptiste Filippi
Roberta Baggio – Benjamin Truchot (Ineris)

ANR FirePlume - "Flash 18 months" - July 2021

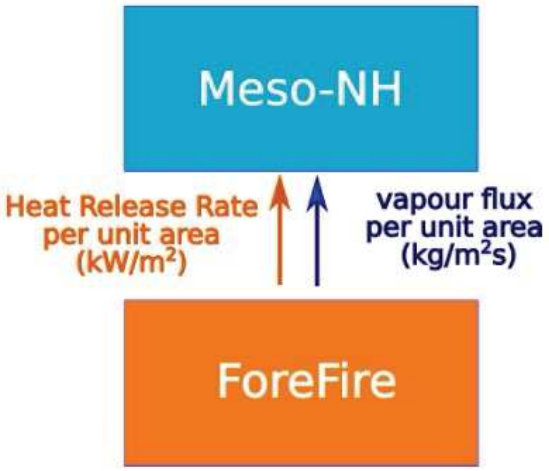
Program Goal:

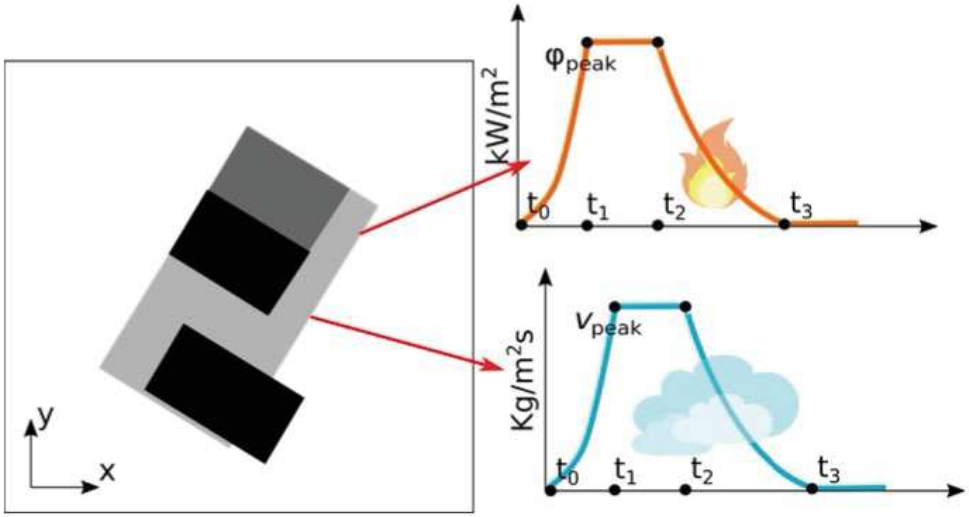
Numerical emergency simulation of fire plumes, from source identification to their dispersion

- Estimation des émissions et du transport (habituellement réalisés avec des codes lagrangiens)
- Caractérisation de la source
- Interaction panache-atmosphère
- Capacité à fournir des résultats à T+6h
- Coria (PI Béatrice Patte-Rouland), Ineris, Lemta, SPE
- GDR CNRS "Incendie"



Coupling with ForeFire





Carte de combustible : ϕ_{peak}, v_{peak}, t_1, t_2, t_3, u_i, ...

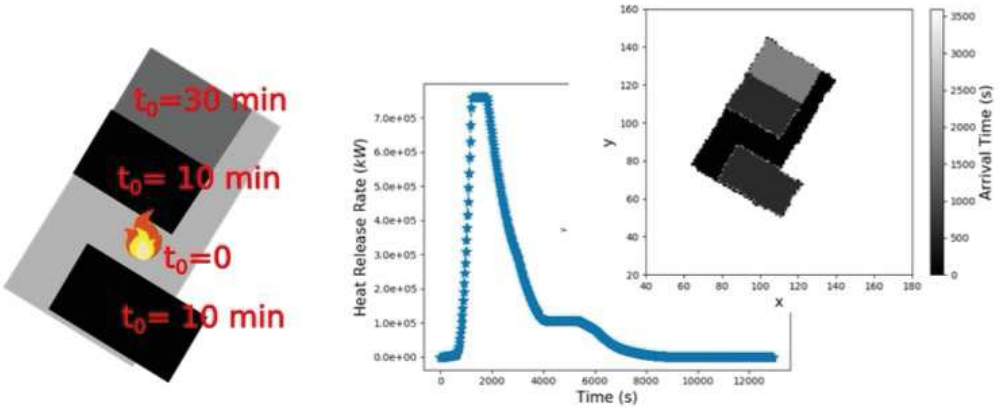
Matrice des temps d'arrivée :

t_0^i assigné a priori,

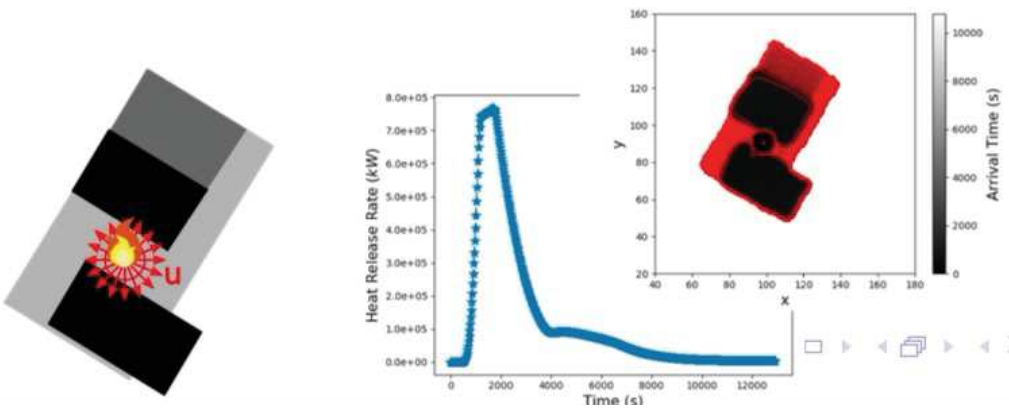
ou calculé à partir d'un modèle de propagation du feu u^i

Coupling with ForeFire

- Assigned Time of Arrival Matrix:



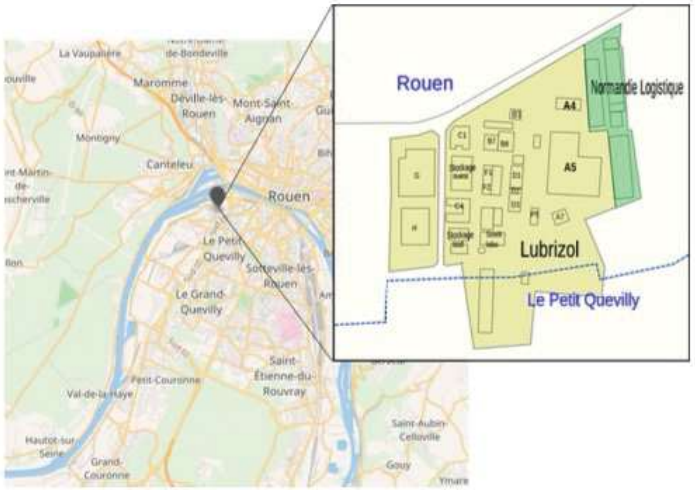
- Time of Arrival Matrix from the Propagation Model:



Lubrizol Industrial Fire

26 septembre 2019 :

L'usine chimique Lubrizol à Rouen prend feu



≈ 02.30 h
00.30 UTC

PROBABLE STARTING TIME

02.30 UTC

FIRE SPREADS OUT OF CONTROL

15.30 UTC

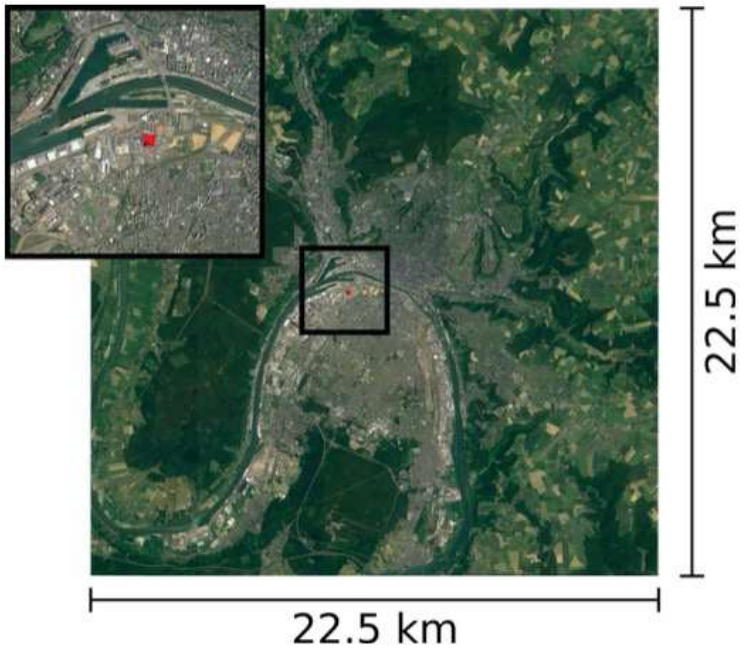
FIRE IS DEFINITELY EXTINGUISHED

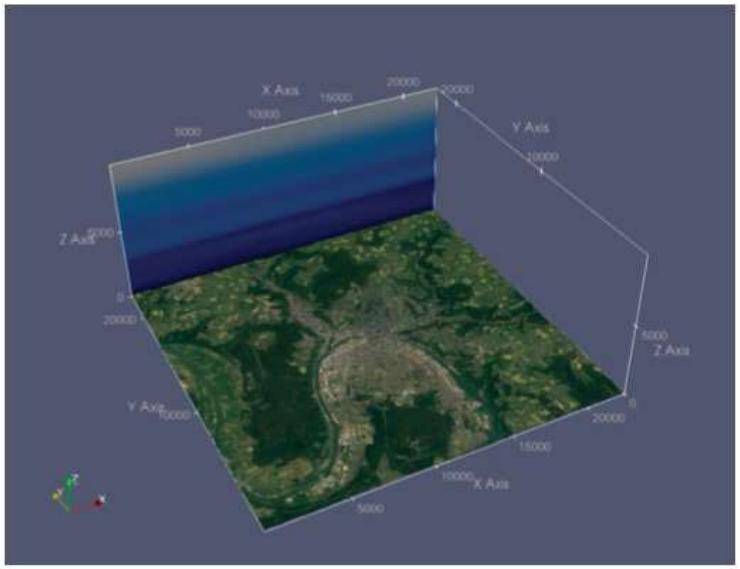
≈ 9500 t de produits brûlés (huiles minérales), surface du feu ≈ 20 000 m^2

Lubrizol Industrial Fire: Meso-NH simulation

Domaine simulé :

22500 m × 22500 m × 9750 m



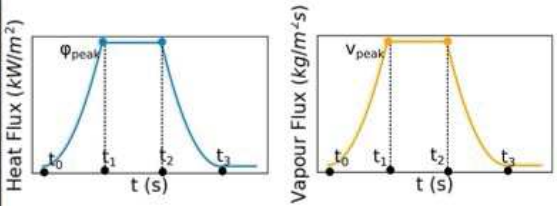


Conditions aux limites Arome - $\Delta x = \Delta y = 75\,m$,

$\Delta z_{bot} = 50\,m$, $\Delta z_{top} = 250\,m$, avec turbulence 3D et Surfex

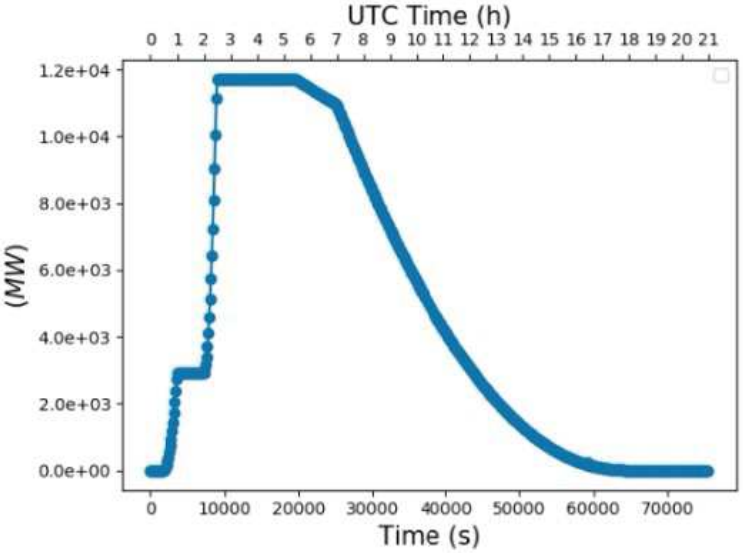
Lubrizol Industrial Fire: Meso-NH simulation

Source Terms:



φ_{peak}=520 kW/m²
v_{peak}=1.7•10^{-2} Kg/m²s

t_1=30 min + t_0
t_2=5 h + t_0
t_3=16 h + t_0



Puissance totale libérée : 97,5 GWh

$\longrightarrow 3 \cdot 10^7 \frac{j}{kg} \times 10^7 kg = 83,3 GWh$

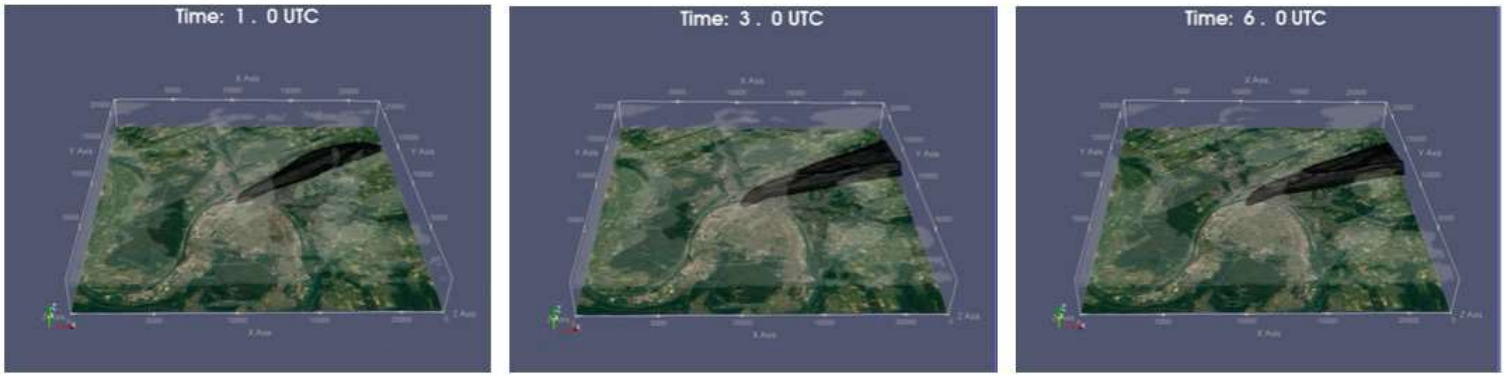
Vapeur totale libérée : 11 500 t

$10^7 kg$ d'huile minérale $\rightarrow 10\%\, H\ 10^6\ kg\ H + 8 \cdot 10^6\ kg\ O_2 = 9 \cdot 10^6\ kg\ H_2O$

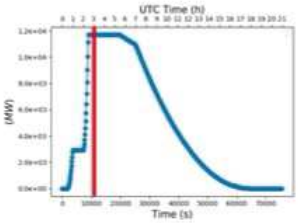
26/09/2019: 0 UTC -ANR Fireplume - Baggio/Truchot/Filippi/Couto -
Heat Release Rate (MW)
Vapour Flux (kg/s)
Time (s)
INERIS
anr
FIRE
PLUME

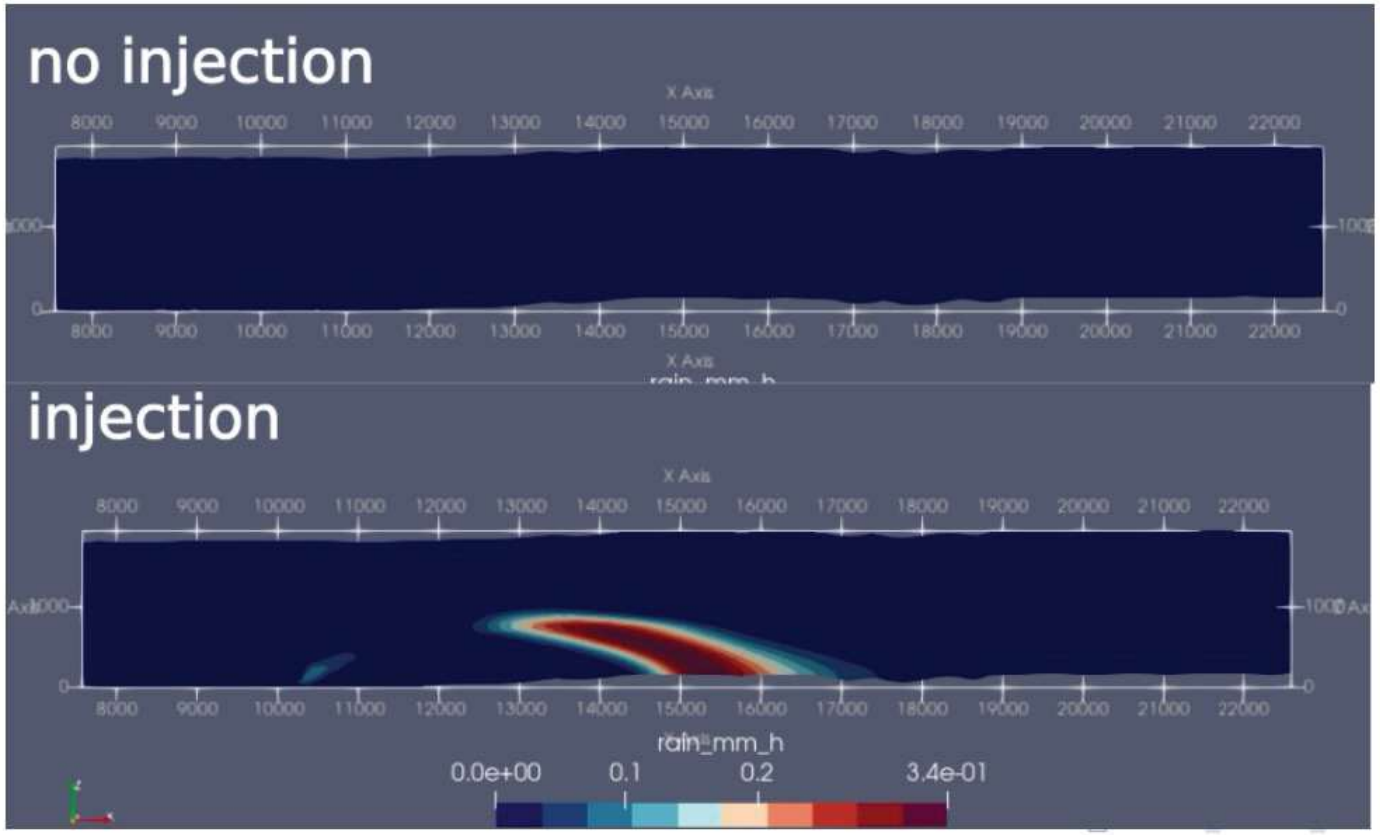
Lubrizol Industrial Fire: Smoke tracer

Evolution of B_{ratio}:

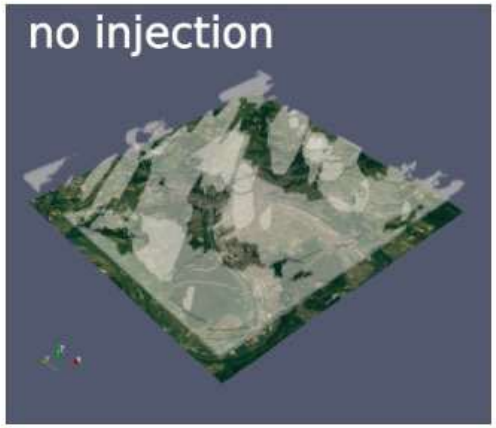


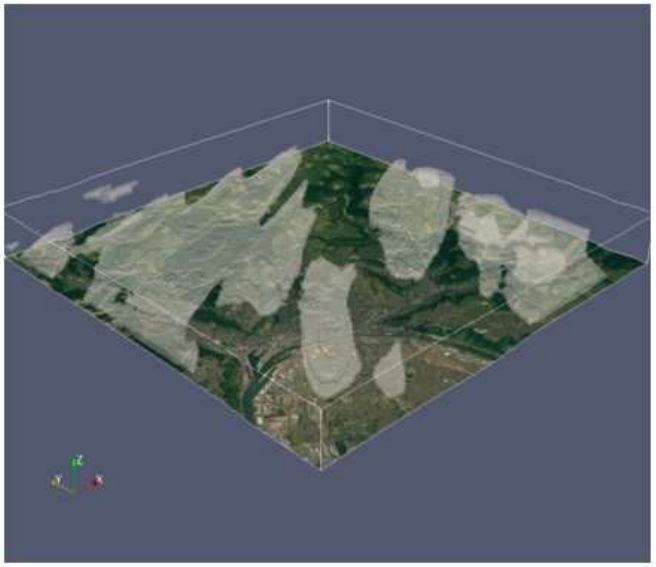
Lubrizol Industrial Fire: Rain

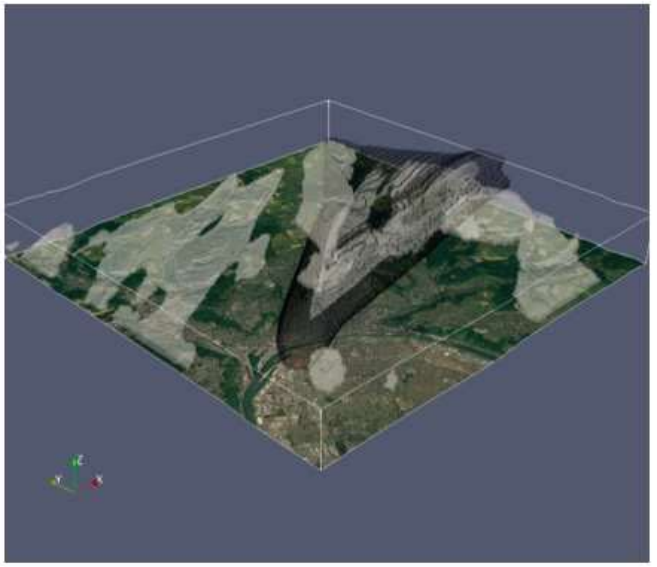




Lubrizol Industrial Fire: Meso-NH simulation



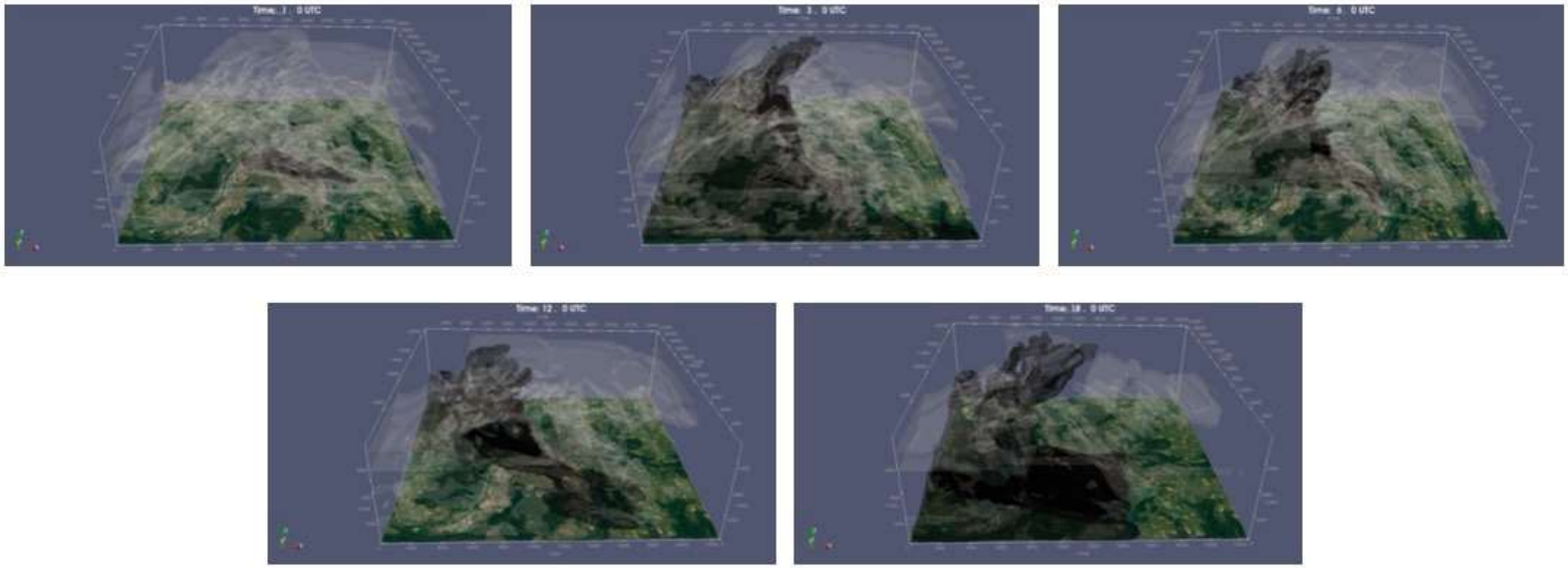




Alternative Scenario: Meso-NH simulation

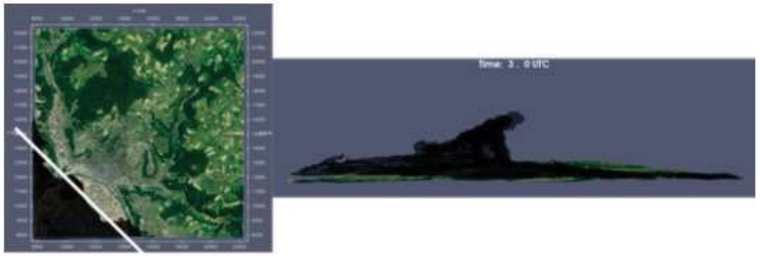
Atmosphère très instable

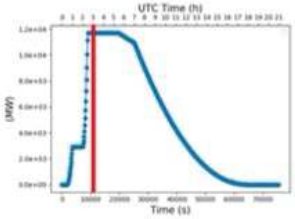
Evolution of B_{ratio}:

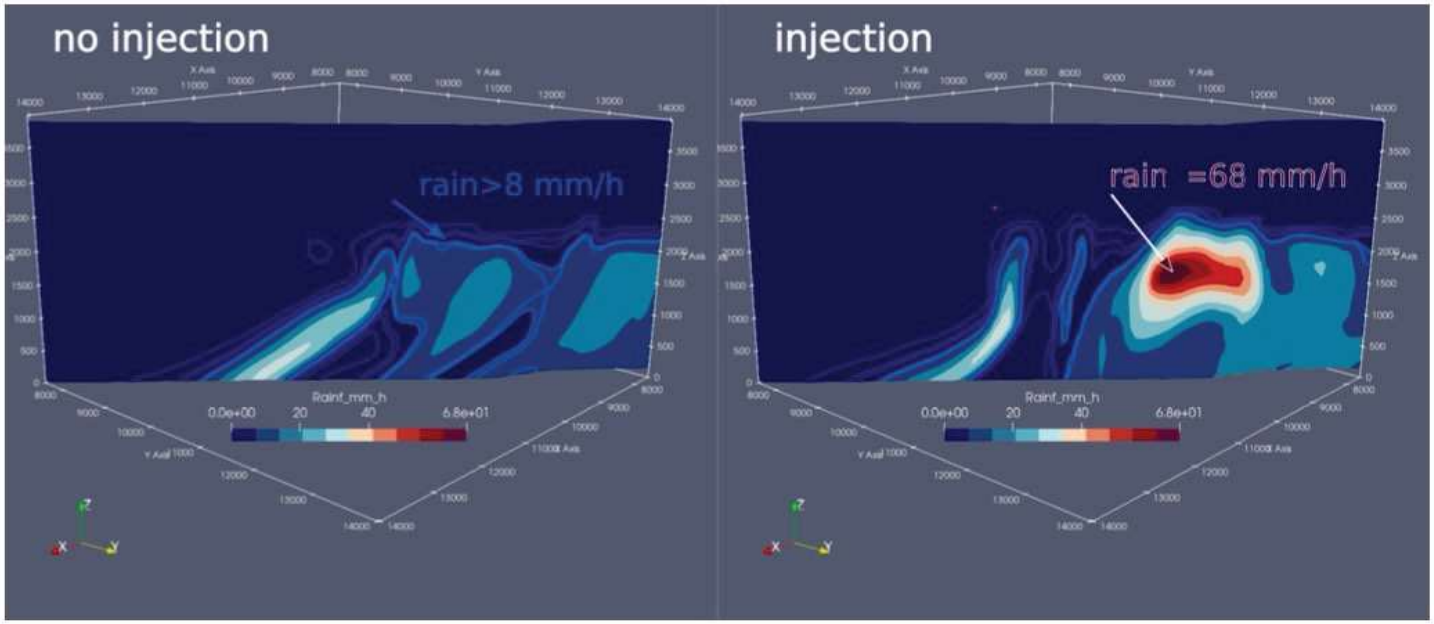


Alternative Scenario: Meso-NH simulation

https://tinyurl.com/fplume







rain at 03.00 UTC

Prévision Immédiate –
les cas des incendies de Narbonne et Marseille
(7/8 juillet)

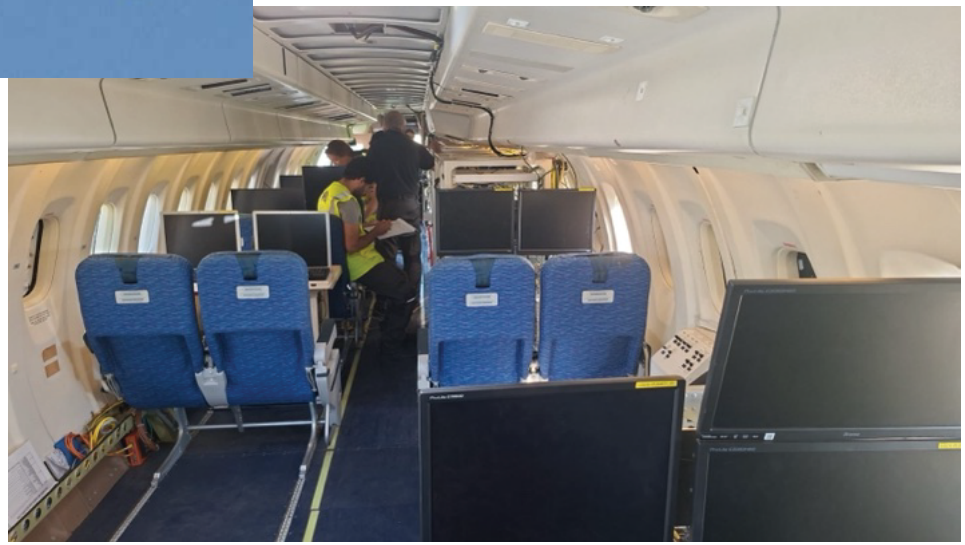
Contexte – Campagne Silex – CNRS SAFIRE – C.Denjean (CNRM)

Caméra du LEMTA (G.Parent)
(vue feu / calibration satellite)

Analyse de gaz / particules

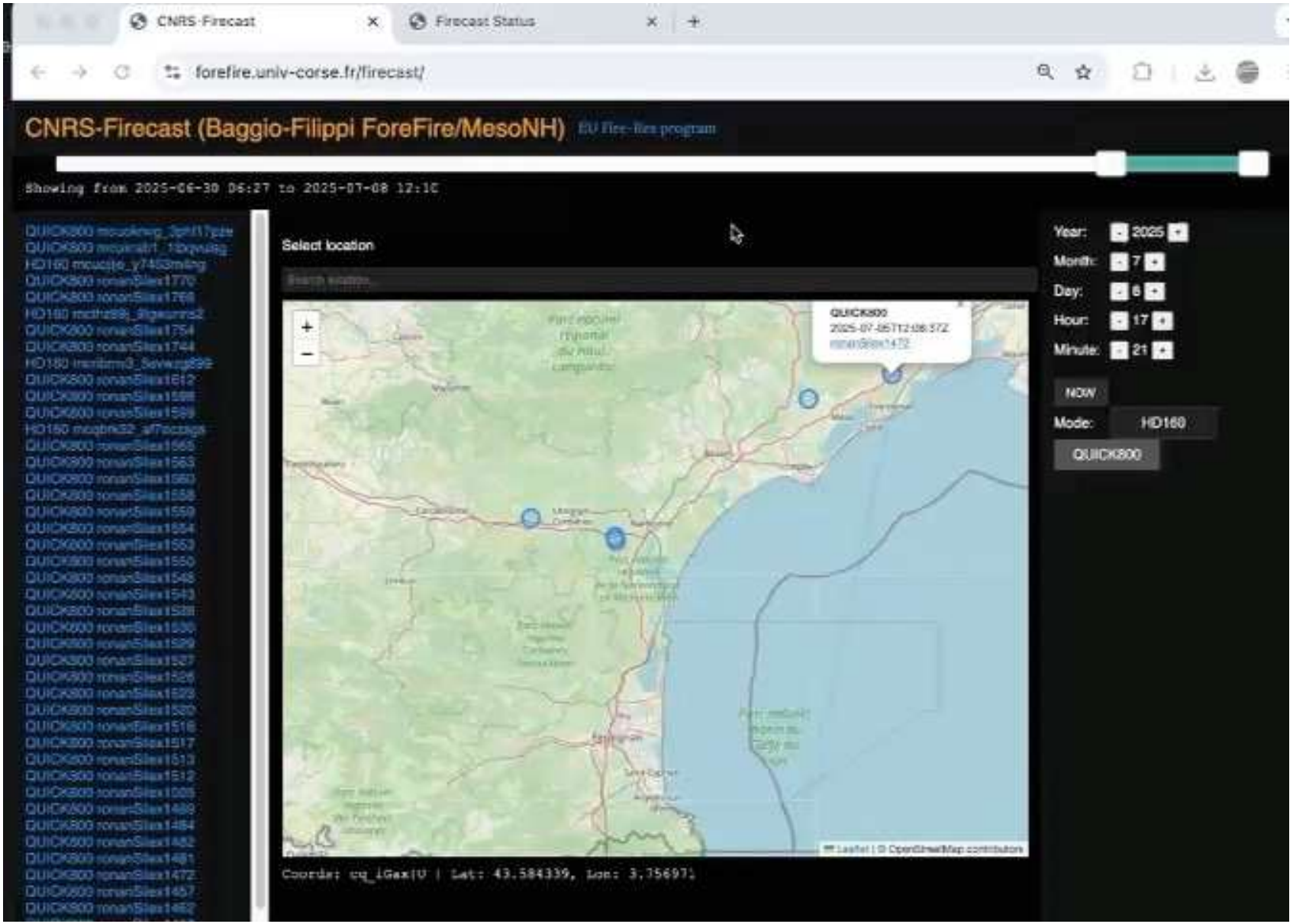
10 juillet/15 Aout

3h/Jour de vol

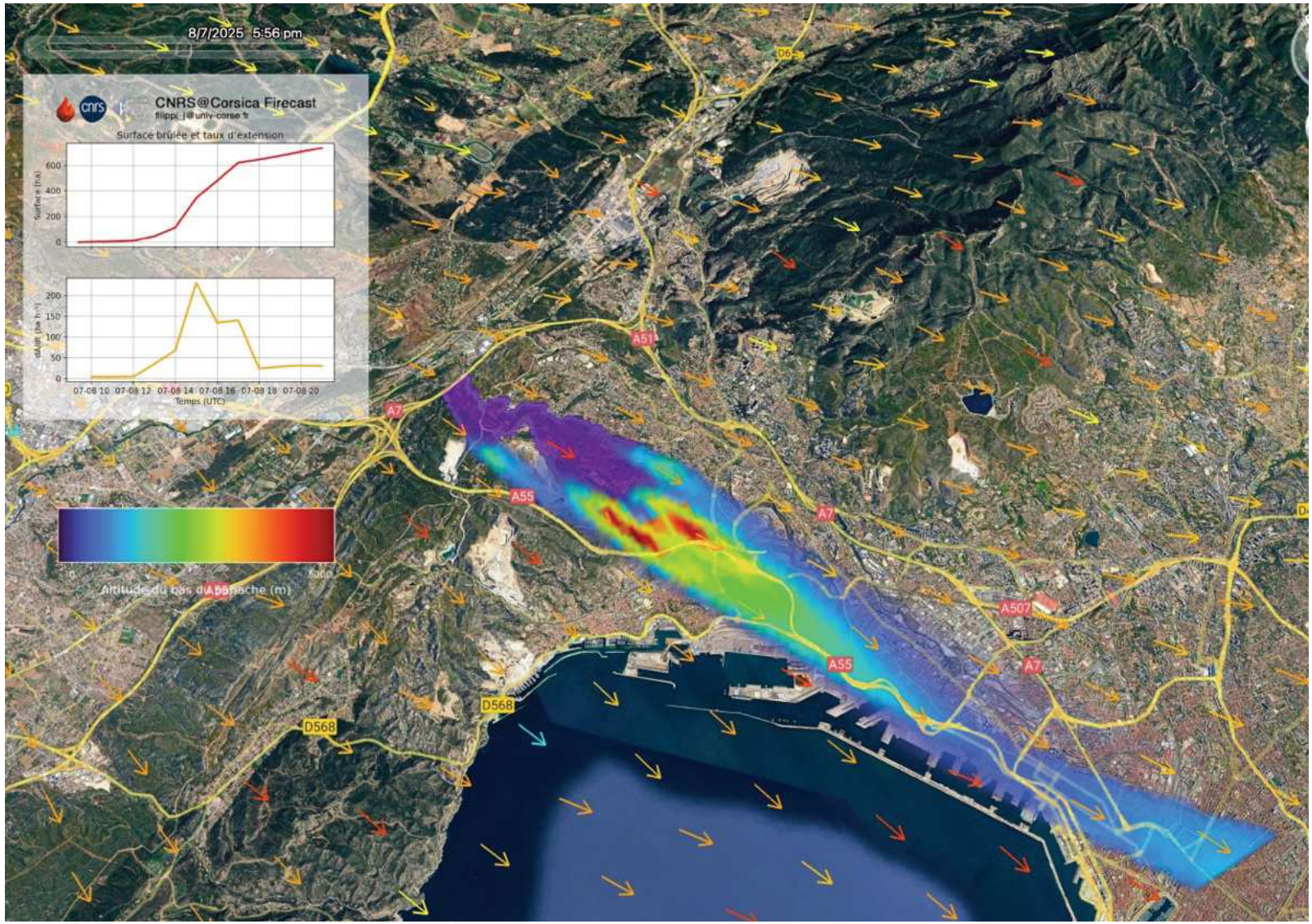


Besoin de prévision instantanée pour établir des plans de vols et prévisions

Firecast:
- Detection satellite (Meteosat Third Generation) (UPC. R.Paugam)
- Lancement automatique de 12 h prévision pour 20 minutes de calcul


CNRS-Firecast
Firecast Status
forefire.univ-corse.fr/firecast/
CNRS-Firecast (Baggio-Filippi ForeFire/MesoNH)
Showing from 2025-06-30 06:27 to 2025-07-08 12:10
Select location
Year: 2025
Month: 7
Day: 8
Hour: 17
Minute: 21
NOW
Mode: HD160
QUICK800
Leaflet | © OpenStreetMap contributors

Incendie Pennes – Détecté satellite à midi – fichiers disponible 14h



Prévision à 18h
Contour
Fumée au sol
Panache

Outil de simulation pour l'aide à la décision - en réalité mixte (casque apple/meta)