Gena, a cross-domain crowdsensing infrastructure

Paolo Diviacco, National Institute of Oceanography and Applied Geophysics - OGS (Italy), pdiviacco@inogs.it
Rodrigo Carbajales, National Institute of Oceanography and Applied Geophysics - OGS (Italy), rcarbajales@inogs.it
Massimiliano Iurcev, National Institute of Oceanography and Applied Geophysics - OGS (Italy),miurcev@inogs.it
Nikola Potleca, National Institute of Oceanography and Applied Geophysics - OGS (Italy),npotleca@inogs.it
Alessandro Busato, National Institute of Oceanography and Applied Geophysics - OGS (Italy),abusato@inogs.it

Def. crowdsensing/sourcing/citizen science:

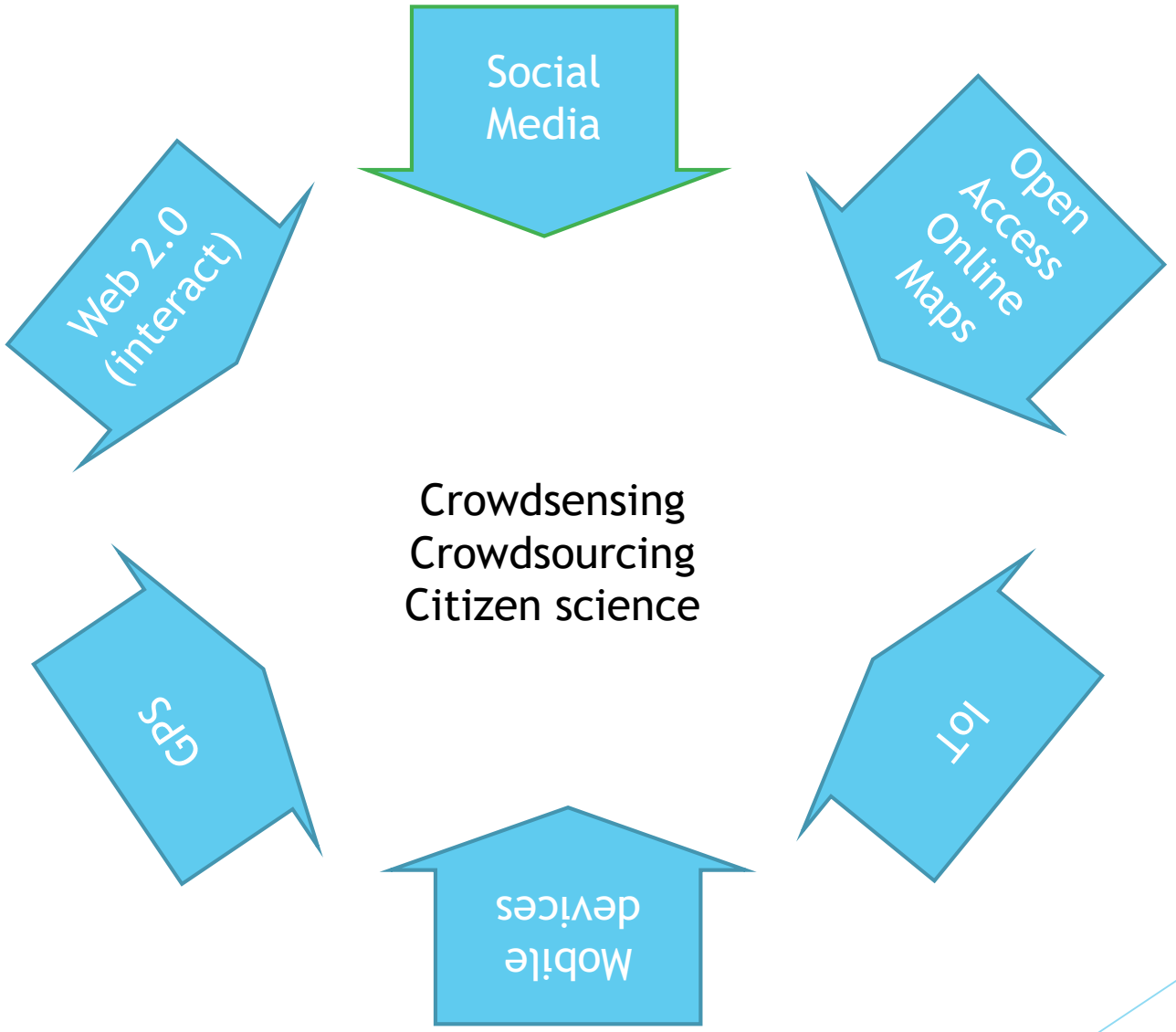
Crowdsensing/crowdsourcing/Citizen-science

It is an innovative paradigm where activities that traditionally are referred to experts are moved towards external volunters.

It means moving some activities outside the scope of the research institution that promotes the initiative.

It is similar somehow to outsourcing…

Enabling technologies



Constants

- Georeferenced data (Every measurement should have geo and time positioning)
- Data transmission (wireless, real o quasi-real time)
- Data redundance is essential…
- Big data (Quantity of data is high which often stresses tech.)
- Infrastructure must be robust, reliable and resilient.
- Privacy (even positioning can be sensible data)
- Quality Control (often very difficult, prescriptions often not followed)

Main Advantages

As we saw, under the umbrella of the term crowdsourcing many ‘flavours’ can be identified upon the parameters that define the type of the initiatives.

Crowdsourcing can be seen simply as:

- A form of outsourcing (reducing personnel)
- A way to save money on logistics and platforms
- It is possible to use both traditional sensors and low cost sensors
- A way to increase the quanty of data
- A way to improve spatial and temporal coverage

Main issues

Quality of data :

Crowd data can be as good as those from authoritative sources (Dorn et al. 2015)

Low cost sensors -> issues in accuracy and precision → validation

Volunteers expertise (citizen scientist) → Training of volunteers

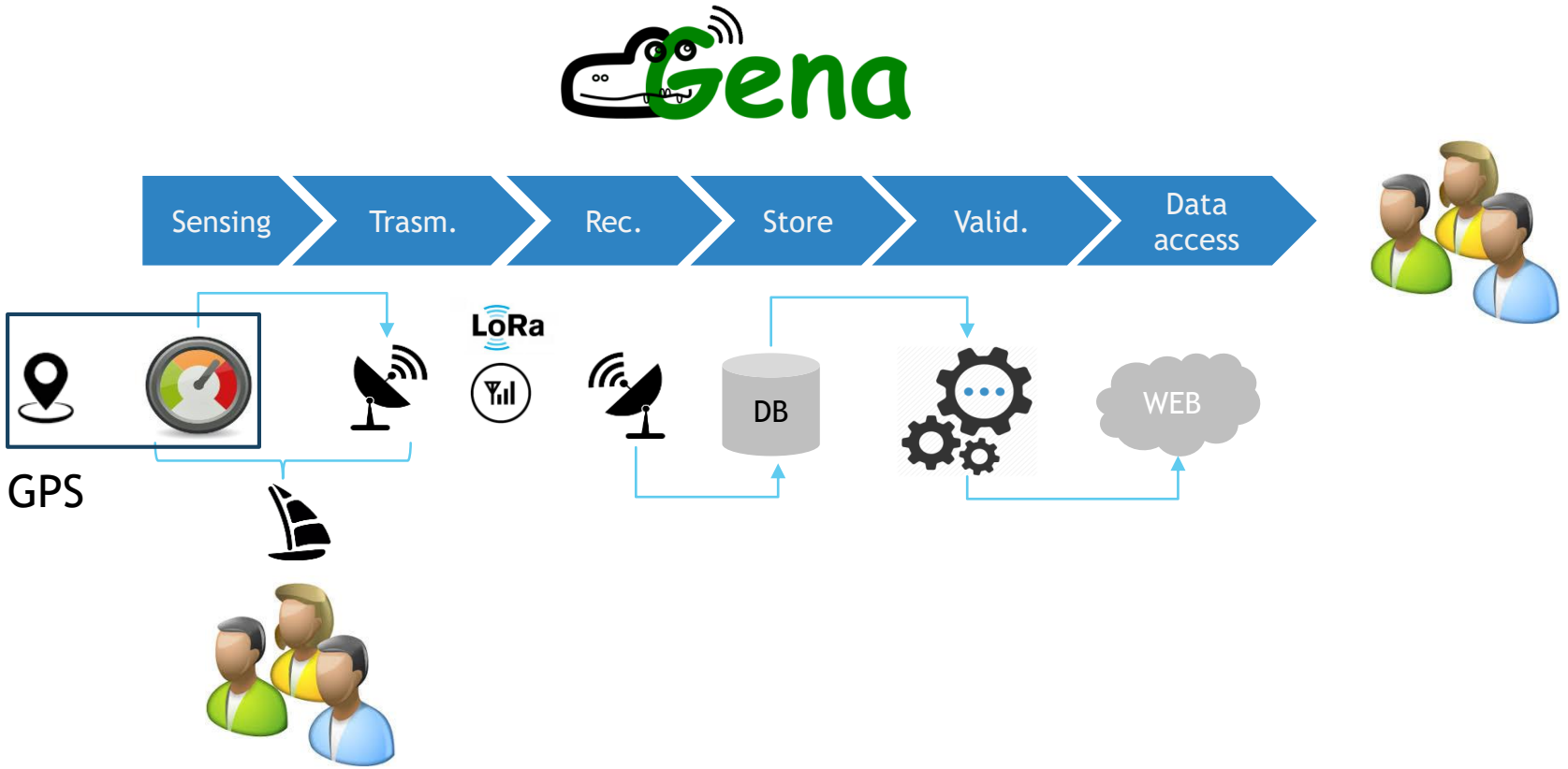
Increase in number of platform -> rises costs

Difficult to have acquisition planning (which is good to avoid researcher's bias)

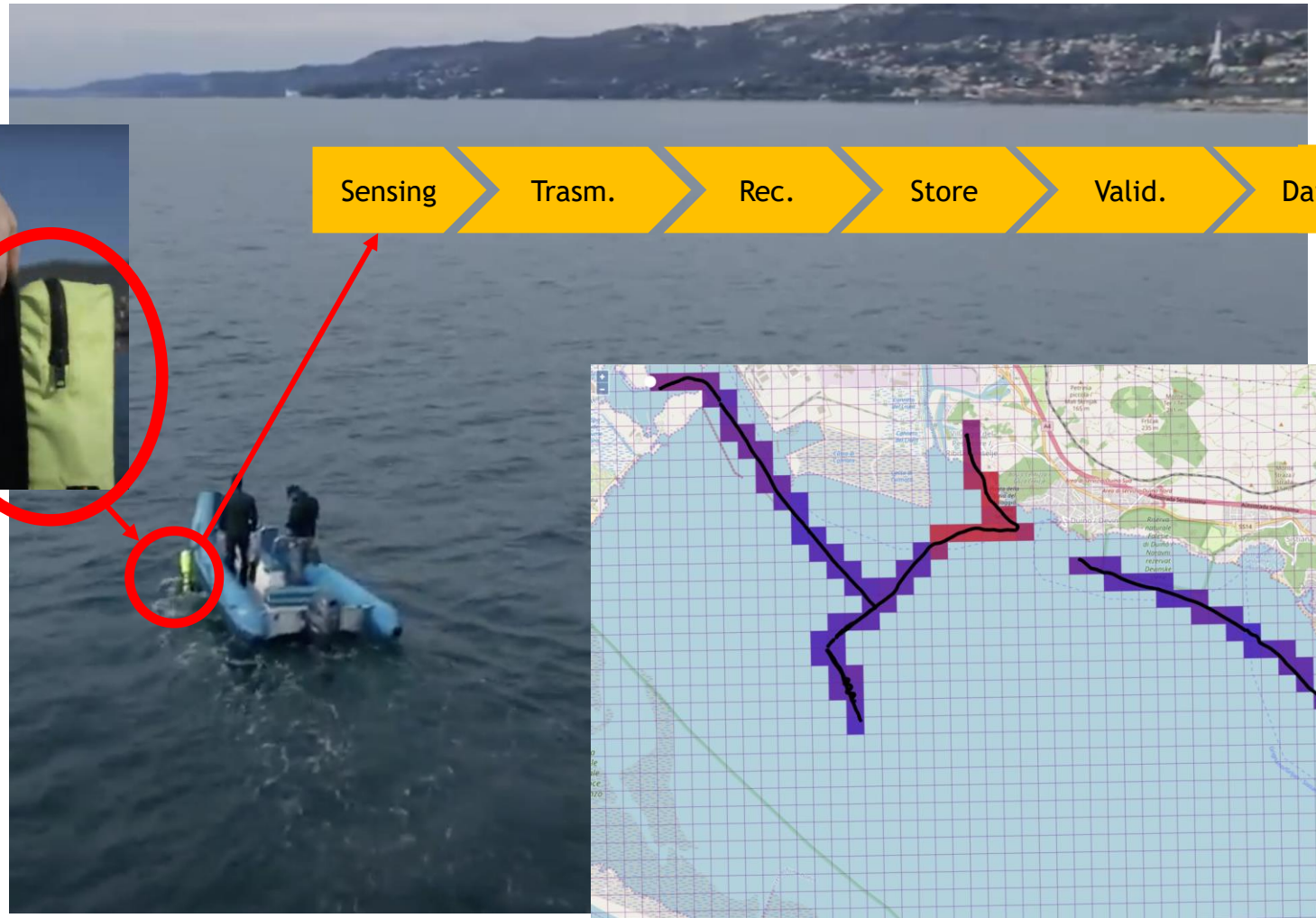
Some areas are more covered than others (touristic/ugly…environmental data often need data in the ugly ones)

..we'll show how we managed some of these issues

Gena workflow



Please attend poster presentation: 62: Citizen science and crowdsourcing in the field of marine scientific research – the MaDCrow project (Tue 13 16-17)

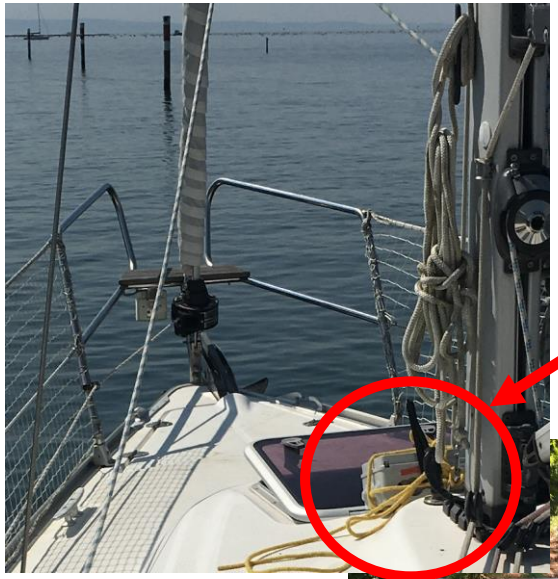


- pH,
- Salinity
- Temperature,
- DO

Sensing → Trasm. → Rec. → Store → Valid. → Data access

OGC WMS/WFS

COCAL 2



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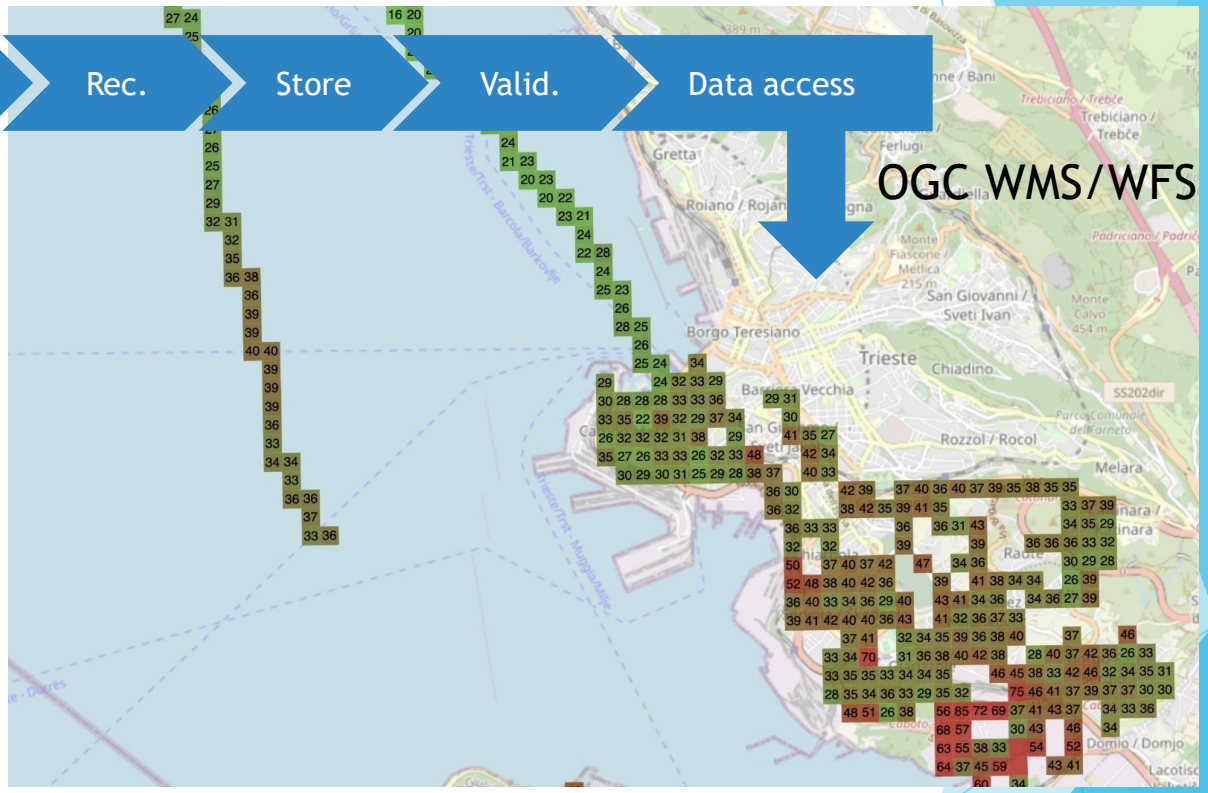
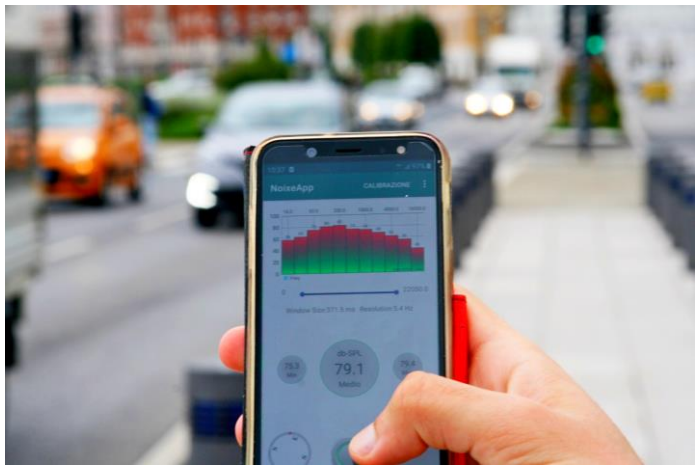
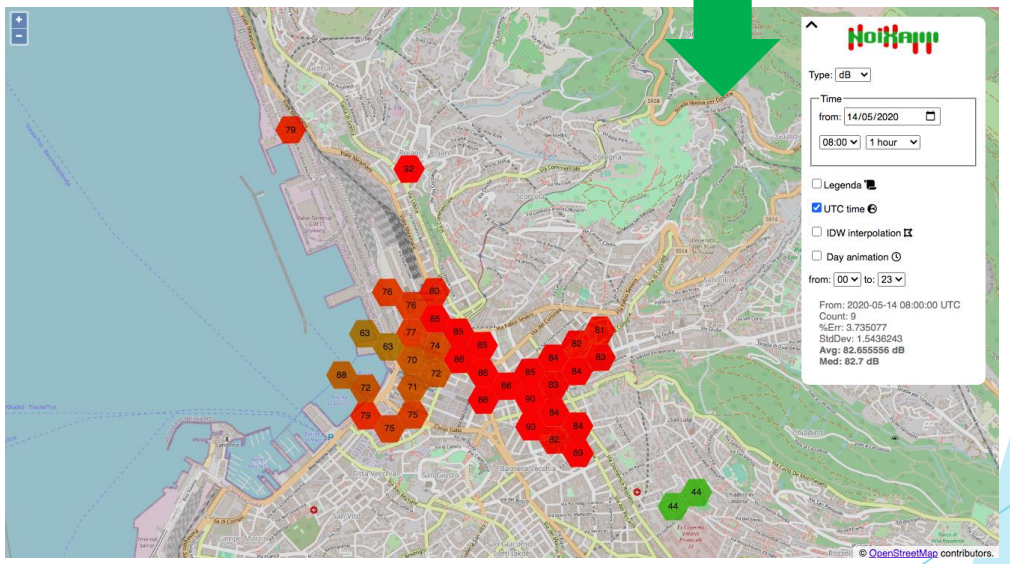
OGC WMS/WFS



Mobile phone app to monitor Noise pollution (urban areas)

Sensing → Trasm. → Rec. → Store → Valid. → Data access





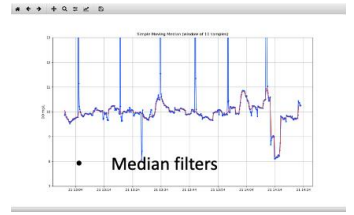
Real time Noise pollution map

Quality control

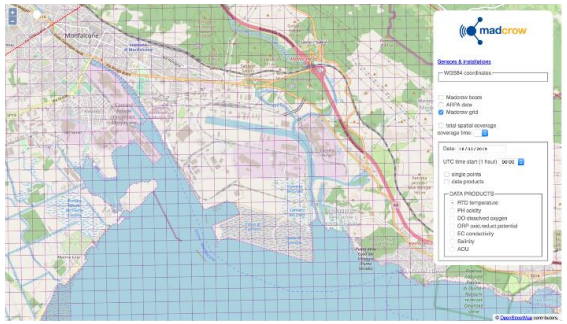
Electronics
Spikes
Improper use
Lack of robustness

Statistics

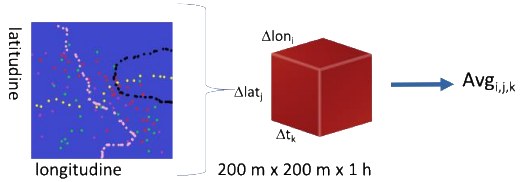
Filter



Gridding



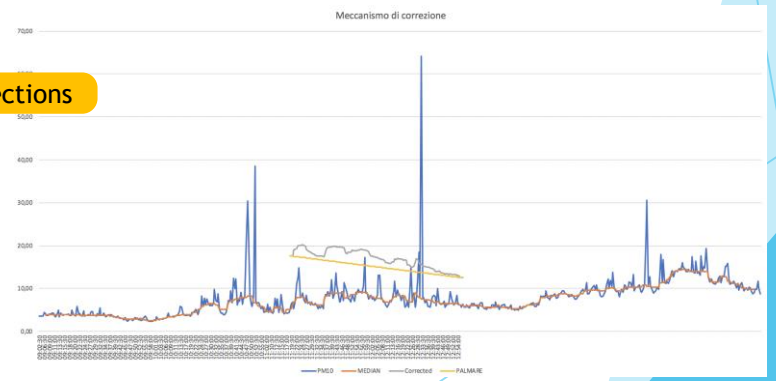
Averaging



Sensor drifts
Issues in deployment.

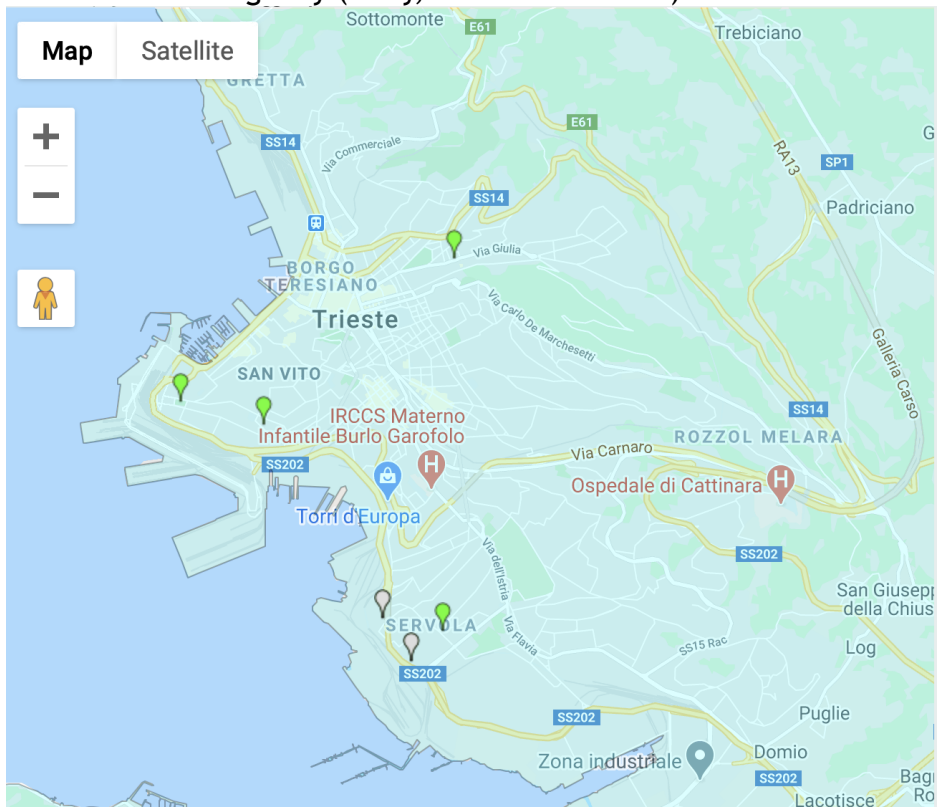
Reference values

Bulk corrections

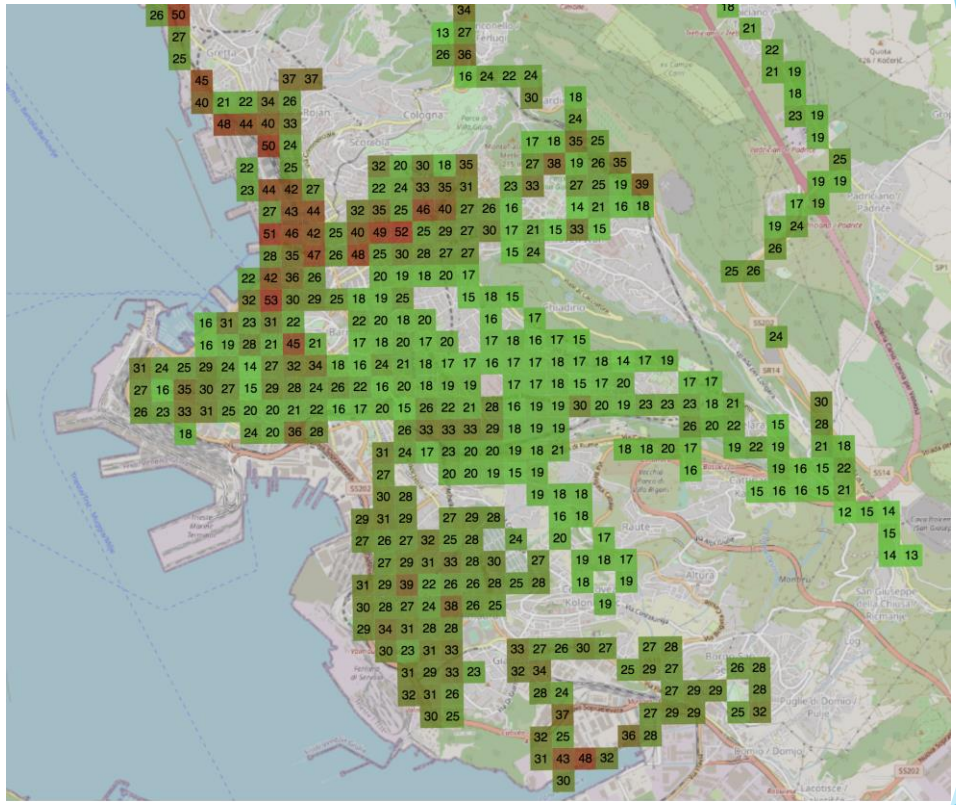


Coverage and resolution

Environmental agency (daily, 4 active stations)



Gena (hourly averaged, 200x200m)



Conclusions:

- We have developed a full infrastructure that can be used by crowsensing/citizen science initiatives
- This infrastructure covers all the aspects from data acquisition to web data access
- We have tackled the issues of quality control using statistics on redundant data and reference stations (eg: from anvironmental agencies)
- Acquisition Hardware is low cost so it can be provided to volunteer citizen scientist without concerns
- We have fostered, so far several CS initives:
  - MadCrow seawater quality,
  - Cocal air quality
  - Noixapp noise pollution in urban areas
  - … more to come.

Thank you for your attention

pdiviacco@inogs.it