



## **Airborne Monitoring of Pollution from Individual Ships in the Framework of the IGPS Project**

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The environmental impact of maritime transport has been recognized by the International Maritime Organization (IMO) which sets limits on fuel quality and emission characteristics of ships. The IGPS project (Identification of Gross-Polluting Ships) is a Swedish project aimed at developing a surveillance system for measuring emissions of  $\text{SO}_2$ ,  $\text{NO}_x$  and particulate matter from individual vessels at sea as well as at harbors. Equipped on aircrafts, this system can be used for efficient compliance monitoring of ships at open sea. Additionally plumes can be sampled several times to increase the measurement quality. This operation environment also sets special demands on the instrumentation such as fast response times for example.

The presented results cover the measurements of four airborne campaigns which were conducted during 2011 and 2012, covering the western Baltic Sea between Denmark, Sweden and Germany as well as the German Bight and the English Channel regions of the North Sea. As platforms, two different airplanes and a helicopter were used respectively. Emission data of more than 150 different vessels was obtained. From the measured emissions the sulfur content in the fuel and the emitted  $\text{NO}_x$  per main engine speed as reference characteristics were determined for the individual ships. Additionally, measurements on the particle size distributions of ship plumes were studied. Furthermore the conducted measurements also showed that the system is flight functional and works fine independent from the type of aircraft.