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SOMSS - A NEW INSTRUMENT FOR MEDIUM RESOLUTION SPECTRAL MEASUREMENTS OF UNDERWATER OPTICAL PROPERTIES USING FIBRE OPTIC SENSORS.

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ABSTRACT:

The **Southampton Oceanographic Multi-Spectral Sensor** (SOMSS) is an instrument for the measurement of underwater spectral radiance, irradiance, transmittance and scattering. The instrument uses multimode, step index, optical fibres to transmit radiation collected by the optical sensor heads to a central instrument body. Spectral measurements are carried out using a spectrograph which images input fibres from the sensors onto a full frame, two-dimensional CCD camera. The CCD camera and the internal light sources for transmittance and scattering measurements are operated by a PC compatible controller and the system has been designed for unattended operation. The use of fibre optic connectors to couple the optical sensors to the instrument allows the instrument to be reconfigured to meet a number of measurement requirements. The main design objective has been to provide spectral data with spectral resolutions approaching those expected for the next generation of remote sensing platforms for ocean colour monitoring such as SeaWIFS and MERIS. Dependent upon sensor type, spectral resolutions from 2 to 8 nanometres have been achieved over a spectral range from 400 to 700 nanometres.

This instrument has been developed under a joint project between the Optoelectronics Research Centre and the Department of Oceanography, both at Southampton University, as part of the NERC funded **Sensor and Instrument Design for Autosub and LOIS** (SIDAL) project.

POSTER

THE NERC SIDAL PROJECT AT SOUTHAMPTON UNIVERSITY

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An instrument for the measurement of underwater spectral irradiance and transmittance is under development at Southampton University as a joint project involving the Optoelectronics Research Centre and the Department of Oceanography. The instrument uses multimode, step index, optical fibres to transmit collected radiation to a central spectrometer. The main design objective is to provide spectral data at spectral resolutions approaching those of the next generation of remote sensing platforms for ocean colour monitoring such as SeaWiFS and MERIS.

POSTER

OPTICAL FIBRE SENSORS FOR OPTICAL OCEANOGRAPHY

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The use of multimode step index optical fibres with bulk optics could provide a range of interchangeable sensors for the measurement of underwater optical properties for use with both single channel and multichannel instruments. This approach to sensor design would have the advantages of making the instruments more versatile and would allow a reduction of sensor size. The key properties of step index multimode fibres relevant to the design of extrinsic fibre sensors for optical oceanography are presented together with possible fibre based sensor designs.

AN OPTICAL PHOTON-COUNTING MULTICHANNEL DETECTOR SYSTEM

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Multi-element detectors combined with signal processing can be divided into integrating and photon-counting systems. For applications at low light levels just like underwater spectroscopy the photon-counting mode is preferable because of its high sensitivity and accuracy.

The presented detector system has 32 channels all operating as photon-counters and was originally developed for solar UV-B measurements under water. It is based on a modified microchannel plate (MCP) with separate charge-amplifier, discriminator and counter for each channel and can operate at light levels even 10^2 - 10^3 times lower than detectable with a single photomultiplier. The modification concerns the resistance of the MCP and the charge amplification which has a lower limit of 100 electrons per event. While the quantum efficiency depends on the chosen cathode material and wavelength, the dark current is only 0.3 counts per second and channel and independent from the temperature between -20° to +20°C.

In our present version the detector is used together with a double-monochromator and diffusor in the range 280-320 nm with 1.3 nm resolution. In another application it will be part of an underwater prism spectrometer where the range 400-720 nm is measured simultaneously with 10nm resolution.