SONIC objectives

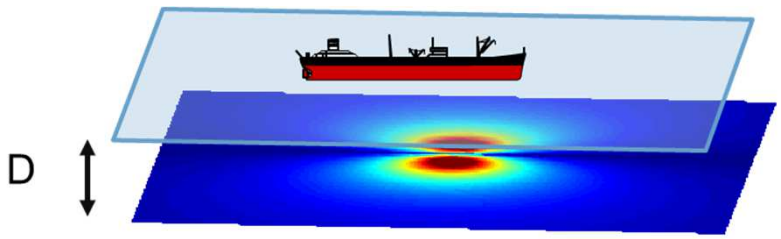
- To **improve** the **understanding** of the relationship between **cavitation** and **radiated noise** far away from the ship;
- To **validate numerical tools and experimental techniques** for the prediction of cavitation and noise for determination of the noise footprint in the design stage;
- To develop test measurement techniques for determining the **noise footprint** at trials;
- To **classify** ships or ship types on their cavitation noise;
- To develop a **methodology to determine the sound map** based on AIS data in a restricted area.

SEVENTH FRAMEWORK PROGRAMME

Shipping sound maps and footprints

- **A shipping sound map is a geographical representation of the SPL (or SEL) due to a set of ships in a specified physical scenario:**
  - Specified depth weighting (e.g., for species X)
  - Specified frequency weighting (e.g., for species X, or 1/3-octave band Y)
  - Averaged (or integrated) over a specified time period (e.g., 1 s, 1 year).

- **A vessel noise footprint is a noise map for a single ship in idealised conditions:**
  - Uniform sound speed and density in water
  - Perfectly reflecting sea surface
  - Fixed water depth
  - Infinite uniform seabed
  - Flat frequency weighting
  - No depth weighting

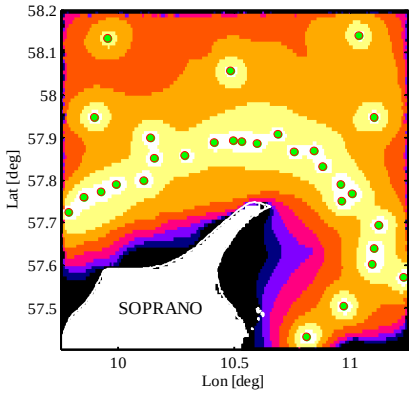


Noise Footprint and Mapping Tool

SONIC/TNO: NFMT

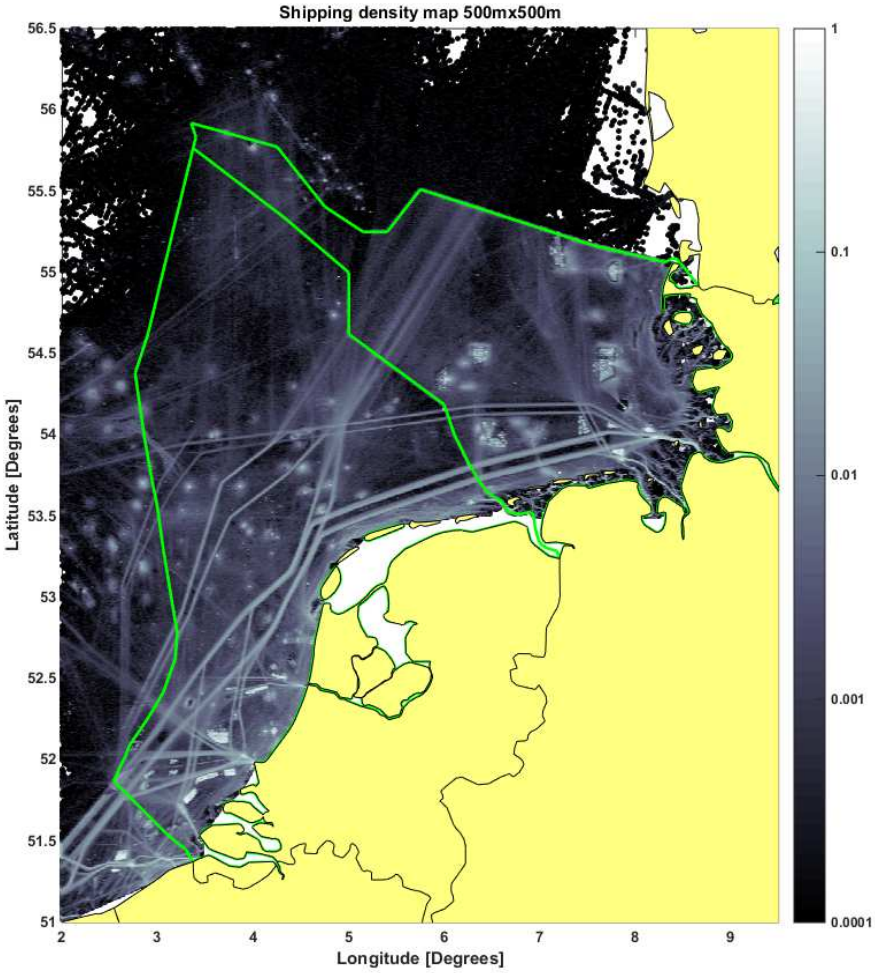
- Ship **locations**: from AIS
- Ship **source level**: model WP2 (using AIS data)
- Efficient **propagation model**
  - benchmarked with AQUO model
  - Current focus on shallow water (North Sea)
- Time average (**SPL**) or integrated (**SEL**):
  - At a given instant (snapshot),
    or averaged over a month, season or year
- **Depth weighting** for fish and mammal species
- **Frequency weighting** for fish and mammal species

  + ‘broadband’ and MSFD indicator bands (63 & 125 Hz)

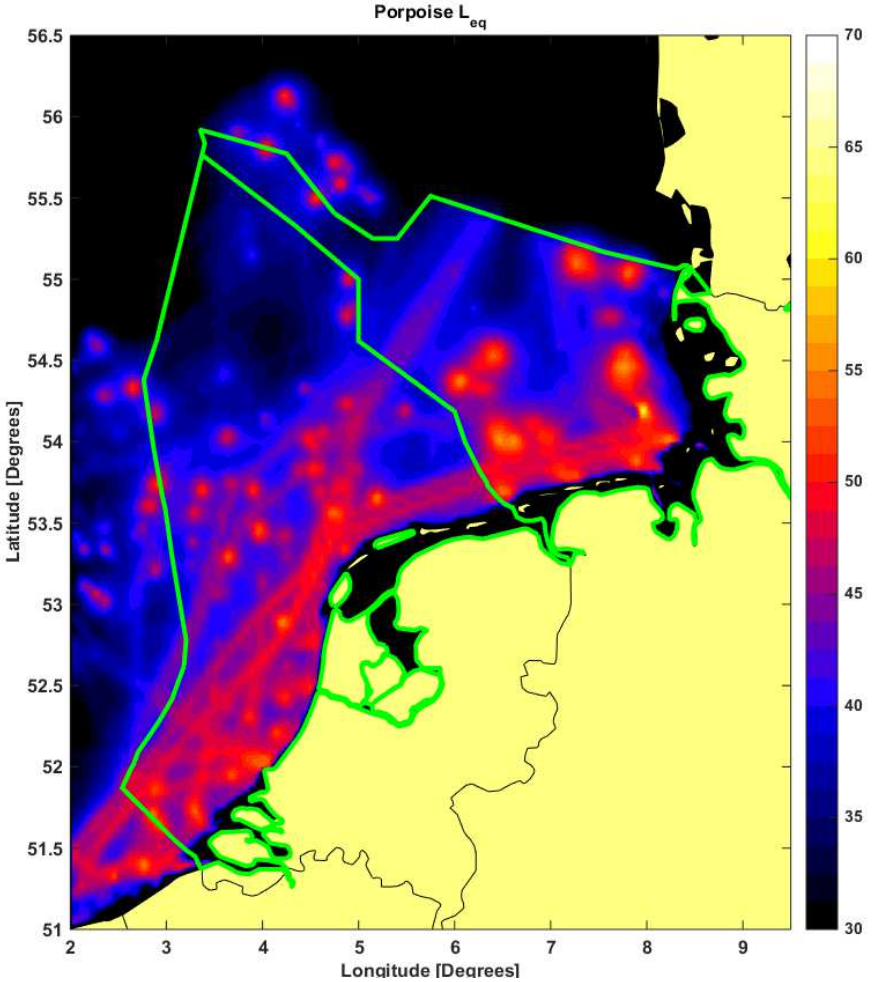


North Sea shipping sound maps

Shipping density (NL & DE)



As observed by a porpoise



SEVENTH FRAMEWORK PROGRAMME

NFMT applications

- Shipping **sound maps** for **MSFD monitoring** (11.2.1)
- Shipping **sound maps** for **fish** and **mammal** species
- Shipping **sound maps** for different operational and technical **mitigation** scenarios
- Vessel noise **footprints** for comparing radiated noise **mitigation** measures (propeller/machinery noise)