

## **Investigation of the chemical impact of offshore structures on the German North Sea environment**

NATHALIE VOIGT<sup>1,3</sup>, TRISTAN ZIMMERMANN<sup>1,2</sup>, JOHANNA IRRGEHER<sup>1</sup>, DANIEL PRÖFROCK<sup>1,\*</sup>

<sup>1</sup>Helmholtz-Centre for Materials and Coastal Research, Institute of Coastal Research, D-21502 Geesthacht, Germany (\*correspondance:daniel.proefrock@hzg.de)

<sup>2</sup>University of Hamburg, Institute for Inorganic and Applied Chemistry, D-20146 Hamburg, Germany

<sup>3</sup>Fachhochschule Lübeck, Fachbereich Angewandte Naturwissenschaften, D-23562 Lübeck, Germany

Today coastal zones and offshore regions across Europe have evolved into industrialized regions as a result of the ongoing wind energy boom. The offshore structures that are exposed to seawater or buried in marine sediments often employ cathodic protection using galvanic anodes to guard against corrosion. Up to 10 t anode material (mainly Al- and Zn-based) for each Turbines is required, which is constantly dissolved. Thus, anodes have to be replaced on a regular basis. Beside Al and Zn, the used alloys contain various other metals as impurities, which are also released into the surrounding water body upon dissolution of the anode material. Up to now, the potential long-term effects on the surrounding marine environment related with the release of different contaminants from such large-scale infrastructure are entirely unknown. This paper describes the development of a suitable analytical method allowing the characterization of the elemental fingerprint of Al- and Zn-based sacrificial anodes used for the protection of offshore structures. In addition a new method for the trace determination of the released elements in undiluted seawater was established. The method was applied for the analysis of water samples taken around in the vicinity of various offshore wind parks in the German North Sea in order to investigate the release and distribution of trace metals potentially originating from the anode alloy into the surrounding marine environment.