

## FIRST DEPLOYMENT OF SUB-SURFACE MOORINGS AS PART OF THE LONG-TERM OCEAN CLIMATE OBSERVATIONS (LOCO) PROGRAM

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In 2002 a consortium of physical oceanographers from the Royal NIOZ, the Institute for Marine and Atmospheric Research (IMAU) and the Royal Netherlands Meteorological Institute (KNMI) obtained funding for the 'Long-term Ocean Climate Observations (LOCO)' program, a proposal for large investments which was funded by the 'NWO-Groot' program. The LOCO program intends to obtain long-term (at least 5 years) observations on some aspects of the (time-variability in) the global overturning ocean circulation. At some critical ocean locations observations on inter-seasonal and inter-annual variability in ocean currents, convection and internal waves will be obtained using sub-surface moorings. The program is embedded in the international WCRP - CLIVAR programme and forms the Dutch contribution to the 'Global Ocean Timeseries Observatory System' which implements a global network of moored time-series observatories.

The funding includes the purchase of the instrumentation and ship-time for the first deployment of the moorings. In 2003 all moorings have been deployed for the first time. The sites are shown in Fig. 1.

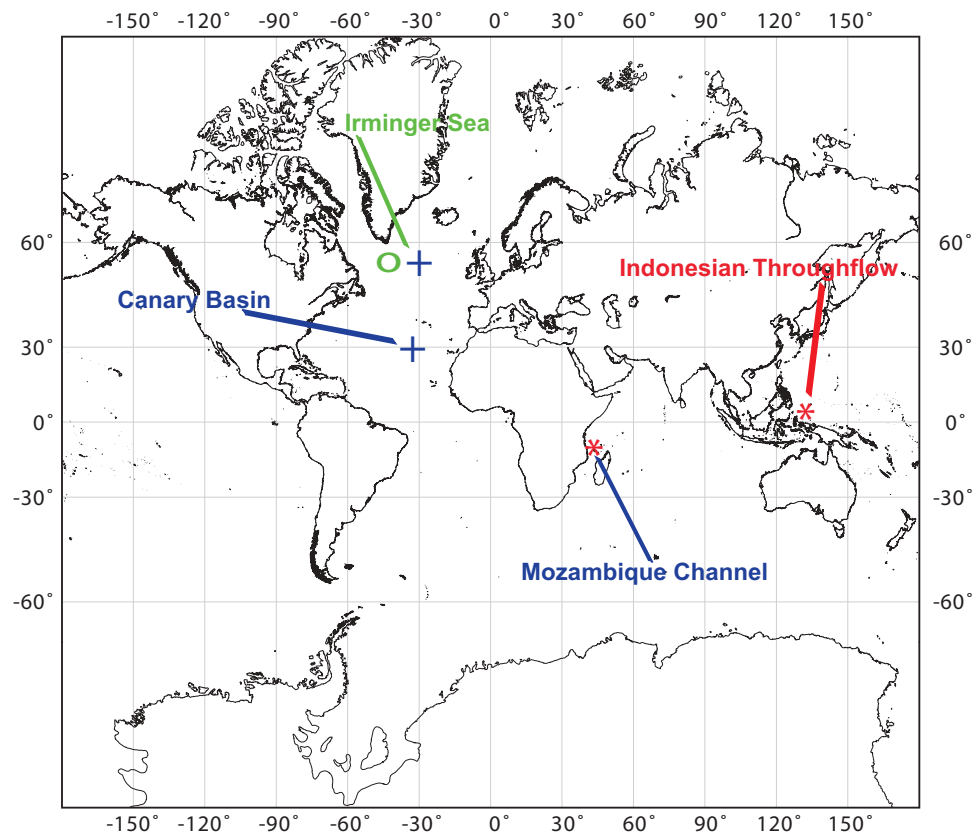


Fig. 1. Sites where LOCO moorings have been deployed in 2003

In the North Atlantic Ocean an array of 4 moorings was deployed both in the Canary basin and in the Irminger Sea to study the climatology of internal waves in these ocean regions. These internal wave moorings will be relocated yearly to obtain information on the internal wave climatology at different characteristic ocean regions. The two sites are complementary in that the Canary basin is near a latitude at which the internal (diurnal) tide can be expected to be trapped, leading to elevated levels of mixing, while in the Irminger Sea the frequency of the trapped waves is not of tidal origin, and is thus expected to be less energetic. The internal wave moorings in the Irminger Sea are located close to the sites where 2 profiling moorings were deployed. These profiling moorings are used to study the variability of deep convection in this region and form an extension of our bi-annual hydrographic repeat surveys along the former WOCE AR1E section. The profiling moorings will remain deployed in the Irminger Sea for a period of 5 years.

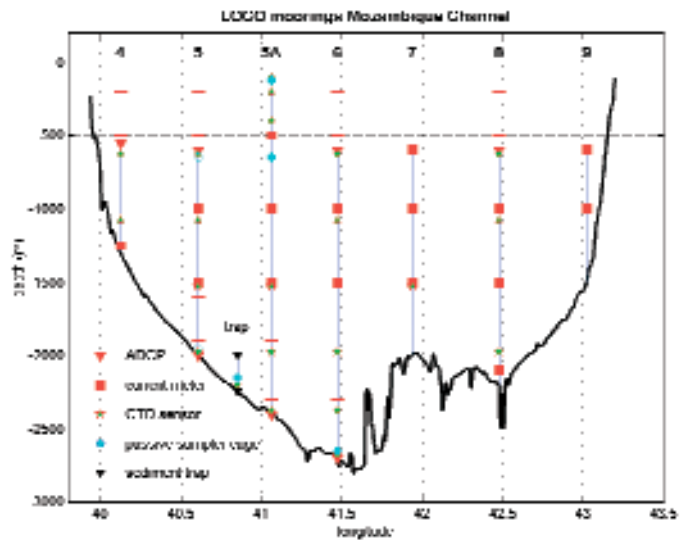


Fig. 2. Mooring array in the Mozambique Channel

In the Indian Ocean an array of moorings was deployed in the Mozambique Channel as a follow-up of a recent successful pilot experiment. The present array minimises the previous undersampling drastically and has a large number of acoustic Doppler current profilers, current meters and temperature and salinity sensors (fig. 2.). These observations will allow a quantification of the meridional fluxes both in the upper and lower layers. These flows form important contributions to the global overturning circulation as our previous experiment has shown. The present observations will be used to determine the seasonal and interannual variability of these flows and to study 1) the relation to large scale 'climate modes' in the Indian Ocean and 2) the connection to variability in the Agulhas current system.



Passive sample cage for organic contaminants and CTD sensor attached to a LOCO mooring cable.

In one of the Indonesian straits that connect the Pacific and Indian ocean, a mooring was deployed as part of the INSTANT program, a large internationally coordinated program to measure the variability in the Indonesian Throughflow over a period of 3 years. The Royal NIOZ mooring was deployed in the Lifamatola Strait, at roughly the same location where a Dutch mooring was located during the Snellius expedition in the early 1980's.

In addition to these moorings equipped with physical sensors, a sediment-trap mooring was deployed both in the Irminger Sea and in the Mozambique Channel close to the other moorings. These observations will be used to study long-term variability in vertical particle fluxes in relation to variability in the physical environment. Also, a large number of passive samplers for organic contaminants, recently developed at Royal NIOZ, were attached to moorings in the North-Atlantic ocean and the Mozambique Channel. These samplers adsorb organic contaminants from the water phase and will be used to study their presence (and transport) in the deep-sea, a subject about which virtually nothing is known presently.



Activities on the deck of the British RV Charles Darwin during deployment of the LOCO moorings in the Mozambique Channel