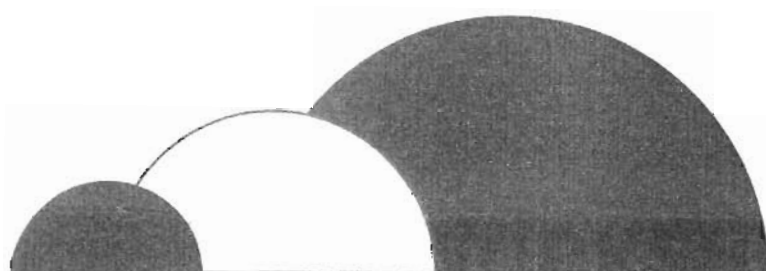


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F I S T

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MODELLING THE CARBON CYCLE IN THE NORTHERN ADRIATIC SEACOSSARINI Gianpiero¹, DEL NEGRO Paola¹, FONDA UMANI Serena², SOLIDORO Cosimo¹

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Key terms: Biological model; Northern Adriatic Sea; Carbon cycle; Bacterial Respiration; Primary production

The interaction between physical and biological processes is a key factor for analysing and understanding the functioning of the Northern Adriatic continental shelf pump. In fact, the downward flux of carbon from the photic zone to the deeper layer of the water column is mainly due to water circulation over the Adriatic Shelf and mixing processes, as well as to carbon uptake by autotrophic plankton, nutrient recycling and respiration of organic carbon by heterotrophic component.

In the frame of this workpackage, the functioning of the continental shelf pump is studied using short-term simulations performed by a coupled transport-carbon cycle model. The transport model is MitGCM, and the biological model has been developed ad hoc for this application.

The biological model represents a synthesis of the current paradigms of the marine ecological modelling and it is in agreement with specific ecological literature on the area of interest.

Some of the processes represented in the model are studied in deep, since their critical role on the process. Different formulations of primary production and exudation, and different parameterisations of light limitation are implemented and compared. Further, bacterial respiration and nutrient recycling are the other processes subjected to a critical review.

The comparison between model results and the results of statistical analysis of data on Northern Adriatic Sea represents a fundamental step for testing and validating the different formulations and parameterisations of the biological model.

W10-110 Orale Crise, Alessandro

10.1474/Epitome.02.0110.Geoitalia2007

DECADAL SIMULATIONS OF THE MEDITERRANEAN SEA ECOSYSTEM WITH A 3D BIOGEOCHEMICAL MODELCRISE Alessandro¹, LAZZARI Paolo¹, SALON Stefano¹, TREVISANI Sebastiano¹, BERANGER Karine², SCHRÖDER Katrin³, CERRATI Gabriella⁴

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Key terms: Med Sea; eco-hydrodynamical; Decadal Simulation

CO₂ sequestration by means of the oceanic areas represents one of the most important subjects among the ongoing studies regarding the climate change. The processes that rule the CO₂ absorption into the sea are today not very well understood. In particular, the Mediterranean Sea appears to be a site of wide interest, where the entity of the sequestration potential is characterized by a large uncertainty.

In the framework of the VECTOR project, a series of decadal simulations of the Mediterranean Sea ecosystem have been planned to be implemented in order to assess and estimate the amount of the CO₂ cycle, with a particular interest in the vertical transfer processes that involve the CO₂ within the trophic web.

The system used to perform the simulations is a three-dimensional coupled eco-hydrodynamical model (BFM and OPA-tracer model) for the whole Mediterranean Sea. The biogeochemical module is characterized by a multi-nutrient carbon-based biogeochemical flux model (BFM). Key aspects of the model are the potential for limitation by macronutrients (nitrogen, phosphate and silicate), adjustable (i.e. non-redfieldian) C:N:P:Si ratio into zooplankton and phytoplankton compartments, chlorophyll to carbon variable dependency. The forcing fields for the Tracer model consisting of temperature, salinity, zonal and meridional currents, vertical eddy diffusivity are obtained subsampling a high resolution OGCM (OPA-MED16 - about 5km horizontal resolution, ENSTA/LOCEAN). The atmospheric forcing fields are obtained from ECMWF analyses (about 50 km for horizontal resolution) and the period considered is 1998-2005.

MED16 simulation was focussed on the investigation of the interannual variability of the convection whose role in the biogeochemical processes is particularly relevant.

The results of simulations are studied, in order to evaluate temporal and vertical evolution of the concentration of the key variables, such as macronutrients, chlorophyll, phytoplankton biomass and productivity.

W10-111 Poster D'Argenio, Bruno

10.1474/Epitome.02.0111.Geoitalia2007

SHORELINE EVOLUTION AT SELE RIVER MOUTH: COMPARISON OF FIELD DATA WITH NUMERICAL MODEL RESULTSVICINANZA Diego¹, FERRANTE Vincenzo², D'ARGENIO Bruno³, MARSELLA Ennio¹

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Key terms: shoreline evolution; numerical model; Sele River mouth

Near a river mouth several important coastal morphology phenomena can take place. These processes are due to the sediment transport caused by the wave currents.

A numerical approach is presented to evaluate the coastal morphology processes and shoreline evolution near the Sele river mouth.

The hydrodynamic and morphodynamic phenomena are described by using a 2DH numerical model. The model consists of three parts: the first simulates wave propagation, the second simulates hydrodynamic behaviour and the last performs morphodynamic and shoreline evolution. In this study the numerical simulation and field data comparison are carried out to evaluate shoreline and

morphodynamic response to the hydrodynamic processes occurring near Sele river mouth. Numerical modelling is based on four year wave data monitoring and two coastline measurement. Model calculations of shoreline change from 2001 to 2004 were in agreement with the measurements. This study is part of VECTOR Project (VulnErabilità delle Coste e degli ecosistemi marini italiani ai cambiamenti climatici e loro ruolo nei cicli del carbonio mediterraneo) research line 2 VULCOST (coastal area vulnerability due to global climatic changes).

W10-112 Orale Delfanti, Roberta

10.1474/Epitome.02.0112.Geoitalia2007

VARIABILITY OF POC EXPORT FLUX FROM THE EUPHOTIC ZONE AT THE VECTOR TIME SERIES STATIONS.SCHIRONE Antonio¹, CONTE Fabio¹, MALAGUTI Antonella², SALVI Stefano¹, ABBATE Marinella¹, GIROSI Laura¹, DELFANTI Roberta¹

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Key terms: carbon cycle; Thorium; Mediterranean Sea; Particulate organic carbon

As part of the VECTOR Project, two areas, in the Southern Adriatic and the Southern Tyrrhenian Sea, have been selected for the study of the main processes controlling the seasonal and interannual variability of the carbon exchange between the atmosphere and the open sea environment. The two areas are characterised by different trophic regimes: the Southern Adriatic Sea shows large spring blooms while the S. Tyrrhenian Sea is one of the most oligotrophic areas of the Mediterranean. Time series of the main physical and biogeochemical parameters are being collected at the two stations. POC export fluxes are estimated by two complementary methods: the ²³⁴Th/²³⁸U disequilibrium method and sediment traps. The ²³⁴Th/²³⁸U disequilibrium method has been increasingly used over the past decade, because it has the advantage of providing a temporally integrated record (weeks to months) of particle export operating from ships and without the apparent biases that characterise sediment traps.

In this work we first briefly discuss the Thorium method and its accuracy for POC flux estimates at the VECTOR time series stations. We then present the data obtained during the first year of activity at both stations and discuss POC export fluxes in relation to total, new and regenerated primary production and to microphytoplankton population.

W10-113 Poster Falco, Pierpaolo

10.1474/Epitome.02.0113.Geoitalia2007

PRELIMINARY RESULTS OF VECTOR OCEANOGRAPHIC CRUISES - HYDROLOGY OF THE SOUTHERN TYRRHENIANFALCO Pierpaolo¹, ZAMBIANCHI E.¹

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Key terms: Southern Tyrrhenian; Vector Program; processes developing

In the framework of research line 8, task 2, of the VECTOR program, whose focus is on time series in the Southern Tyrrhenian collected by moored instruments, since november 2006 we have carried out three oceanographic cruises in that area. The ultimate goal of this data collection activity consists in understanding processes developing in the water column affecting and/or ruling the carbon cycle in that pelagic area.

To this aim, we identified the position of one station where a mooring was deployed, with sediment traps, conventional and acoustic current meters, temperature and conductivity sensors, and where hydrological and biogeochemical investigations are being carried out on a regular (seasonal) basis.

In addition to this focal point (39°30' N, 13°30' E, bottom depth 3450 m, 90 nm off the Italian continental coastline), we have collected hydrological data over a transect connecting it to the Gulf of Naples, in SW-NE direction.

In this poster we show the first results of the analysis of the hydrological data collected during the first three cruises. In particular, we present vertical sections of the main physical parameters (temperature, salinity, density) focussing the attention on the geostrophic velocity field associated with the vertical structure of the water column, and to the double diffusion processes, easily identified in the salinity profiles.

W10-114 Poster Ferraro, Luciana

10.1474/Epitome.02.0114.Geoitalia2007

MARINE COASTAL ENVIRONMENT OFF SELE RIVER PLAIN, PRELIMINARY RESULTS OF VULCOST ACTIVITY (VECTOR PROJECT).ALBERICO Ines¹, BUDILLON Francesca², FERRARO Luciana², LIRER Fabrizio¹,PELOSI Nicola², D'ARGENIO Bruno³

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Key terms: Marine coastal environment; coastline evolution; Sele river plain offshore

Vulcost is the research line of the Vector Project that aims at evaluating the vulnerability of the Sele and Bussento (Campania, Italy) coastal systems, respect to possible future sea level changes.

The first step has been to assess the recent evolution of the coastline and the present day littoral morphology as well as that of depositional systems and ecosystems down to 50 m below the sea level. To this aim several proxies have been integrated:

- comparative analysis of georeferenced technical maps, evidencing the changes in the coastline in the time interval spanning from 1984 to 1998;

- **swath bathymetry** and acoustic mosaics of the seabed, calibrated by sediment sampling and analysis to delineate the present day distribution of the main lithofacies associations and the algal and marine plants coverage;
 - **statistical analysis** of the main benthic foraminiferal species distribution, to provide information on ecological niches, since it has been observed that specific faunas, do colonize well distinct environments.
 All the information concurred to define four peculiar shallow marine environments:
 - a submerged beach and a fluvial delta sector, wave dominated, down to 15/18 m of depth;
 - a sandy pelitic seabed from 15/18 m down to about 30 at places with patches of *Cymodocea nodosa* and *Caulerpa racemosa*, mainly controlled by extreme storm events and bottom currents;
 - an homogeneous pelitic seabed down to 50 m of depth, swept by bottom currents;
 - a littoral sector characterized by rocky outcrops and relict of *Posidonia oceanica* mat, between 10 and 20 m off the coast enclosed by the Salso and the Solofrone river.

outer sand banks, detached from the ancient and fixed inner barrier, to form a para-lagoonal intermediate area.
 Onshore movement and connection to the inner barrier is the secular trend of the main sand banks, thus testifying an overall rollover tendency possibly due to relative sea-level rise.
 In a sediment-starved system the rollover process not necessarily occurs with mass conservation.
 Barrier thinning and shoreline erosional trend can be seen as the main responses due to flooding of the coastal area without sufficient sediment compensation.
 A GIS-based coastal vulnerability index has been constructed using a multiple regression procedure that considers a set of coastal morphodynamic and physical factors. The present beach configuration as well as the recent shoreline and shoreface evolutionary trends are the main variables to consider in order to achieve information on the possible behavior of beaches and barrier island systems to sea-level rise and climate-changes.
 The procedure permitted to obtain a simple coastal zoning that emphasize the most critical areas, that could become the main erosional hot spots in case of submergence and concomitant recurrence of storms.

W10-115 Poster Fonda Umani, Serena

10.1474/Epitome.02.0115.Geotalia2007

CARBON CYCLE VARIABILITY IN THE NORTHERN ADRIATIC ECOSYSTEM: A RE-ANALYSIS OF HISTORICAL DATA

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Key terms: Carbon cycle; northern Adriatic; variability

The northern Adriatic has been recognized for many years as a region of high marine production at several trophic levels from phytoplankton to fish. The rivers draining into the northern Adriatic are the major sources of external nutrient input, especially during stratified periods. The water mass exchange between the northern region and the remainder of the essentially oligotrophic Adriatic has a great influence on the productivity and standing crops of different sub-areas. A terrigenous supply of nutrients all along the western coast via run-off influences the productivity of a relatively narrow coastal belt, and consequently the biomasses and production rates are spatially very variable. In shallow turbulent environments, like the northern Adriatic, where increased nutrient availability is episodic, the microbial or the grazing food web can alternately dominate in the carbon flow over short time periods. In spring, as a result of episodic nutrient enrichment of the euphotic zone and insufficient grazing, as a controlling factor of their population size, large-sized phytoplankton blooms occur that consequently determine a major export to the bottom via sedimentation. On the opposite, microbial food web is typical of low energy environment, mostly based on regeneration processes. As a consequence, the final fate of photosynthesised carbon can strongly change over time in the same environment as a function of the planktonic food web structures. In the framework of VECTOR project ("Vulnerabilità delle Coste e degli ecosistemi marini italiani ai cambiamenti climatici e loro ruolo nei cicli del carbonio mediterraneo") a re-analysis of the entire available data set of parameters relevant in driving C fluxes and export rates has been planned to provide conceptual models and appropriate parametrizations to modelers, with the aim to hindcast and forecast ecosystem scenarios at the basin scale.

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W10-116 Orale Fontolan, Giorgio

10.1474/Epitome.02.0116.Geotalia2007

COASTAL VULNERABILITY ASSESSMENT: THE GRADO AND MARANO BARRIER ISLANDS

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Key terms: coastal vulnerability; risk assessment; sea-level rise; storm surge; Grado and Marano lagoons

Maximum vulnerability is normally considered for the lowest parts of the coastal system, as the barrier islands and subsiding deltaic areas. Inundation risk of the Grado and Marano lagoons depends on the elevation of the inner plain and on land use values. Most of the area surrounding the inner lagoon is below the mean sea-level, and is presently defended only by dikes constructed along the inner lagoon margin after the November, 1966 storm. Two main tourism localities (Lignano and Grado), as well as an important industrial area (Porto Nogaro) and significant agricultural and commercial activities are presently the main targets due to sea-level rise.

A twofold adaptation measure has to be considered: 1) a measure linked to the possible expansion of the lagoon limit landwards, in order to compensate for the unavoidable drowning of the present lagoon, 2) a measure linked to the defense of the barrier islands, in order to abate the erosional phenomena that could lead to the opening and loss of the entire lagoons, and reduce the direct impact of storms.

The lagoon has a double barrier island chain, given by dynamic and elongate

W10-117 Poster Galati, Maria Barbara

10.1474/Epitome.02.0117.Geotalia2007

MEDITERRANEAN WAVE CLIMATE: VARIABILITY AND TREND

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Key terms: wind waves; extremes; trend; seasonal cycles; climate

This contribution analyses the wave fields in the Mediterranean Sea, during the second half of the 20th century (1958-2001), in order to study the climate variability of SWH (*Significant Wave Height*) and its recent trend. The results are important for planning and managing coastal defences and off-shore activities. In this study, the SWH fields are produced by a third-generation wave model, WAM (*Wave Model*), at 0.25 degs lat-lon resolution. The two sets of forcing wind fields used are provided by the ERA-40 reanalysis and the HIPOCAS project. ERA-40 have a 0.5 deg grid step and a temporal resolution of 6 hours. The HIPOCAS have the same grid step and a hourly temporal resolution. Output wave parameters fields (SWH and direction) are saved every hour. The comparison between the two simulations and with satellite is used for assessing the accuracy of the results. The project aims at describing the mean wave fields, their seasonal cycles, extreme values and climate trend.

W10-118 Orale Gambaro, Andrea

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STUDY OF ORGANIC SULPHUR COMPOUNDS (DMS, DMSP AND DMSO) IN LAGOON ECOSYSTEMS: THE CASE OF THE VENICE LAGOON

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Key terms: Dimethyl sulphide; Dimethylsulphoniopropionate; water; climate change; Venice Lagoon

During the past decade much of the research on volatile sulphur compounds (VSCs) has focused on their production and fate in the oceans and coastal marine environments. This intense interest arises from an awareness that biogenic sulphur gases play an important role in the cycling of sulphur and in global climate regulation. Dimethyl sulphide (DMS) is the most important marine source of sulphur released into the atmosphere.

The Venice lagoon is the largest wetland of the Mediterranean and it is characterised by different subsystems which determine its elevated complexity and diversity. It can be considered an ecosystem of transition between land and sea, which continuously exchange matter and energy with the drainage basin and the Adriatic Sea.

This study of the origin and fate of dimethyl sulphide (DMS) and the relationship with climate in a particular and complex lagoon ecosystem such as that of the Venice lagoon focuses on the temporal evolutions of DMS concentrations in surface water together with those of dimethylsulphoniopropionate (DMSP), dimethyl sulphoxide (DMSO), nutrients (nitrate, nitrite, ammonium, phosphate, silicate), chlorophyll a, chlorinity, water temperature and phytoplankton (composition and density). Measurements were made during 1997 at six stations in the Venice lagoon. The temporal trends of DMS concentration were different at the six stations and they showed no relation to DMSP or to the chlorophyll a concentration at four stations whereas at two stations DMSP concentrations in the surface water is related to DMS and chlorophyll a concentrations suggesting that the production and the fate of DMS could be different for the two periods.

W10-119 Orale Gasparini, Gian Pietro

10.1474/Epitome.02.0119.Geotalia2007

HYDROGRAPHIC AND TRANSPORT VARIABILITY IN THE SICILY STRAIT

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Key terms: Hydrography; Transport; Sicily Strait

The Sicily strait is a key point to observe the exchanges between the eastern