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Biofouling protection for marine underwater observatories sensors by local chlorination

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During the last 20 years, many marine autonomous environment monitoring networks are set up in the world. They commonly use various sensors like dissolved oxygen, turbidity, conductivity, pH or fluorescence. These stations have been developed aiming at either collecting field data to calibrate satellite observations or for water quality assessment. Most of them are surface buoys or subsurface moorings. These systems are now equipped with sophisticated sensing equipment. Sensors, housings and support structures are subject to fouling problems and emphasis has to be put on the long-term quality of measurements that may face very short-term biofouling effects. Biofouling has long been considered as a limiting factor in ocean monitoring requiring the placement of any materials under water. Many potential solutions to this problem have been proposed. The biofouling can disrupt the quality measurement sometimes in less than a week. Many techniques to prevent biofouling on instrumentation are actually listed and studied by researchers and manufacturers. Some of them are implemented on instruments. Very few of them has been tested in-situ for long term deployment.

This situation is very complex and must be approached simultaneously in two ways: by the improvement of knowledge of biofouling kinetics and by the development of prevention strategies. This biofouling development gives rise very often to a continuous shift of the measurements. Consequently the measurements can be out of tolerance and then data are unworkable. Video systems such as cameras, video equipments and lights are as well disrupted by biofouling. Pictures become blurred or noisy and lights loose efficiency since the light intensity is decreasing due to the screen effect of biofilm and macro-fouling.

The protection of the sensing area of the sensor is a concern which has been treated for the last decade, operational solutions are now implemented on commercially equipment and are used for long term deployment, however common solutions like wipers or copper screen present technological weakness due to mechanical complexity, on the other hand the use chemical biocide like TBT (Tributyl tin) is now impossible. Despite the fact that this chemical have proved to be extremely efficient, tributyl-tin compounds have been shown to have deleterious effects upon the environment. TBT is now banned for antifouling paints from 2003 and should not be used on ships hull from 2008.

A convenient method consists of localised chlorine generation. This paper presents the results of research and development on biofouling protection for marine environmental sensors by local chlorination. We will demonstrate the efficiency of the localised chlorine generation method for long term coastal deployment specifically for continental margin benthic observatories. This reliable technique can be adapted to many kind of sensors quite easily and to optical ports usually used for oceanographic instruments, cameras, video and lights.