Interactive web interface with sound levels and probability to exceed some thresholds in different timescale

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1 Summary

Abstract

This deliverable illustrates the QUONOPS online web interface and how to use it to visualize and analyse the results.

1. QUONOPSmodel

Since 2010 Quiet-Oceans operates the proprietary Quonops© ocean noise-monitoring and prediction system, developed and owned by the company and protected by an international patent *(Folegot 2009)*. Quonops© produces an estimate of the spatio-temporal distribution of the noise levels generated by human activities at sea, aggregating multiple sources and assessing short-, mid- and long terms source contributions to the global noise field.

Based on physical acoustic propagation models, Quonops© relies on real input data and it has been largely validated through *in-situ* measurements. More details on QUONOPS implementation for the SOUNDSCAPE project are in the deliverable 5.2

2. Web platform

An exhaustive manual on the interactive web interface is available on the website in manual section (Quonops Online Services (quiet-oceans.com)). Here the main features and their use for the project purposes will be explained.

3. Basic tool

The online service of QUONOPS model assures a user-friendly and all-inclusive underwater noise mapping service. The web interface allows not only to develop some simple models online but also to visualize the results and the associated statistical elaborations, as in the case of SOUNDSCAPE project,. The production of statistical maps effectively characterizes the spatio-temporal emergence of anthropogenic noise from the real environmental conditions of a studied area, helping in developing mitigation actions.

The access to the service is on the webpage: https://qos.quiet-oceans.com/. After the login is possible to visualize all the available results by selecting the study area, than the summary of all the possible informations on grid, environmental and anthropogenic input data and model results is available (see Figure 1).
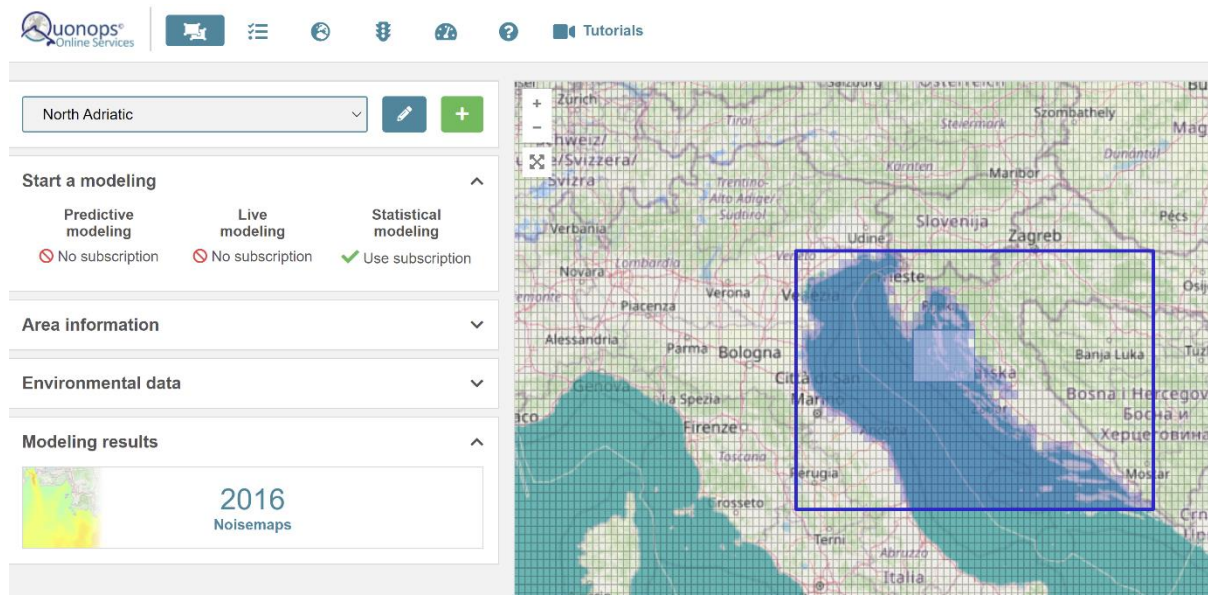
Figure 1- Example of web interface once selected the study area results.

In the case of the SOUNDSCAPE project, the maps could be explored within3 depth layers (whole water column, top - i.e. from surface to 15m -, or bottom - i.e.from 30 m to floor-; Figure 2). The results on the North Adriatic Seaare available for the 63, 125, 250 and 4000 Hz 1/3 octave bands and they are calculated as monthly average from January to December 2020.
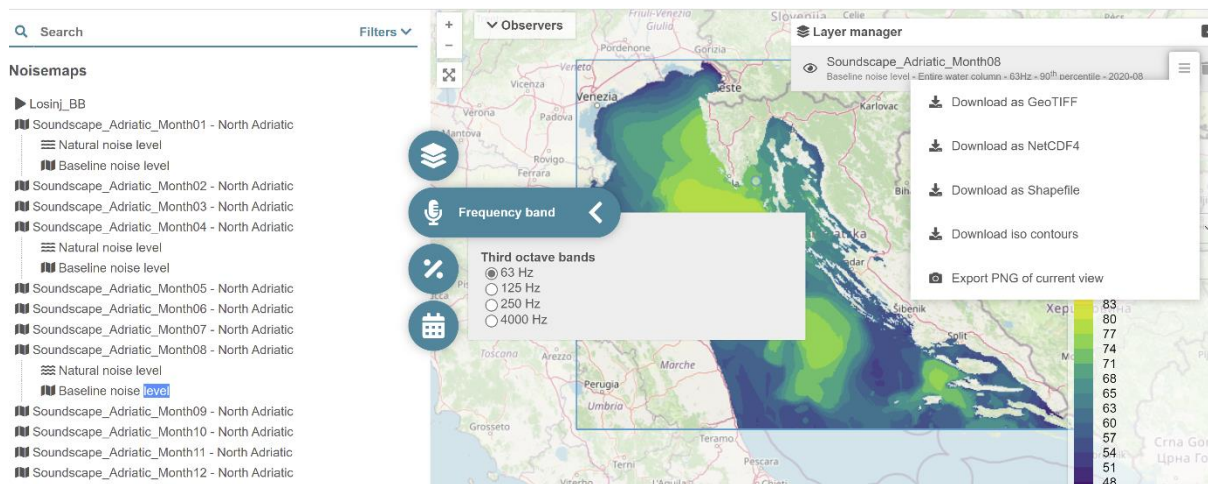

Figure 2- map presentation in the web interface

Each map can be customized by changing the colormap and the maximum value of Sound Pressure Level scale; further it can be downloaded as geotiff, netcdf4, shapefile, iso countours or png format.

It is also possible to perform a statistical analysis that offers the possibility to calculate the 5th, 10th, 25th, 50th, 75th, 90th and 95thpercentiles, as shown in Figure 3.
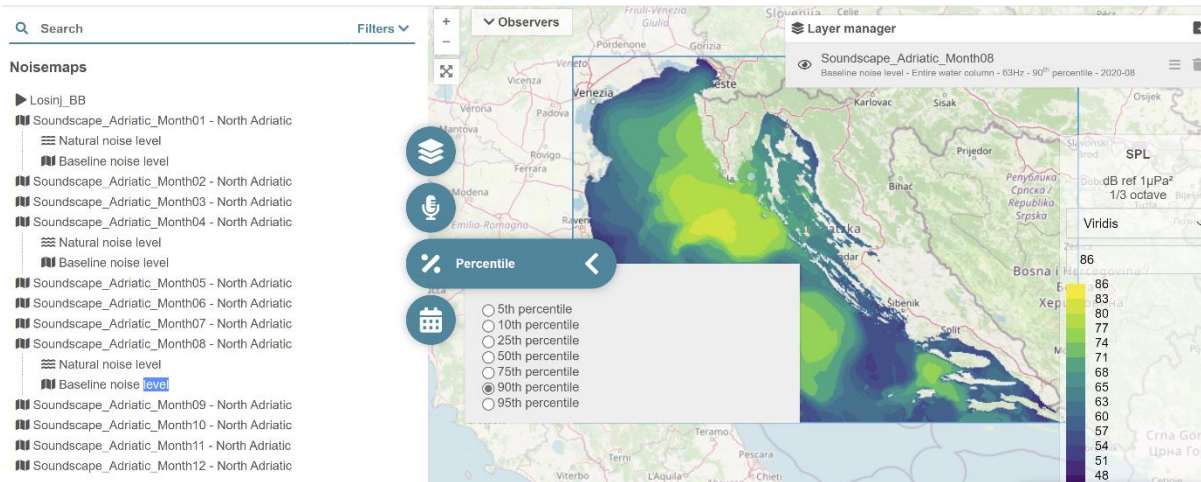
Figure 3 Statistical tool for percentile calculation

4. **Advanced tool**

More refined analysis can be performed by the web service. By using the observer menu,it is possible to access to a more specific analysis dedicated to Natura2000 and theexclusive economic zone (EEZ) areas located in the North Adriatic Sea. Alternatively, it is possible todefine a customized area of interest for the elaboration (i.e main traffic lines or other details). On the chosen areas, the tool will calculate the basic statistics related to the noise level distribution (min, max, mean and standard deviation and graph), as shown in Figure 4.
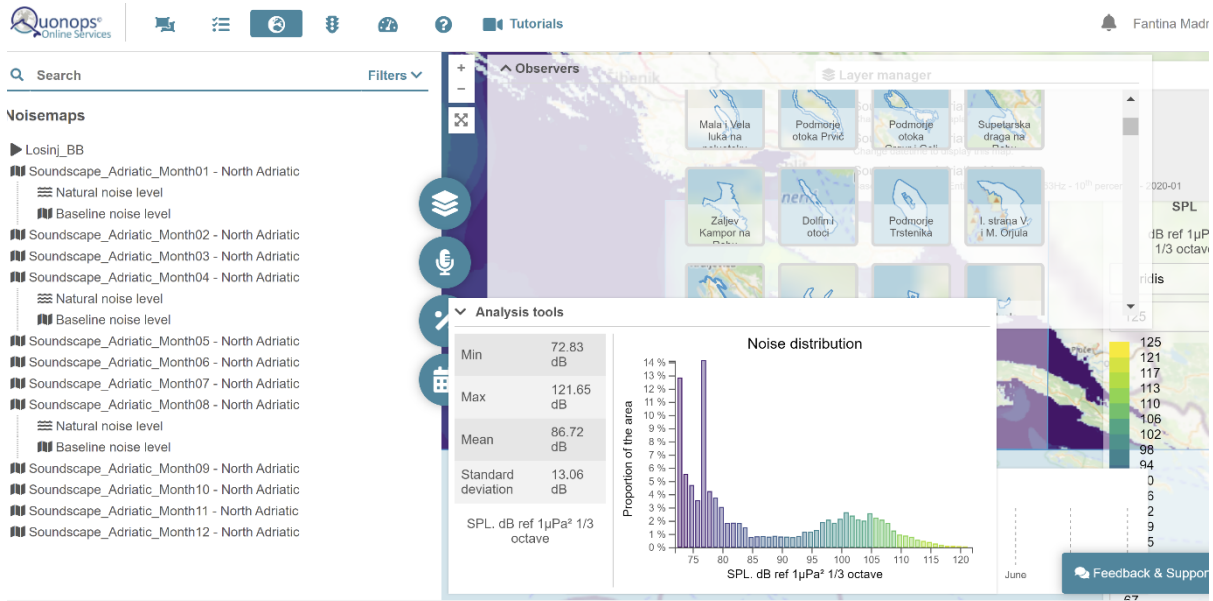
Figure 4 Analysis tool for customized areas

5. Use of percentile value distribution

The modelled noise levels are also spatially visualized in the web-interface taking into account the percentiles.This help in understanding if the reported 1/3 octave band SPLs represent a common noise level in the target area or if it is an extreme event during the considered time.

Figure 5 shows the 75th percentile for the 1/3 octave band frequency centred on 63 Hz calculated on the baseline map of August 2020. The elaboration with Qgis tools permits to categorize the isoline of SPL 1/3 octave band in the map. These lines highlight the areas where the 75th percentile of the noise distribution is higher than the isoline values. Setting a given SPL threshold value, ie. 84 dB re 1 μPa, the isoline indicates which areas are over the threshold and/or which follow a decreasing or increasing trend.
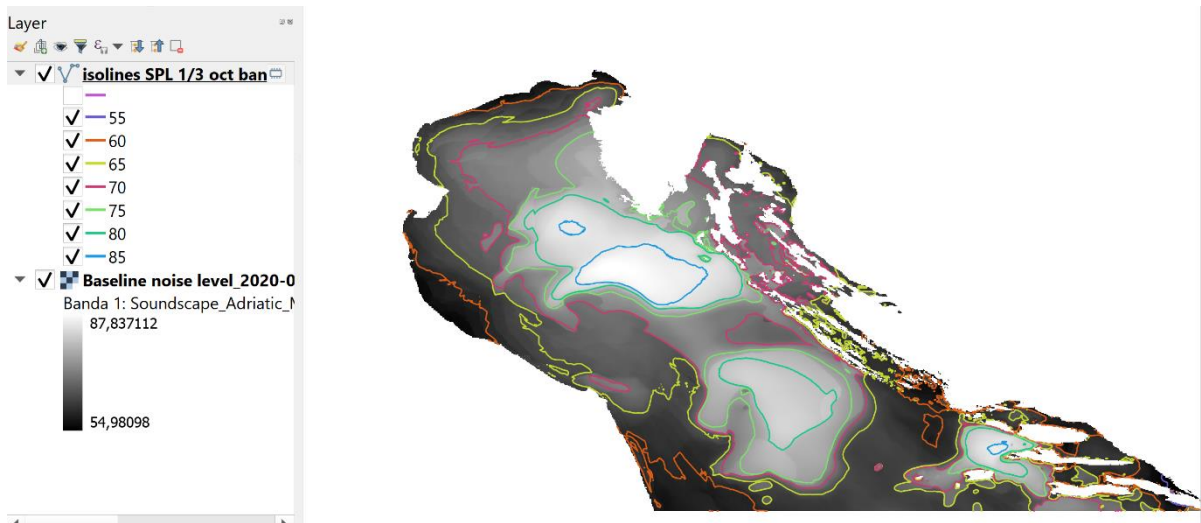
Figure 5 Map of Augustdistribution of the 75th percentile of SPL for the frequency centred on 63 1/3 octave band Hz in the whole water column and isolines.

References

T. Folegot, (2009), Method for monitoring, predicting and reducing the level of acoustic energy of a plurality of sources in an aquatic environment and method for monitoring, predicting, and reducing the risk of noise annoyance for marine species, European Union Patent EP2488839, 10 October 2009.