JRAP8: Monitoring of submarine CO_2 fluxes and ecological impact studies on natural analogues for CO_2 leakage

Deliverable JRAP-8/ 1:

Report on the technical prerequisites of offshore automatic detection of gases, data storage and data transfer

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ACRONYM : **CO_2GeoNet**

TITLE : **Network of Excellence on Geological Storage of CO_2**

PROJECT CO-ORDINATOR : **British Geological Survey – BGS (UK)**

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WPs involved:
IA : IA-1 (Research infrastructure), IA-2 (Communication & Information), IA-4 (Joint research development)
JRA: JR4-2 (Monitoring techniques - Geochemical); JR4-3 (Monitoring techniques Biological); JR5-1 (Risk&uncertainty-ecosystem); JR5-4 (Risk&uncertainty –Quantification tools)
SEA: SE-3 (Electronic)

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1. INTRODUCTION

It is the aim to carry out a feasibility study for automatic sampling and detection of offshore gas release (CO_2 and CH_4). This work will deliver basic data and experience, and will assess knowledge and technical gaps in order to facilitate further developments of continuous geochemical monitoring devices as applied to open sea environments and lakes. First operational testing of basic gas monitoring installations will be conducted in the Gulf of Trieste and will be coupled to ecological investigations. Analysis of water chemistry will be accompanied by a preliminary assessment (modelling) of CO_2 seabed behaviour, and exposure tests on mussels and other organisms exposed to likely CO_2 concentrations. It is the aim of the collaboration to establish the basic infrastructure within the team for coming gas and water monitoring (e.g. within the ´CO2REMOVE´ proposal) coupled to ecological impact investigation at a demonstrated CO_2 site. For this feasibility study, the Gulf of Trieste is chosen as an appropriate marine test site due to the available infrastructure.
Initially and topic of this report, the technical feasibility of installing automated CO_2 and CH_4 sampling and detecting devices was explored. Furthermore, the technical prerequisites for sensor integration, and storage and transfer of data was be evaluated. The host will be a meteo-oceanographic buoy (MAMBO 4) managed by the COSTE group (Coastal Oceanography and Engineering group) at OGS. OGS has a long experience in operating with three other buoys which are currently operated in the Gulf of Trieste. Due to local methane fluxes in the Gulf of Trieste (result of a pre-study by OGS and BGR), both a CO_2 and methane sensor will be installed.

2. RESULTS

Participants of BGR, OGS and URS met on Wednesday, July 6, 2005 at OGS in Trieste.
After visiting the newly constructed buoy MAMBO 4 (Fig. 1-3), the technical prerequisites for the installation of the monitoring devices were discussed, integration of single devices due to power availability were proven and a work plan for the next six months elaborated.

Fig. 1: Inspection of buoy MAMBO 4

Fig. 2: Buoy MAMBO 4

Fig. 3: Buoy MAMBO 4

Main topic of the meeting was the elaboration of a work flow and a concept for the technical development within the next six months (for concept see Fig. 4, 5).

OGS will provide the buoy MAMBO 4 as a platform for this monitoring JRA and power supply for the technical devices. As discussed in Trieste, no further solar panels need to be installed. Furthermore, OGS will serve for connectors and fixation of the sampling funnel, and, if necessary, for diving activities. As a final task, OGS will test to establish an online-presentation of data on the CO_2GeoNet webpage.

BGR will develop a gas monitoring device for CO_2, CH_4 and gas flow rates, including the preparation of tubing, connections and of a 3-way plastic sphere valve. This 3-way plastic sphere valve shall be placed close to the buoy to allow sampling from a boat. Furthermore, BGR is responsible for data acquisition and transmission to GSM. Here, all partners may have access to the data. Furthermore, BGR will provide sampling bottles for gas sampling by divers. The corresponding sampling funnel (Fig. 6) was already made available to OGS.

URS will develop a monitoring device for dissolved CO_2 and CH_4 inclusive the relevant tubing and connections.

Samples of monitoring tubing will be sent by BGR and URS to OGS in order to evalute the dimensions, the mechanical characteristics, and the weight in water to finally design the technical installation requirements on the buoy by OGS.

Testing of all devices shall be conducted within the next six months.

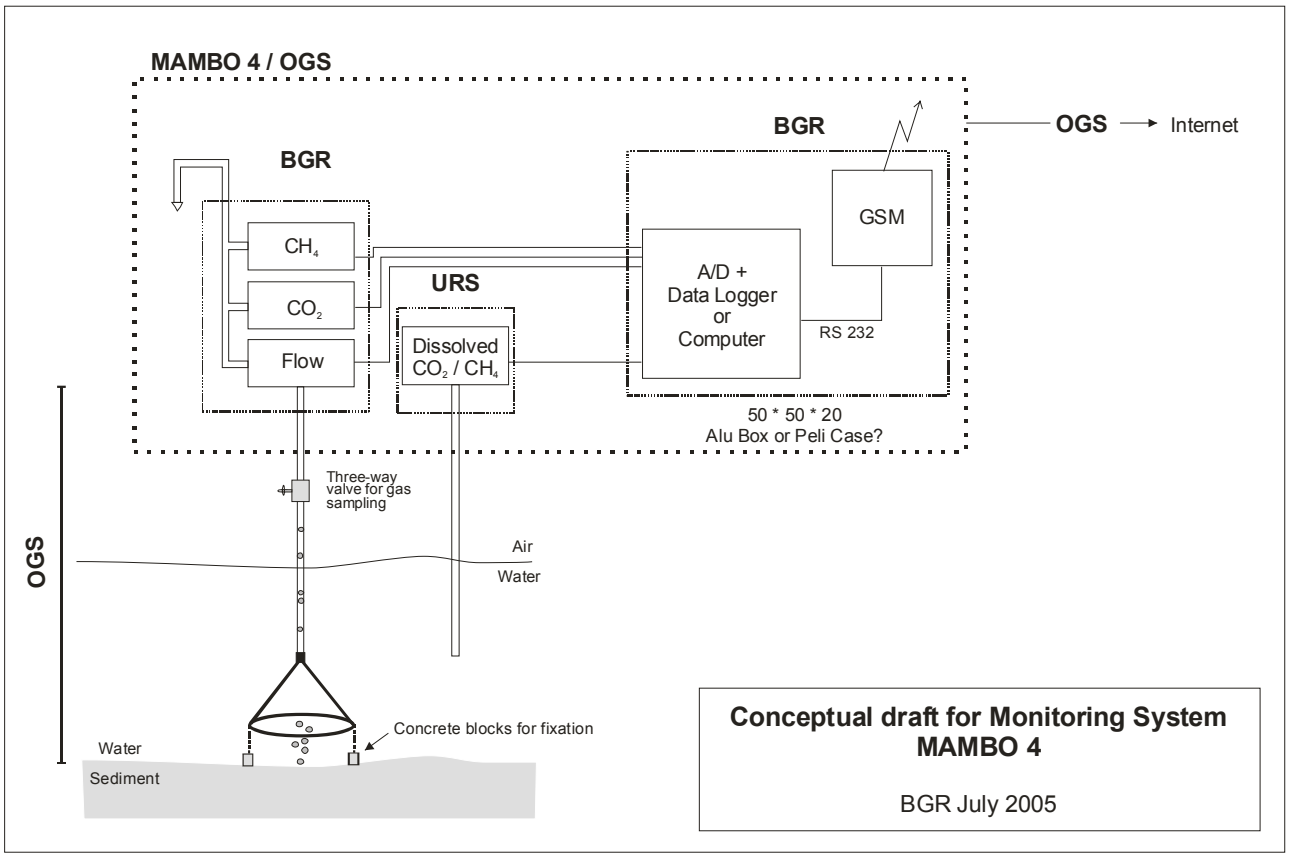

Fig. 4: Conceptual draft of the monitoring system on buoy MAMBO 4, including partners´ responsibilities.

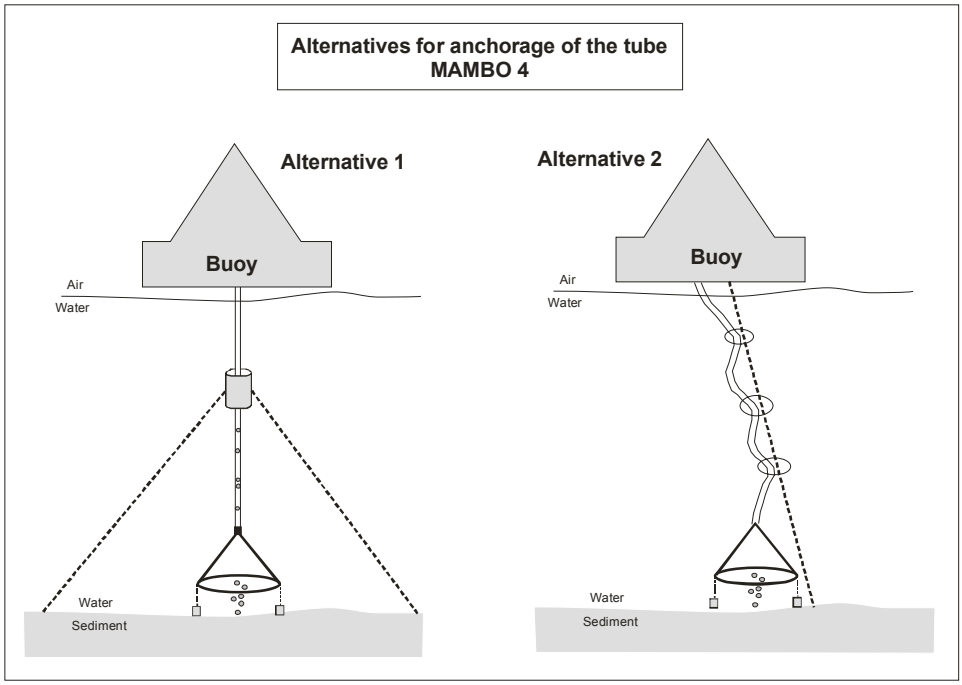

Fig. 5: Two alternatives for anchoraging of the tube to assure migration of gas bubbles upwards

Fig. 6: Gas sampling funnel and gas storage bottles