



Automatic instruments for environmental knowledge

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Availability of reliable and low cost environmental data is the basis of modern operational oceanography, that needs them to perform environmental quality assessment, nowcasting activities and feeding of forecasting models. Traditional data collection systems like oceanographic cruises are too expensive and do not offer an adequate space-time coverage. To overcome these limitations, expressly designed instruments and systems were built to work from buoys, ships of opportunity, and towed vehicles.

In the last thirty years advanced instruments have been developed at CNR-IAMC (formerly CNR-IST), some of which in cooperation with CNR-ISSIA and University of Tuscia – Viterbo, in the framework of Italian and European research programmes.

Hearth of all devices is a versatile data acquisition and transmission system, that can be equipped with GPS, one or more terrestrial, cellular or satellite modems, ADC-DAC boards, serial communication interfaces. A custom set of macro-commands, including system management, data acquisition and transmission has been written, to make the device really versatile and flexible. The hardware is based on stackable PC-104 boards that offer a PC-like architecture with a very small size. The Operating System is ROMDOS. The software has been written in Microsoft Compiled Basic, with some routines (the communication and data acquisition ones) written in x86 Assembly to enhance performance.

This system was installed on coastal monitoring buoy networks moored in Sicily, Apulia, and also integrated within the C-CEMS observing system (Latiun region), performing timed data acquisition and transmission; one of the buoys hosted also a water sampler, controlled by the data acquisition and transmission system, able to fill up to eight 250 ml bottles, adding a fixative.

In the framework of the MFSTEP programme, an Automatic Multiple Launcher, able to deploy eight XBTs or T-FLAPs (a fluorimetric expendable probe, developed at Laboratory of Experimental Oceanology and Marine Ecology, University of Tuscia) was built. This device is capable of performing operations triggered by its geographical position, and can work almost unattended from Ships of Opportunity (usually ferries travelling on the same route, so obtaining a good coverage), storing and transmitting acquired data immediately or when requested to.

New achievements in the field of automatic monitoring systems have recently been reached. The need to work in the harsh Arctic environment and specially at the sea-ice interface where, due to blocks falling from glaciers, is too difficult and dangerous to go by a boat, newer instruments have been developed to be hosted on, or be towed by, a small unmanned vehicle designed by CNR-ISSIA of Genoa. The Civitavecchia Laboratory built ARLOC, a miniaturized and flexible probe that can be easily integrated in different types of platforms, able to acquire temperature, pressure, fluorescence by chlorophyll a, pitch, roll and acceleration. During the last Svalbard campaign this instrument, together with a new version of the water sampler, able to fill eight 500 ml bottles, showed a good reliability.

All the data acquired by these technologies are fundamental to enhance and better exploit both environmental monitoring and operational and forecasting oceanography.