



## Hyperlocal air quality measurements & forecasts with eLichens sensors & software solution. Presentation of Grenoble use case

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## Our Mission

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Enable **Air Quality Services** through its Cloud **Models & Analytics** assisted by **Patented Smart Sensors Network**

**In Grenoble (18,44 km<sup>2</sup>):**

- Ten eLichens air quality stations.
- One eLichens station placed next to a reference station.



## Company Profile

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- Founded: December 2014
- Locations: Sunnyvale, CA & Grenoble, France
- 19 Employees
- Second Fund Raising in May 2018
- Complete Solution : Smart Sensors + Data Fusion + SW Algorithms
  - Most Disruptive NDIR CO2 & CH4 Gas Sensors
  - Deployment ongoing (Smart City Air Quality)
  - Gas Leak Monitoring Station
- Patented Technology – 34 patents



# Disruptive Technology serving Smart City

For Smart City markets, there are **much demands** that are **hindered** by:

- Cost of deployment
- Relevance of the Information
- Experience – no personalized/hyper local

eLichens has a coherent offering by being the first to enable a complete high performances/cost efficient solution.

**eLichens offers a complete solution based on its Smart Sensors, unique and major differentiator.**



## eLichens Complete Solution



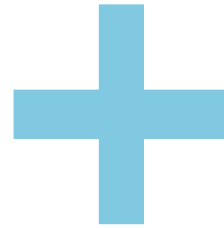
### Sensors

- ✓ Today: CO<sub>2</sub>, CH<sub>4</sub>
- ✓ Advanced development: PM<sub>0.2/1/2.5/10</sub>
- ✓ Future: Pollen, NO<sub>2</sub>, O<sub>3</sub>

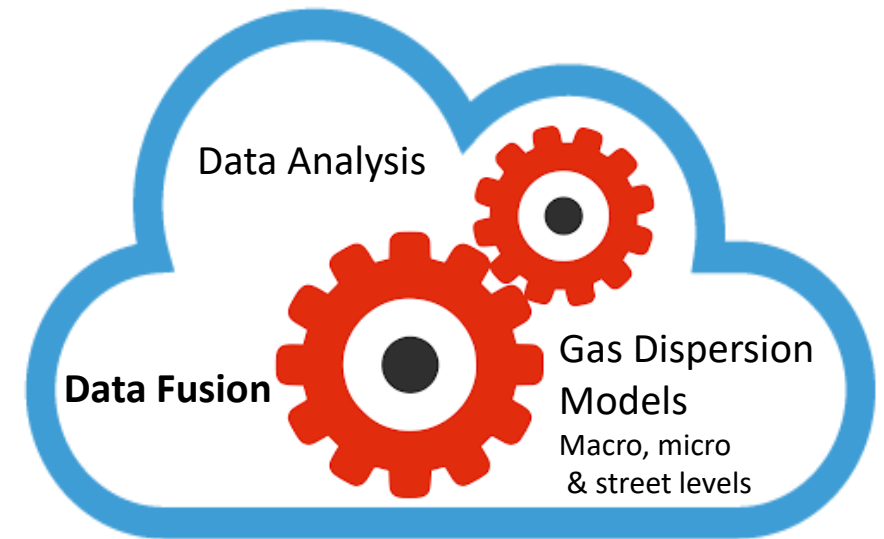


### Air Quality Station

- ✓ Outdoor & Indoor
- ✓ Multi-environmental sensors
  - CO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, CO, PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>
  - Temp, Pressure, Humidity, Microphone
- ✓ Wireless Network: Sigfox, Wifi, BLE, 2G,...
- ✓ Compact, Cost Optimized, Low Power



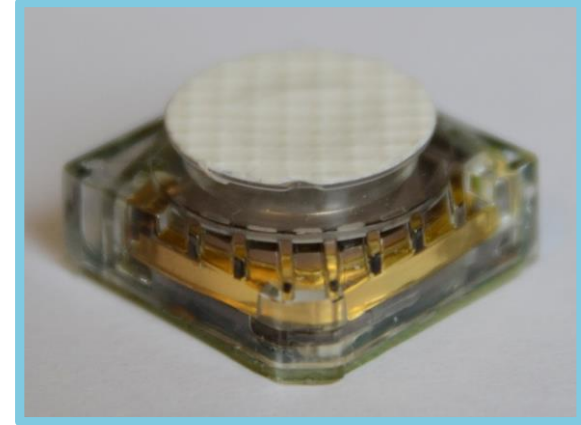
### eLichens Cloud SW Engine



Detection, monitoring, forecast  
and risk assessment

## eLichens Outdoor Air Quality Station

- ✓ eLichens offering is an A<sup>2</sup>S<sup>3</sup> (Autonomous Applications Specific Sensing Solution) smart sensors & data Fusion
  - ✓ Versatile, Configurable, Compact, Cost effective
- ✓ eLichens delivers to end customer complete solution.
  - ✓ Outdoor
  - ✓ Multi-environmental sensors
    - NO<sub>2</sub>, O<sub>3</sub>, PM<sub>1</sub>, PM<sub>2.5</sub>, PM<sub>10</sub>,...
    - Temp, Pressure, Humidity
  - ✓ Wireless Network: Sigfox
  - ✓ Compact, Cost Optimized, Low Power

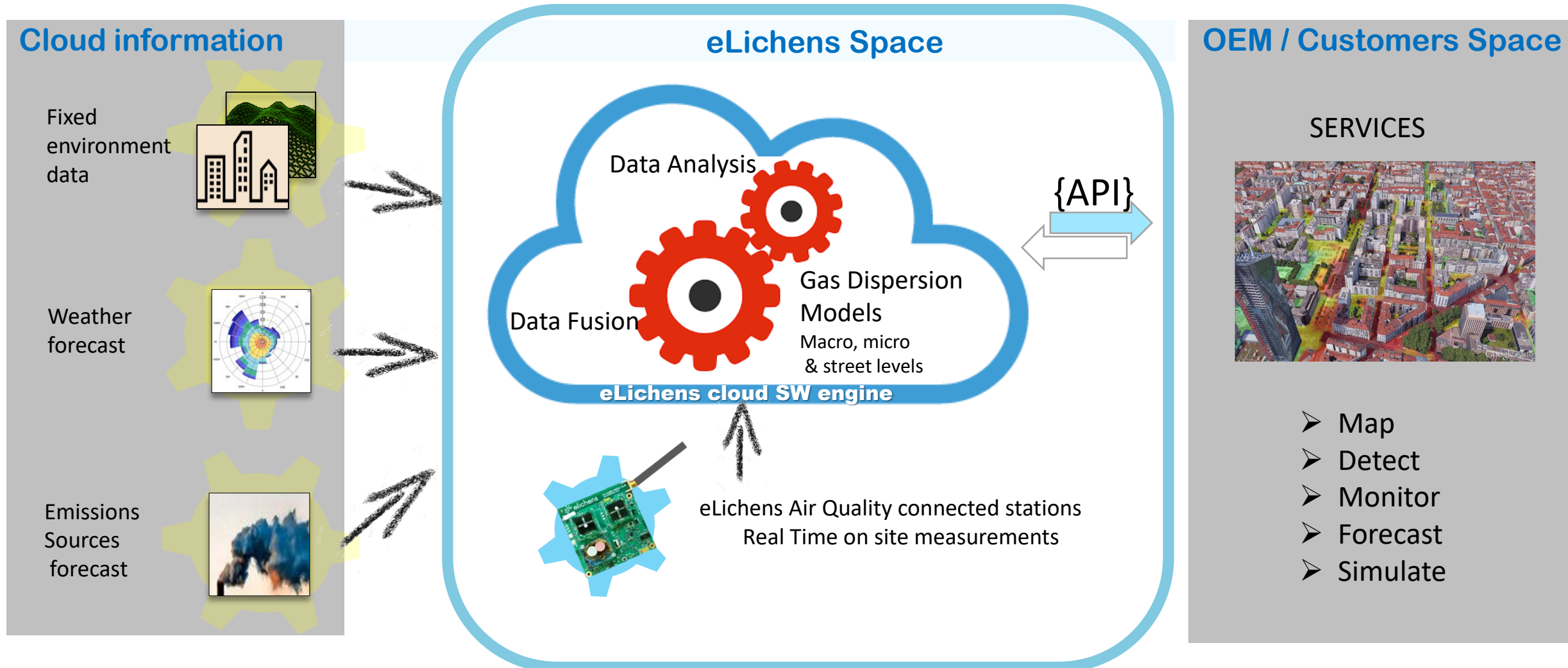


eLichens is the first to enable high performances/cost efficient solution for the elusive CH<sub>4</sub> & CO<sub>2</sub> sensing

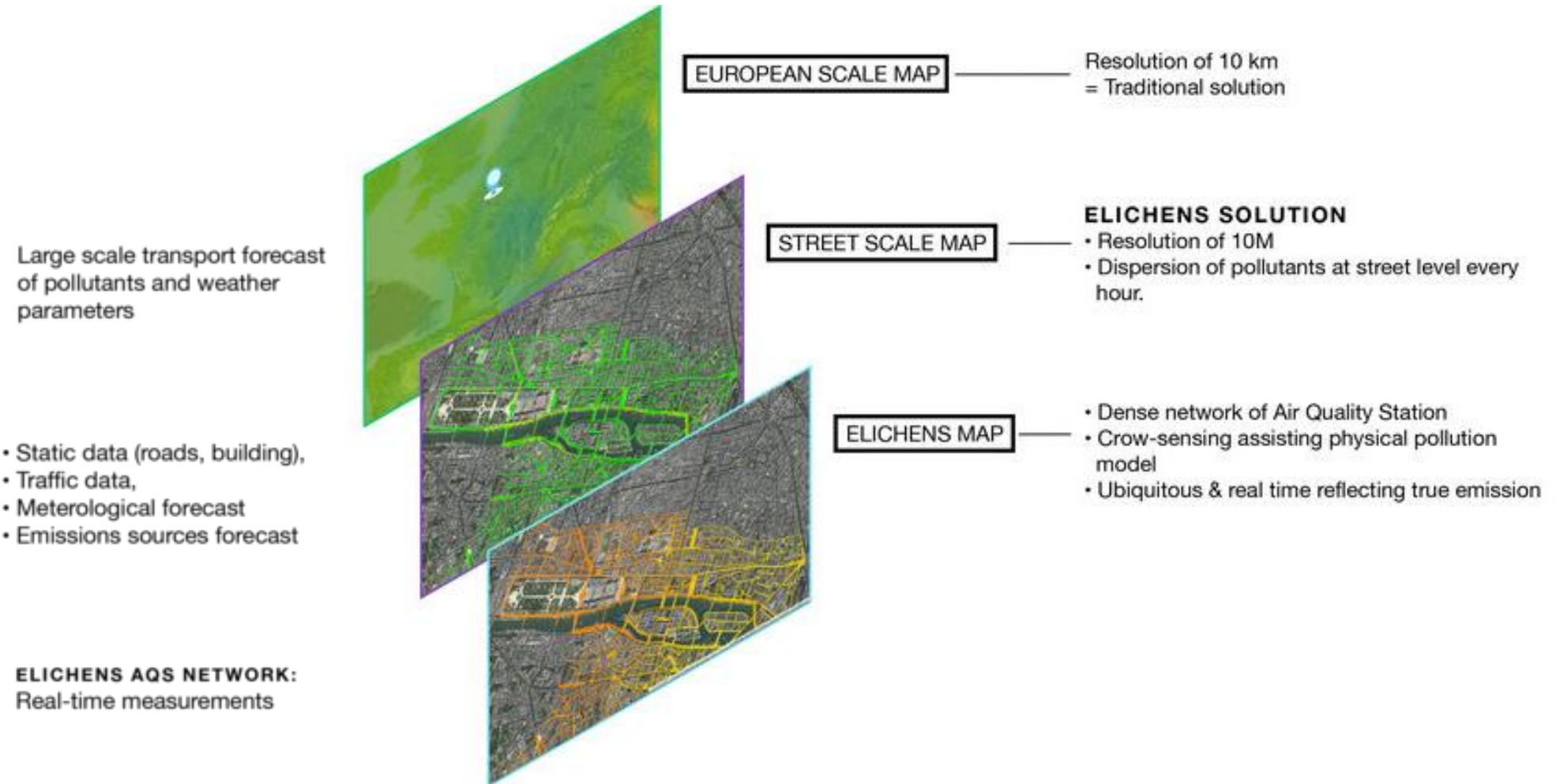




# Smart City – eLichens Air Quality Solution



# Operational Air Quality Models



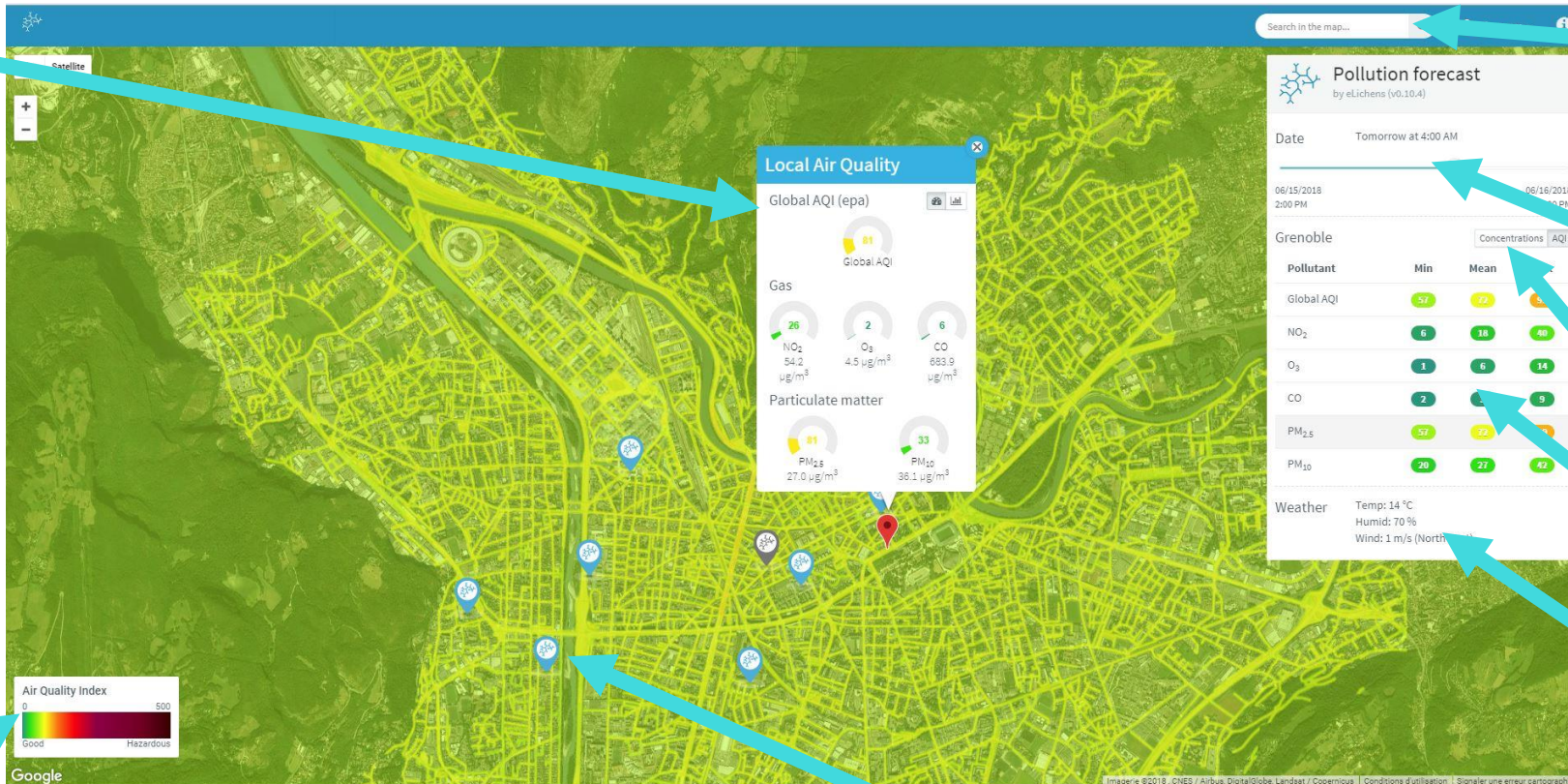


# Live Example - eLichens Air Quality (AQ) Application Grenoble, France

Live at <https://map.elichens.com/>

Hyper local AQ (click somewhere on the map to pop up)

- Now and forecast
- Every pollutant



Location search box

Scroll to change time of forecast:

- Updates images
- Updates information below
- Updates hyper local data

Select concentration or global index

AQ statistics per pollutant

Weather information

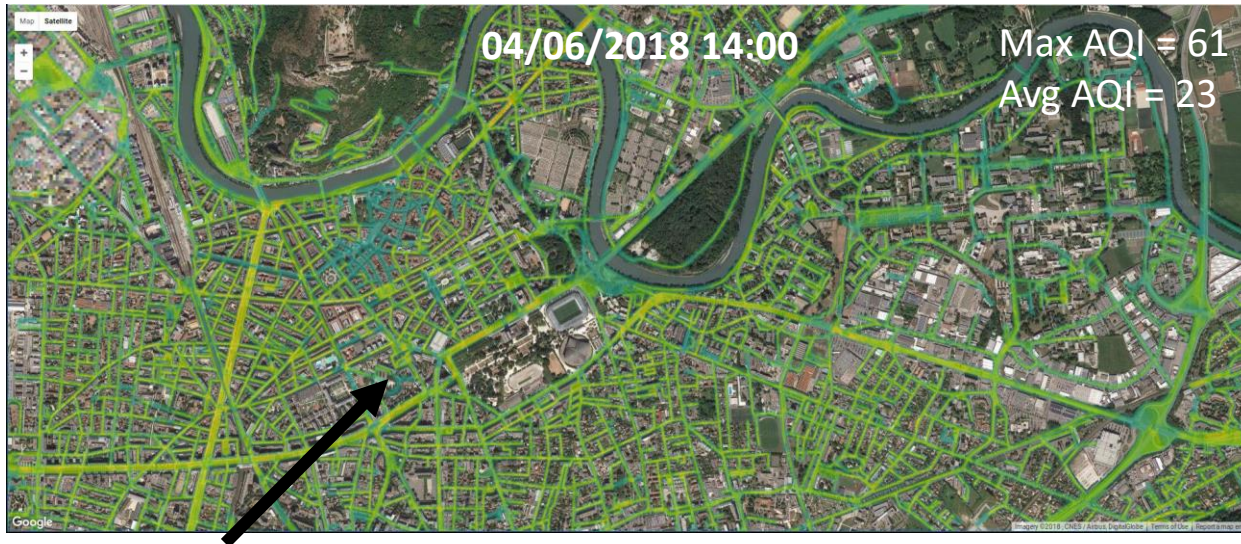
EPA AQ Index

eLichens Air Quality Station

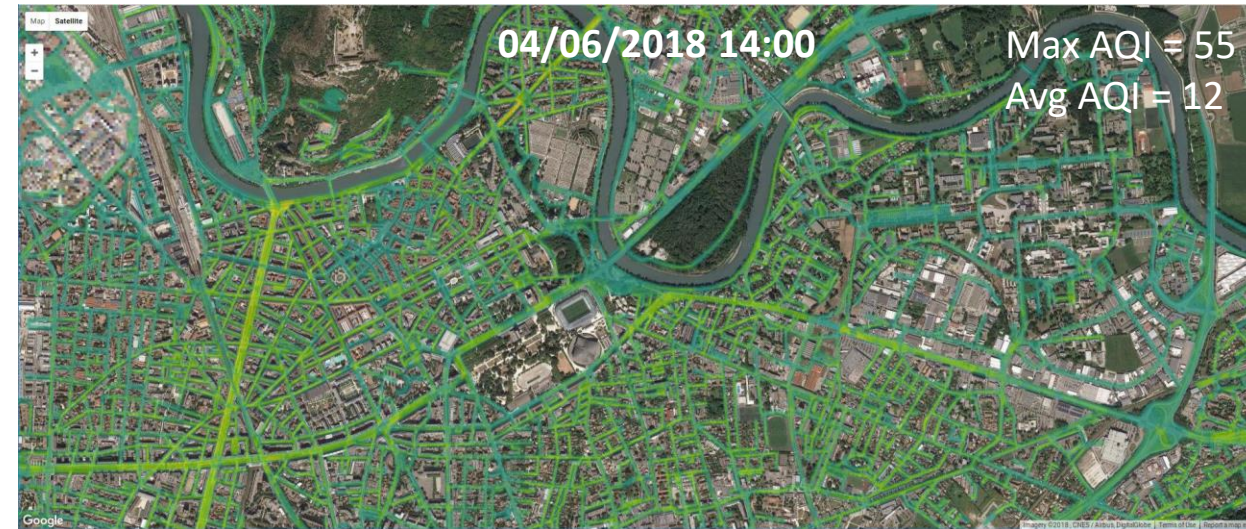


# Complete solution – Hyperlocal information (<https://map.elichens.com>)

✓ *Without data assimilation (ex: NO2 AQI)*



✓ *eLichens Solution - With data assimilation (ex: NO2 AQI)*



**NB:**  $[NO_2] = 6 \mu g/m^3$  at reference station (urban background) i.e. AQI = 11

➤ **Dispersion Models & Sensors assisted → eLichens Differentiators**

Trust the model to predict the trends & Correct the bias using real-time sensors data

*Others* vs. *eLichens*

*Accuracy: daily output* vs. *hourly output*  
*No unpredictable events* vs. *capture real time events*



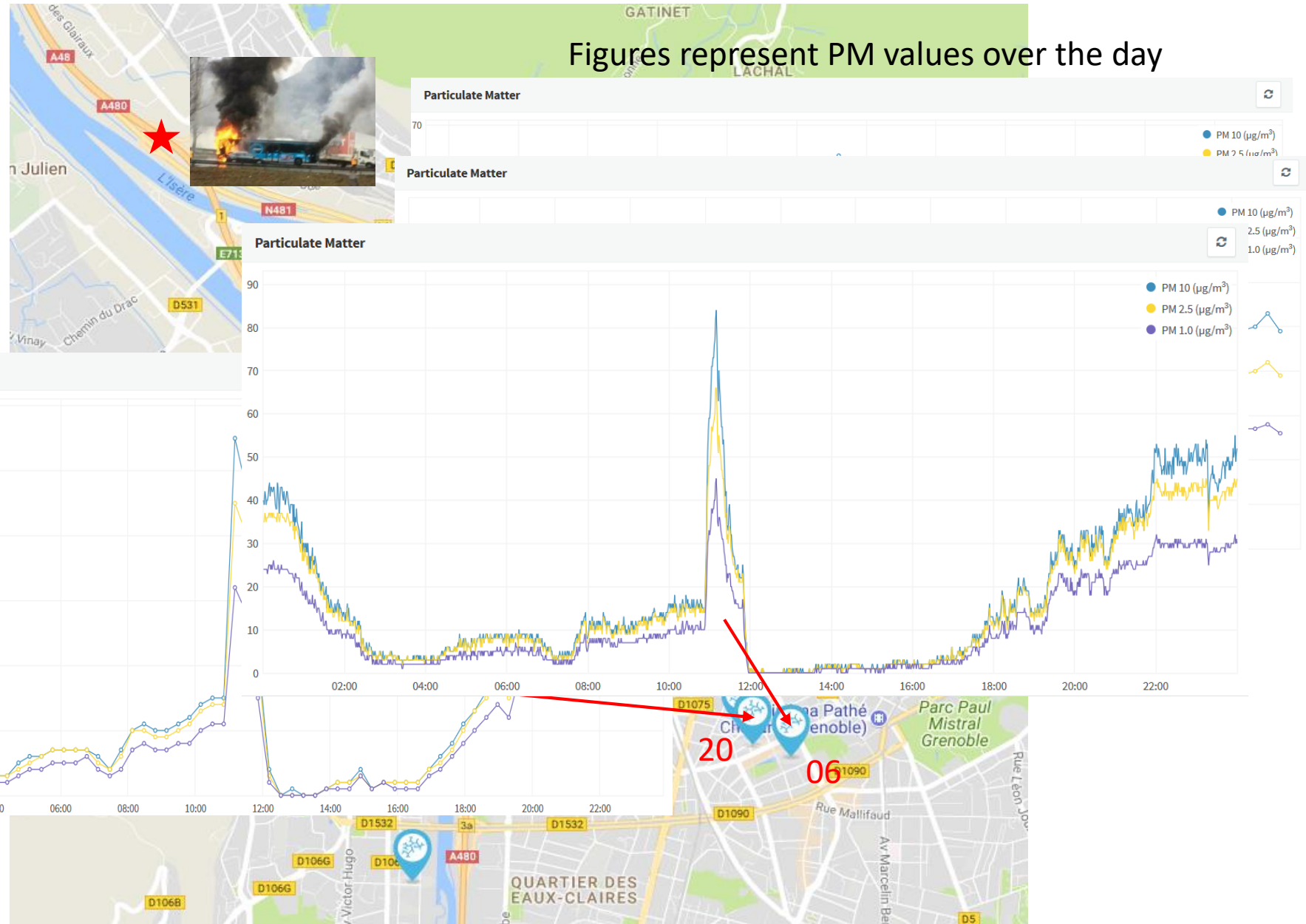
Event: Bus on fire  
Date: 2018/02/01  
Time: around 11 AM

- Event detected mostly on stations **02, 06, 07, 20**.

- Small peak detected on stations **03 and 11** that could be due to event.

- No significant peak on stations **08 and 17**

Drop in PM values just after event due to rain episode.





Event: Bus on fire  
Date: 2018/02/01  
Time: around 11 AM

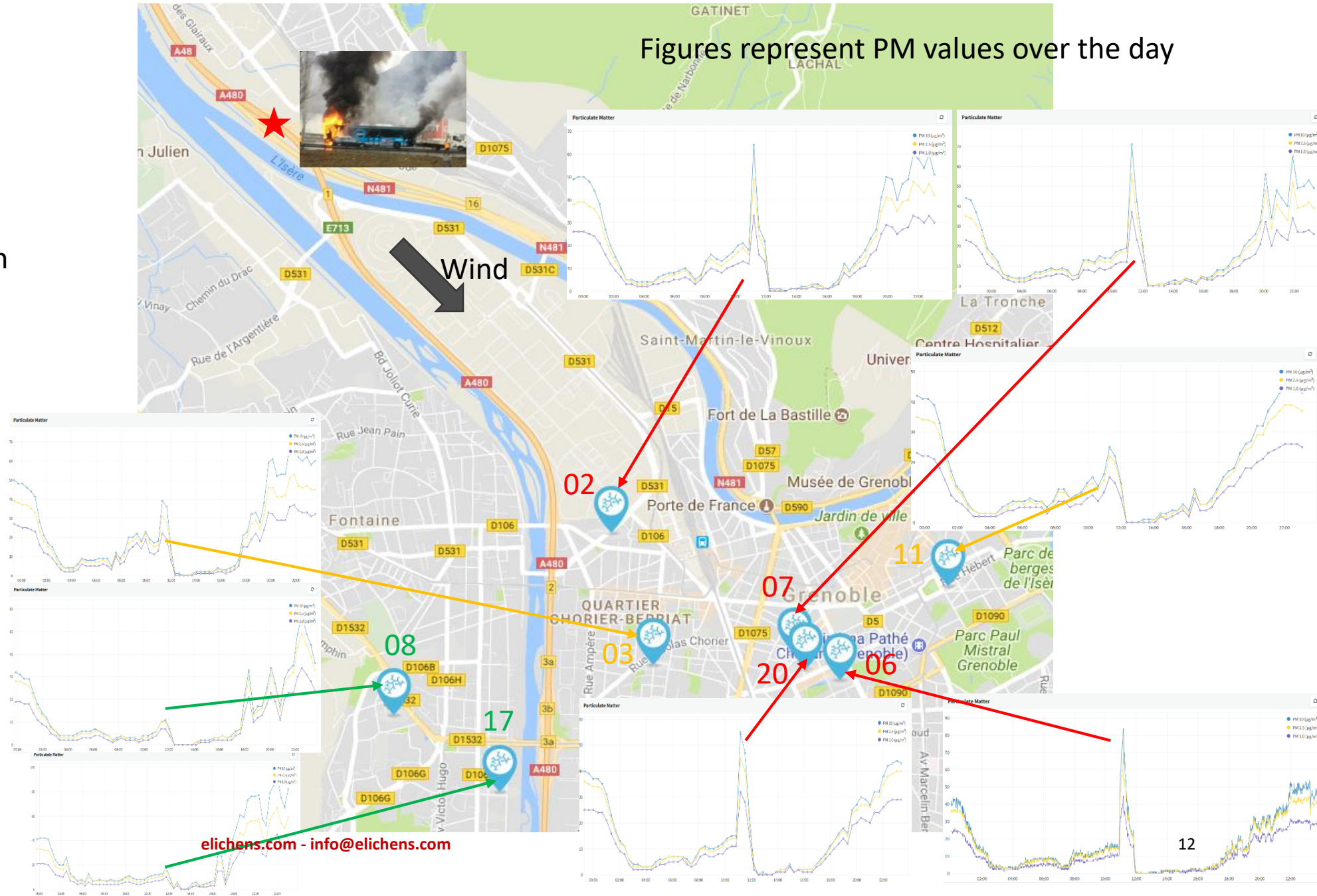
- Event detected mostly on stations **02, 06, 07**.

- Small peak detected on stations **03 and 11** that could be due to event.

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Drop in PM values just after event due to rain episode.

Figures represent PM values over the day



## Example: Use of High-resolution Air Quality Data

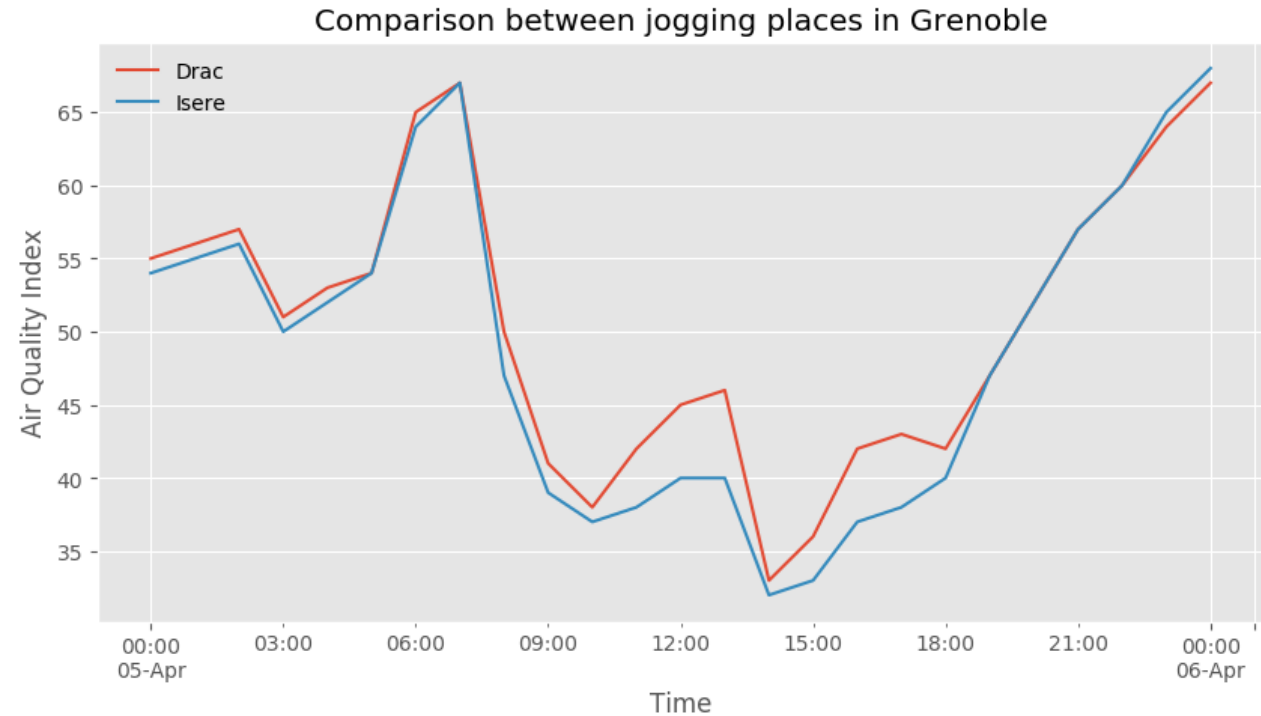


You want to go running today, but...

- You don't know when. During lunch time or in the evening?
- You don't know where. Along the Drac or the Isère?

eLichens high-resolution Air Quality map can help you with your decision!

Let see the forecast for the following hours.



During lunch time air quality is clearly better than in the evening (lower AQI).

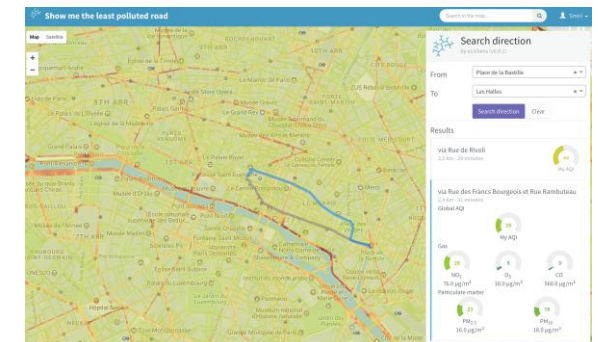
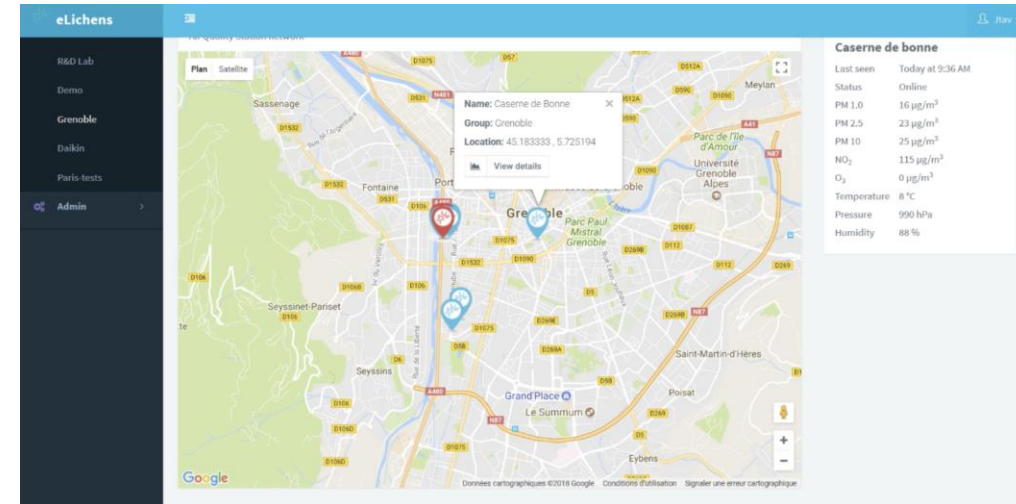
And at that time, it is safer going along the Isère.

**Make your choice to breathe better!**



## Other Smart City Usage Examples

- Hot spots detection
  - Redirect traffic temporarily
  - Track pollution trajectory
- Historic Pollution data
  - Scheduled traffic management based on patterns
- Gas leak detection (not in Grenoble)
  - Safety and prevention
  - Lower disaster event risks



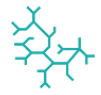
## Conclusion

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- ✓ With Grenoble use case, we were able to provide a cost optimized and high performance air quality monitoring & forecast solution.
- ✓ Our solution can complete Atmo's network information by:
  - providing high-resolution real-time & forecast air quality data
  - detecting sudden and temporary events which affects air quality
- ✓ One of our goal is to help citizens take appropriate actions or decisions to improve their well-being.
- ✓ Developers are welcome to use our API!!

Our high-resolution map of Grenoble and our API are in open-access on

<https://map.elichens.com/>



E L I C H E N S



**Thanks for your attention!**