WARMER SECOND FIELD STUDY PLANNED AT THE VENICE LAGOON

In collaboration with: Magistrato alle Acque di Venezia

Background

Venice lagoon (500 km^2) is connected to the Adriatic Sea by means of three openings which allow port activities as well as tidal water exchanges. The mean depth is one meter but there is a dense network of natural and artificial canals to facilitate rapid transport within the estuary. The city of Venice is situated in the middle of the lagoon and a large industrial complex (petrochemical, metallurgy, energy) located at the western edge (Porto Marghera) and both contribute heavily to the rampant pollution of the estuary. The main sources of point and non-point source pollution are industrial and agricultural activities around the lagoon which contribute contaminants to the lagoon via effluent discharge and run-off. In addition to this, urban sewage with its associated toxicants without treatment is discharged directly into canals of Venice which enter the lagoon and subsequently coastal waters. Due to these reasons, the water quality in the lagoon has been subjected to several studies during the recent past and a continuous monitoring network with 10 stations (SAMANET) has been established in the lagoon (Fig. 1 & 2). Recent study show that primary production in the lagoon amounts to 5.5 tN/day, supported mainly by nitrate. More than 75% of this flux is recycled to ammonia, directly or through mineralization ; 14% is exported to the Adriatic Sea, 6% transferred to higher level. Recycling processes generate a daily flux of 4tN/day which is added to 11 the 11tN/d coming from external sources. Sediments contributed to this flux more than half, and detritus ca. 25% (Solidaro et al. 2002). All this inform confirms the importance of continuous data records which could be used to develop better models useful for management of the lagoon, (Bendoricchio & De Boni, 2005).

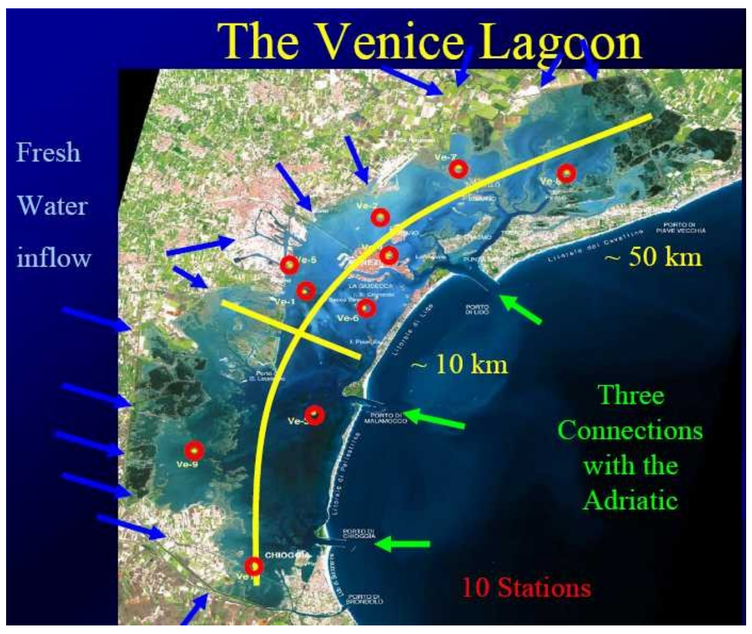

Fig. 1. Continuous monitoring stations in Venice Lagoon

Fig. 2. Monitoring Station Venezia-3.1, S. Pietro in Volta

	Electro-active			Total dissolved			Fraction electro-active (%)			Nutrients			
	Cd	Pb	Cu	Cd	Pb	Cu	Cd	Pb	Cu	DOC	TIN	P-PO4	Chl
	ng/L			ng/L						(mg/L)	µg/L		µg/L
Max	86	291	444	250	1657	2231	82	68	39	3,81	2447	152	4,9
Min	10	48	76	14	147	806	20	11	7	2,25	243	11	1,3
Median	28	146,5	171	71	340	946	41,5	45,5	18,5	2,95	438	22	3,25

Table 1. A statistical summary of dissolved heavy metal and nutrient content in the lagoon (calculated from Ferrari et al 2002, based on data from 16 stations, sampled monthly,12 X)

OBJECTIVES

3. The deployment of WARMER continuous monitoring platform at Venice Lagoon will be the second field test (duration of the field test: ca. 3 months) of the project after the first experiment conducted in England at Henningfield reservoir (Fig. 4) & Blackwater estuary.
4. In Venice Lagoon there is a well established continuous monitoring net, infrastructure with co-operating laboratories, research institutes and universities, all these makes it an ideal location for the test.
5. During the field test WARMER project intends to test the newly developed sensors for nutrients and heavy metals.
6. Venice Lagoon is a large, eutrophic, turbid water body with successive algal booms during the year. These developments are helpful for some of the remote sensing, tasks under taken by NERSC in attempting to use it as a tool to drive and calibrate models using chlorophyll-a , total suspended solids data and colour spectra.

Fig.3.WARMER monitoring platform.

Experimental Plan

Magistrato alle Acque di Venezia maintains 10 continuous monitoring stations (SAMANET) in the lagoon which measure a number of parameters (pressure, temp., conductivity, salinity, DO, DO%, pH, Redox, Chlorophyll-a, Turbidity)* continuously. During the field test, WARMER monitoring pontoon will be moored at the following SAMANET stations for a period of 3 weeks at each station, starting from mid April till end of July.

- Ve-4 Fondamenta Nuove; (near city, by the side of Murano Island; affected by pollution from boat traffic and Murano glass industry)
- Ve-6 Sacca Sessola: (outside the city area in the middle of the lagoon, where spring and summer algal booms are common)
- Ve-5 Porto Marghera: (at the outlet of Porto Marghera industrial area, one of the heavily polluted sites)
- Ve-7 Dese: (at the outlet of the Dese river; brings point and diffused pollution from watershed)

*In addition to these parameters WARMER pontoon is equipped with a nutrient analyser to measure dissolved nutrients continuously (SRP, nitrite, nitrate and ammonia)

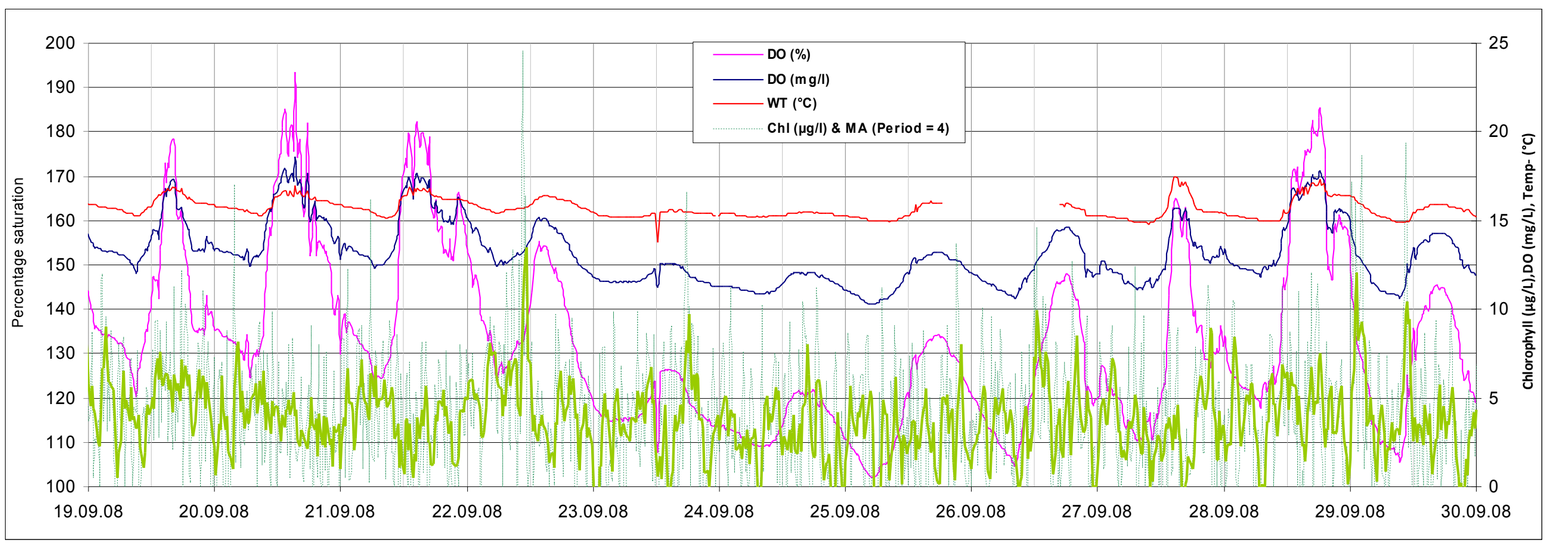

Fig. 4 . The variation of dissolved oxygen, % saturation, water temp. and chlorophyll-a (µg/L) concentration in Hanningfield Reservoir during the initial deployment period . The dark green line presents the calculated moving average (MA) for chlorophyll.

WHY CONTINUOUS MONITORING?

4. Continuous, high frequency data is a useful source of information for the understanding of seasonal chemical and biological changes in the in the lagoon. They are useful to estimate nutrient dynamics, primary and secondary production as well as to assess C,N,P fluxes associated with biogeochemical cycling and toxicant transport.
5. More and better water quality data is needed for to calculate Maximum Permissible Loading in all EU countries (or Total Maximum Daily Loads). We need better data to assess trends, to determine current status of waters and their impairments, and to test water quality models.
6. Data and models show that eutrophication of the Venice Lagoon has improved in recent years. Total P concentration has decreased from 40 to 15-20 µg/L which is well below the target goal (Bendoricchio & De Bon, 2005i). Such success in the Venice Lagoon and similar locations elsewhere (e.g. Lake Erie, U.S) demonstrate the importance and utility of high quality data gathering and modelling efforts.

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Rferences

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