

## Airborne monitoring of compliance to NO<sub>x</sub> emission regulations from ocean-going vessels in the Belgian North Sea

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Along the worldwide tightening of standards for sulphur emission from ocean going vessels (OGVs) come actions that are also being taken to reduce nitrogen emission. Particularly, as a milestone in this regard, on January 1<sup>st</sup>, 2021 the NO<sub>x</sub> Emission Control Area (NECA) for the North Sea and Baltic Sea came into effect. In response to the newly established NECA, the sniffer sensor system on the Belgian coastguard aircraft was modified and extended with a NO<sub>x</sub> sensor. Moreover, a methodology was developed to evaluate OGV compliance to the NO<sub>x</sub> emission limits through in situ measurements of the plume exhaust. The quality and uncertainty of the measurements demonstrate that it is likely to achieve an effective compliance monitoring of the NO<sub>x</sub> emission standards on the sea. Those emission standards are further divided into four tiers depending on the keel laying date. As has been proved by the results, NO<sub>x</sub> emissions for Tier II OGVs, contrary to what might be expected, are on average higher than those for Tier I OGVs. What is even more problematic, Tier II OGVs have also more often been found to be non-compliant than Tier I OGVs.

### **Keywords**

Ship Emissions; Air Pollution; Airborne Surveillance; Maritime Policy; Marine Environment; Nitrogen Dioxide