JOMOPANS Newsletter - 2020

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North Sea Region
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Dear readers,

For me this is a very special Jomopans newsletter. As a result of close co-operation for 2,5 year in the Jomopans project we now present the soundscape maps for the North Sea. Whether we like what we see – there is a lot of noise on the North Sea – these maps for the first time, fully quantify the amount of ambient noise. To make the maps, all parts of the Jomopans project must fit. We defined standards and used them, we calculated the maps using modelling, and these maps were validated with all the measurement data. Finally, we are developing a GES tool to present the huge amount of data to our end users.

I am very proud that we have achieved these results.

Not everything went smoothly and especially the field work at sea is challenging and unpredictable. On our website //northsearegion.eu/jomopans you can find examples of our field work with photos and movies.

There is still a lot of work to do and the last months will focus on the implementation of our results in the operational monitoring of underwater noise.

I hope you enjoy this newsletter and that you can join us at our end event in the spring of 2021.

On behalf of the Jomopans project team,

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North Sea Soundscape maps

Jomopans develops a framework for monitoring ambient sound in the North Sea by using spatial maps of the anthropogenic and natural soundscapes as input for assessment of the environmental status. Jomopans has specified frequency spectra in the 10 Hz to 20 kHz one-third octave (base-10) bands of the monthly percentiles of the distribution of one second snapshots of the depth-averaged sound pressure level (SPL), as acoustic metrics for continuous noise in the North Sea. A key task in the project was to select, verify and validate modelling methods applicable for generating maps of this metric with sufficient spatial and temporal resolution. The focus was on ships and wind as the dominant sources of sound.

An assessment was made of the various uncertainties in the acoustic modelling and input data. TNO, FOI, Quiet Oceans and JASCO have jointly quantified the numerical uncertainty of the propagation loss models, by comparison of the results of various models for well-defined benchmark scenarios. The uncertainty in ship source level modelling has been quantified and reduced through collaboration with the ECHO programme of the Port of Vancouver and Transport Canada. Uncertainties in wind and ship noise modelling have been assessed by CEFAS in an independent comparison of model results with measured data from selected Jomopans North Sea monitoring stations. Based on this assessment, model input parameters have been adjusted. All gained insights will be shared in a modelling guideline document, which will help countering the current lack of standardization in underwater ambient sound modelling and providing confidence in the model predictions

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After these careful preparations, TNO has now produced maps of the underwater noise from ships and wind for all months of 2019. As an example of these maps, figure 1 show the spatial coverage and the relative comparison of the contributions of anthropogenic (ships) and natural (wind) noise sources.

After several processing and quality control tests, the project partners were able to gather a reliable data set for the model comparison from these 15 stations (Fig. 2).

The reasons for the existing data gaps, which are shown in Fig. 2, are diverse: Selected

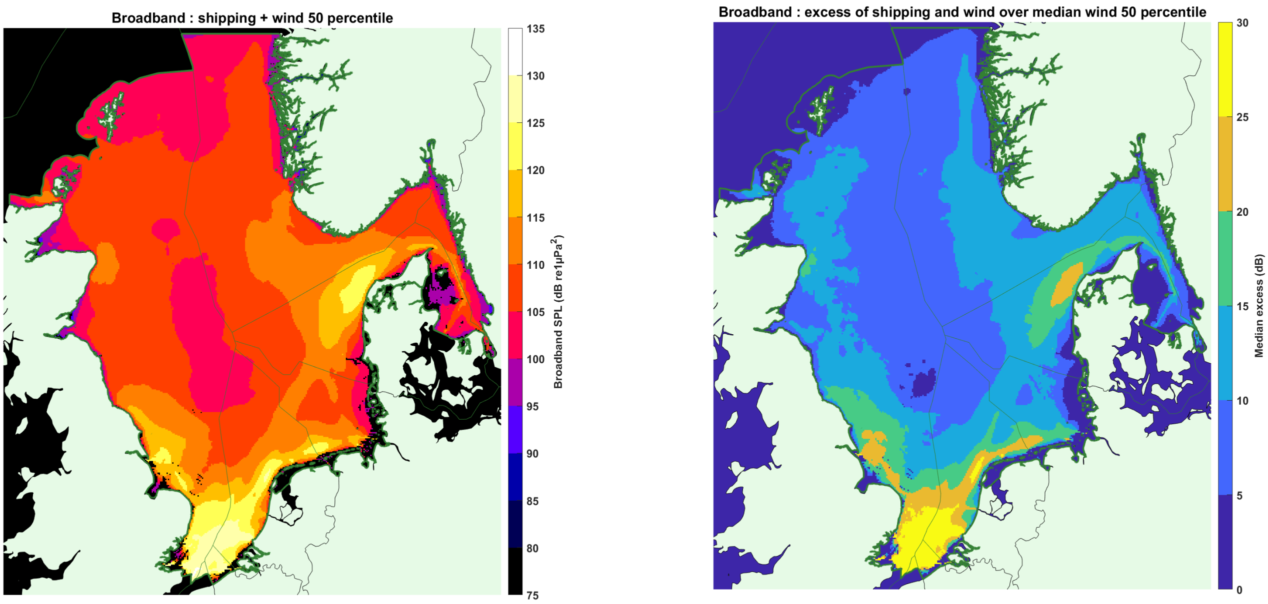

Figure 1. LEFT: monthly median (50-percentile) depth-average broadband (10 Hz – 20 kHz) SPL from ships and wind; RIGHT: monthly median excess of ship noise over wind noise.

Acoustic data after a full year of hydrophone measurements

To be able to compare and assess the model results with measured data, JOMOPANS carried out a one-year sound monitoring program. During 2019 every partner in the project installed a sound measurement station with a calibrated hydrophone and recorder at a pre-selected position in their national waters. As mentioned in a previous newsletter, the hardware used had to meet the agreed technical standards and all systems were calibrated in a standardized and coordinated way.

The locations of the stations were chosen to cover a wide range of different regions, from areas with high traffic to more remote locations. Also logistical aspects were taken into account in the selection of locations, as cabled hydrophones in the vicinity of existing measurement stations can be maintained more easily than those located far away in the center of the North Sea.

In order to obtain convenient sound data JOMOPANS deployed hydrophones in 15 different offshore locations (distributed among the 8 partners in the project).

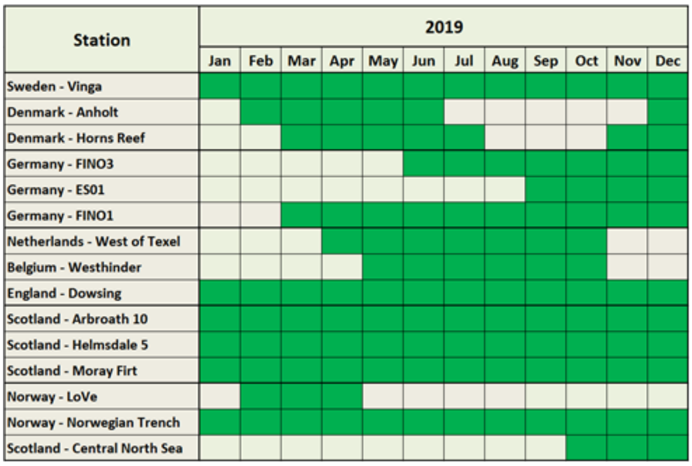

Figure.2: Sound data availability for every JOMOPANS North Sea station in 2019

monitoring stations were initially planned as temporary measurements (e.g. position in the center of the North Sea), there were of course difficulties and risks in installing monitoring stations at sea (rough offshore conditions can always lead to system failures), some stations were lost due to storms or fishing activities (although some were found again, see LINK to articles on the Jomopans Website) or it was temporarily impossible to recover them due to weather or ship time restrictions. But in total, a unique set of reliable and essential data has been successfully measured collectively, which is not only essential for further project work, but will also be made available to the broader community when the project ends.

GES-tool development

The JOMOPANS online GES tool is in the final stages of development. The technical implementation of the tool is in the hands of the company Michael Carder Ltd. They have developed a flexible and user-friendly web-interface tool. This interface allows JOMOPANS to upload and curate data layers, consisting of soundscape maps produced by WP4 and habitat maps prepared by WP7 (Fig.3). Once online, users (agencies, NGO's, researchers etc.) will be able to browse and search the maps, display these and download data for further analysis. Most important, however, will be the ability to derive pressure and risk indices from the maps (Fig.4). These indices rely on analysis of the relative contribution of natural and anthropogenic sources to the noise in a specified frequency band and geographical area. In other words, they express the degree to which the soundscape is dominated by natural vs. anthropogenic noise. The index can be calculated as a pressure index, evaluating the noise on its own, or as a risk index, where the habitat or distribution of a key species is weighted into the index (Fig. 4).

The tool is now being populated with the soundscape maps from WP4 and habitat maps of selected marine mammals and fish. Creating habitat maps from observations of animals is outside the scope of JOMPANS and beyond the expertise of the team and we therefore must

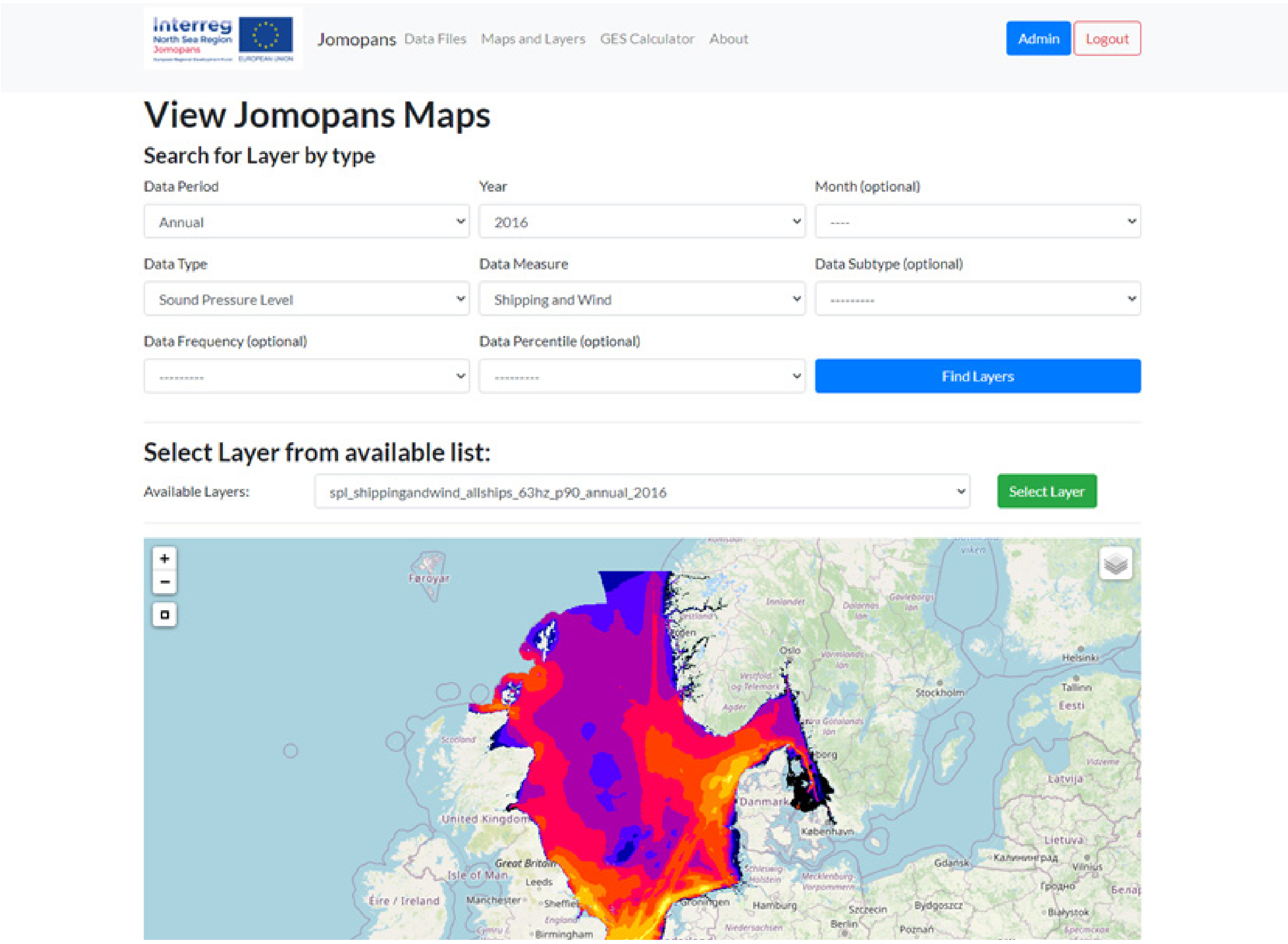

Figure 3. Example screenshot from the GES tool interface. The user can apply search criteria to the maps and select the map to display and download, if additional analysis is to be performed.

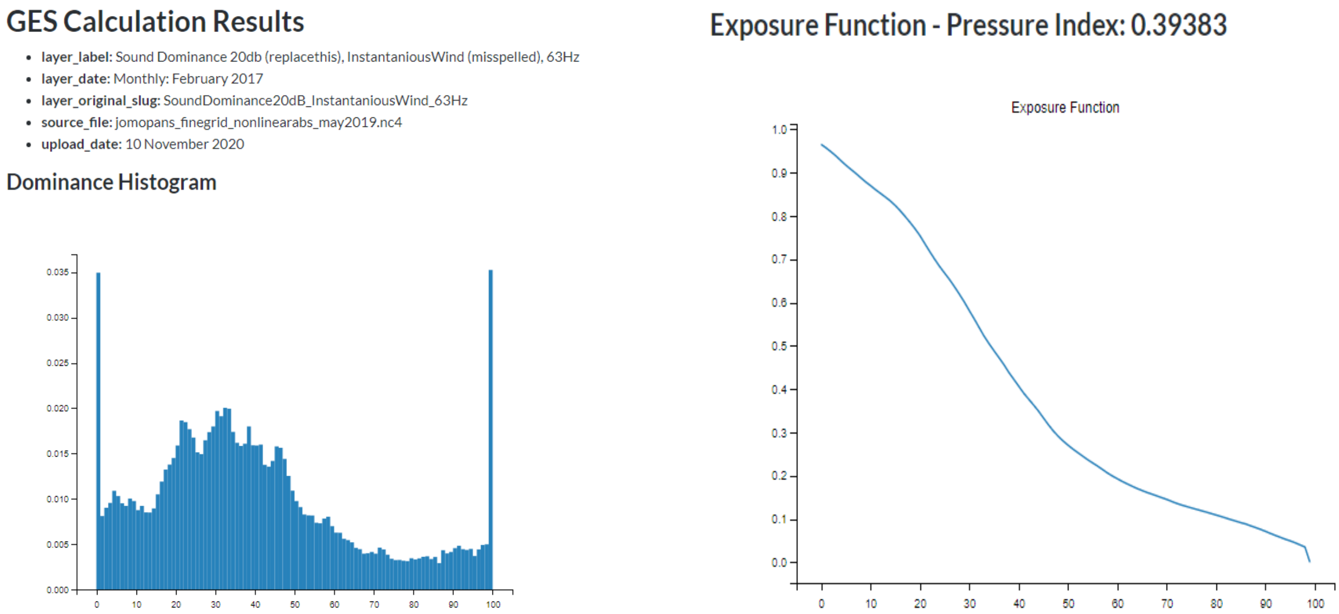

Figure 4. Example screenshots of the output from a GES calculation. Dominance expresses the percent of time where ship noise dominates the soundscape in a particular point in the map. In the example, most parts of the map have a low dominance of 20-50%. The exposure curve to the right integrates this in a single curve and the pressure index characterizes the overall contribution of ship noise to the soundscape. A pressure index of 0 indicates no dominance by ship noise, whereas an index of 1 is equal to total dominance of ship noise everywhere, all the time.

rely on external sources for this information. We anticipate that three species of marine mammals, two species of birds and four species of fish will be included in the tool

Of marine mammals, the species will be the most common cetaceans in the North Sea: harbour porpoise, white-beaked dolphin and mike whale. These species also cover three functional hearing groups, from low frequency to very high frequency. The source of data will be Waggitt et al. (2019), which are currently the most comprehensive maps available. No useful maps of distribution of seals in the North Sea has been identified.

Four species of fish are included: Cod, herring, plaice and haddock. These species are all commercially important, which also means that abundant information on their habitats is available. They furthermore represent two functionally important groups: fish without swim bladder (plaice) and fish with swim bladder (cod, haddock and herring). Both haddock and herring are also highly soniferous. The source of the fish data is the Norwegian Institute of Marine Research.

Two species of birds are included: northern gannet and common guillemot, also from Waggitt et al (2019). The role of underwater hearing and hence the susceptibility to underwater noise in birds is still largely unknown, so the birds are included tentatively.