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A.I.O.L.

SESSIONE POSTER

RIASSUNTI

23-25 SETTEMBRE 2013

1. Elementi geomorfologici e sequenze deposizionali legate a correnti di fondo sul margine continentale del George V Land (Antartide orientale)

De Santis Laura * (OGS, Italia), *Tolotti Raffaella* (OGS; Università di Genova, Italia), *Caburlotto Andrea* (OGS, Italia), *Lucchi Renata G.* (OGS, Italia), *Presti Massimo* (OGS, Italia), *Daniela Accettella* (OGS, Italia), *Patrizia Macrì* (INGV, Italia), *Ester Colizza* (Università di Trieste, Italia)

La circolazione delle correnti intorno all'Antartide condiziona, oggi, quella di tutti gli oceani e quindi di conseguenza il clima del pianeta. Nell'Oceano Meridionale avviene un notevole scambio di energia fra le acque fredde prodotte in Antartide e quelle tropicali più calde. Le acque fredde e salate che si formano lungo le coste dell'Artico e dell'Antartide rappresentano il "motore freddo" della circolazione globale. Il rilievo geomorfologico, acquisito nell'ambito dei progetti PNRA/WEGA (2000) e PNRA/MOGAM (2006), in collaborazione con Geoscience Australia, sul margine continentale del George Vth Land, tra 143 e 145°E e tra 65° e 68°S, ha fornito informazioni circa i processi deposizionali attuali e passati, legati all'attività delle correnti di fondo, che si formano nella Polynya del Mertz e che rappresentano circa un terzo delle masse d'acqua di origine antartica. Sulla piattaforma dati sismici e sedimentologici hanno rivelato la presenza di un corpo sedimentario (Mertz Drift) di 35 metri di spessore, originato dal passaggio della corrente di fondo High Salinity Shelf Water (HSSW). Le carote di sedimento dimostrano che questa corrente che si forma oggi in prossimità della costa, sembra persistere, con diversa intensità, da almeno due cicli climatici. Nel record climatico degli ultimi 600.000 anni conservato nelle carote di sedimento raccolte sul rialzo continentale, lungo i canali Wega e Jussieu, si trovano indizi del passaggio in profondità della corrente di fondo proveniente dalla piattaforma. La carta geomorfologica della scarpata continentale conferma tali evidenze, rivelando la presenza di campi di *sediment waves*, spesse centinaia di metri ed internamente stratificate, sui fianchi del canale WEGA. Misure oceanografiche e campionamenti della fauna bentonica effettuati da CSIRO (AUS) sulla testata dei canyon della scarpata confermano il ruolo chiave delle correnti di fondo sia di upwelling che quelle di cascading, formatesi nella polynya del Mertz, nella proliferazione di estese colonie di coralli e spugne.

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2. Benthic ecosystem functioning as a tool for sustainable management in port areas

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The purpose of this study was to promote ecosystem-based management and its application in coastal areas, grounded on a better understanding of the ecosystem functionality in the presence of specific types of stress. In particular, this study aimed to assess the benthic ecosystem functioning in a harbour area subjected to multiple and diffuse impacts. The main objective was to define the ecological performance of harbour sediments through the: 1) definition of structural characteristics of different types of sediments in the investigated sites; 2) evaluation of the benthic community structure in the same sites; 3) estimate of energy storage processes (primary production), its transformation (secondary production) and dissipation (respiration); 4) identification of taxa resistant to pollutants and their trophic role in these sites; 5) assessment of the ecosystem functioning in the area. Sampling was performed in spring 2013 in 7 sites, characterised by different degrees of impact, inside the Port of Trieste. At each station sediment cores were collected with a gravity corer and additional sediment samples were taken by a van Veen grab. Bottom water samples were collected with a horizontal Niskin bottle and measurements of photosynthetically active radiation (PAR), water temperature and salinity were recorded at each station. We evaluated the following parameters: sediment grain-size, total organic C and total N, bipolymeric C content, concentration of chlorophyll *a* and pheopigments, prokaryotic abundance and an estimate of specific microbial groups resistant to pollutants, abundance and diversity of microfito-, meio- and macrobenthos, primary production, secondary production, exoenzymatic activities and benthic respiration. The assessment of the benthic ecosystem functioning in polluted areas may represent a useful tool to develop sustainable forms of management of coastal resources.

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3. Quaternary Contourite drifts of the Western Spitsbergen margin

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The study of contourite drifts is useful for the reconstruction of the oceanographic and climate history of continental margins since they contain expanded sedimentary sequences characterized by relatively high and continuous accumulation rates. Two mounded features interpreted as contourite drifts has been recently depicted along the continental margin west of Spitsbergen, just south of the Fram Strait where significant water mass exchanges impact the Arctic climate. The internal geometry and morphologic characteristics of the two drifts were studied on the base of multichannel seismic reflection data, sub-bottom profiles and bathymetry. The two drifts, that we named Isfjorden and Bellsund, are located on the continental middle slope between 1200 and 1800 m depth, whereas the upper slope is characterized by reduced- or non-deposition. The more prominent Isfjorden Drift is about 25 km wide and 45 km long, and over 200 ms TWT thick. We revise the 13 years-long time series of velocity, temperature, and salinity obtained from a mooring array across the Fram Strait. Two distinct current cores are visible in the long-term average: i) The shallower current core, corresponding to the West Spitsbergen Current, has an average northward velocity of about 20 cm/s, while the deeper bottom current core corresponding to the Norwegian Sea Deep Water (NSDW) at about 1450 m depth, has a northward average velocity of about 9 cm/s. Brine-enriched shelf waters, produced during winter through persistent freezing and brine release in the polynyas of the Storfjorden, are supposed to contribute with sediments input to the northward flowing NSDW being, therefore, responsible for the accumulation of the contourites. The onset of the drift growth west of Spitsbergen is inferred to be about 1.3 Ma and related to the Early Pleistocene glacial expansion recorded in the area.

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4. Late and postglacial fluctuations of the oceanographic conditions in the southern margin of the Svalbard Archipelago (Arctic Ocean)

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Piston core SV-04 recovered from the middle slope of the western Svalbard continental margin during the BIO Hespérides SVAIS cruise (Summer 2007) was analyzed for its sedimentological, paleontological, and biomarker content in order to reconstruct the changes in the oceanographic conditions occurred during last glacial-interglacial period. The high-resolution age model based on 8 radiocarbon dating and rock magnetic parameters indicate sediment record spanning last 25,000 years. Microfossil abundances show marked shifts along the record that were associated to different climate/environmental conditions. Low concentrations of coccoliths, diatoms, planktic foraminifers and cysts of organic-walled dinoflagellates (dinocysts), characterize the lower part of the sequence (Late Pleistocene, IRD-rich, coarse-grained sediments), and increase up the sequence (Holocene, fine-grained, bioturbated sediments). Transfer functions based on dinocyst assemblages were used to quantitatively reconstruct the sea-surface conditions of the studied area, including salinity, temperature of warmest and coldest months and the seasonal extent of sea-ice cover (expressed in number of months per year with >50% sea-ice coverage). The biomarker profiles trace the final retreat of the Barents ice sheet at the end of the deglaciation period and a transition from an early Holocene hypsithermal to a neoglaciation in the late Holocene, as observed in other paleoarchives from this region. All these tools have proved to be very useful in explaining the main climatic features at North-Eastern Atlantic latitudes, which were closely linked to the Barents ice sheet history during the last deglaciation and the Holocene.

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5. Extreme episodic glacimarine deposition during last deglaciation of the NW Barents Sea

*SVAIS and EGLACOM scientific party * (OGS, Italy; University of Barcelona, Group of Geosciences Marines, Spain; ICREA, Spain; University of Salamanca, Department of Geology, Spain; University of León, Faculty of Biological and Environmental Sciences, Spain; INGV, Italy; ICM- CSIC Barcelona, Spain; University of Trieste, Department of Mathematic and Geosciences, Italy; Geological Survey of Denmark and Greenland, Department of Stratigraphy, Denmark; University of Siena, Department of Earth Sciences, Italy; University of Parma, Department of Earth Sciences, Italy)*

The depositional history of the Storfjorden and Kveithola trough-mouth fans in the north-western Barents Sea has been investigated within two coordinated Spanish and Italian projects in the framework of International Polar Year activity 367, NICE STREAMS. The investigation has been conducted using a multidisciplinary approach to the study of sediment core with cores positioned on high-resolution multi-beam bathymetry and TOPAS/CHIRP sub-bottom profiles. Core correlation and age model were based on 23 AMS 14C dating, rock magnetic parameters, lithofacies sequences, and the presence of marker beds including two oxidized layers. Sediment facies analyses allowed the distinction of a number of depositional processes whose onset appears closely related to ice stream dynamics and oceanographic patterns in response to climate change. Low water content, high density and shear strength glacigenic diamicton deposited during glacial maxima, indicates ice streams grounded at the shelf edge. The massive release of IRD occurred at the inception of deglaciation, indicates ice streams lift off and disruption, while a several m-thick sequence of high water content, low shear strength, interlaminated sediments deposited by subglacial outbursts of turbid meltwaters, indicating fast ice streams melting and retreat (plumites). Crudely stratify and heavily bioturbated sediments deposited under contour currents sediment traction with climatic/environmental conditions favourable to bioproductivity. The extreme sedimentation rate of 3.4 cm y⁻¹ calculated for the plumites recovered on the upper slope, indicates a massive, almost instantaneous (less than 150 y), terrigenous input corresponding to an outstanding ice-melting event that we associated to MWP-A1. Different bathymetric and oceanographic conditions forcing the local mode of glacial retreat, determined a different thickness of plumites along and across the slope that had a strong impact on the slope stability and onset/development of the biological productivity after LGM.

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6. Contribution to the knowledge of the Recent non-marine ostracods (Crustacea: Ostracoda) from the central Mediterranean area (Sicily, circum-Sicilian islands, and Malta)

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In the frame of a wider survey aimed at investigating the inland water crustaceans of the central Mediterranean area, we studied the non-marine ostracod fauna of mainland Sicily, its surrounding archipelagoes and the Maltese islands. Altogether, 157 ostracod samples were collected from an equal number of sites sampled between 2006 and 2013. Novel distribution data have then been added to those reported by Pieri et al. (2006) leading to a total of 224 studied sites. In the frame of this survey, collecting sites were selected in order to encompass the most common and representative types of freshwater aquatic habitats present in the area (i.e. temporary ponds, springs, flooded meadows and streams). The occurrence of *Ilyocypris getica*, a species new to the Italian ostracod fauna and currently exclusively recorded from a single pool on Ustica island, is reported. In addition, one putative new species endemic to Sicily, *Eucypris* sp.1, is left in open nomenclature and it is currently under study. The updated checklist of the Sicilian-Maltese insular area includes 30 species and 11 taxa identified at supraspecific level, belonging to 7 families (Cyprididae, Candonidae, Cytherididae, Darwinulidae, Ilyocyprididae, Notodromadidae and Limnocytheridae). In conclusion, the obtained results show the presence of a high diversified ostracod fauna in the study area, which is possibly due to its geographical position, and provide a sound basis for further comparative faunal studies aimed at investigating the affinities and origins of the central Mediterranean inland-water ostracods.

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7. Pluriannual observations (2007-11) of particulate organic carbon at LTER Marechiara station (Tyrrhenian Sea)

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Coastal areas are sites of active biogeochemical processes, due to intense interactions between land, atmosphere, sediments and open waters. Despite their smaller area compared to the open ocean, coastal environments display much higher intensity and variability of many biogeochemical fluxes. Thus, having high-quality observations of carbon stocks and fluxes in coastal zone environments is essential both for understanding coastal ocean carbon balance and to assess their role on the continent-scale carbon budgets. This study was focused on the particulate organic carbon (POC), which is a key parameter to measure when investigating the C cycle at sea. The samples for the POC determination were collected along the water column at the LTER MareChiara Station (Gulf of Naples, Tyrrhenian Sea) from January 2007 to December 2011. The POC data have been analyzed as related to the environmental features (temperature and salinity) in order to assess the influence of physical properties on POC variability. Moreover, the carbon content was estimated using appropriate conversion factors for the heterotrophic bacterioplankton (from cell numbers, CHB) and for phytoplankton (from chlorophyll concentrations, C_{phyt}) in order to evaluate the relative contribution of heterotrophs and autotrophs to the POC. Preliminary results showed the highest POC concentrations in the surface layer (0-10 m) in April - June (up to 75 μM). However, the maximum integrated (0-60 m) POC values were generally measured in March-April, during the spring bloom, which occurred when a weak or absent thermal stratification of the water column was observed. The relative contribution of CHB was higher than C_{phyt} during oligotrophic conditions, while phytoplankton dominated during the main blooms (spring and autumn) over the whole water column.

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8. NETLAKE -NETworking LAKe observatories in Europe: un'azione COST (ES 1201) per la cooperazione a livello europeo nel campo del monitoraggio ad alta frequenza dei laghi

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Gli sviluppi recenti nel campo della tecnologia dei sensori hanno permesso di compiere notevoli progressi nello studio degli ambienti lacustri e consentono oggi un monitoraggio approfondito e ad alta frequenza dei parametri limnologici fondamentali. È ormai sempre più diffuso l'utilizzo di piattaforme per la raccolta di dati in continuo, che possono poi essere trasmessi attraverso sistemi web ed utilizzati da ricercatori, amministratori e privati cittadini. Un grande potenziale risiede nell'integrazione delle diverse realtà esistenti in Europa in questo campo. L'obiettivo generale di NETLAKE è proprio la creazione di un network di enti, ricercatori e siti di monitoraggio, allo scopo di integrare il più possibile le conoscenze esistenti e applicarle nel campo dello studio e della tutela degli ambienti lacustri. Tra i *deliverable* di NETLAKE vi sono la creazione di un meta-database di siti esistenti, un *tool-box* di protocolli standardizzati per la raccolta e l'analisi dei dati, una serie di casi di studio su argomenti di interesse applicativo e gestionale, oltre ad una serie di attività di "Citizen-Science" e la produzione e diffusione di materiale didattico e divulgativo. NETLAKE vuole infatti rappresentare una piattaforma di incontro e scambio tra ricercatori, gestori, amministratori pubblici, associazioni e cittadini interessati al monitoraggio dei laghi, con lo scopo ultimo di colmare il gap spesso esistente tra ricerca, gestione e comunità locali. NETLAKE è un'azione COST del dominio ESSEM (Earth System Science and Environmental Management). È stata lanciata nel 2012 e si concluderà nel 2016. Vi hanno aderito 23 paesi europei, inclusa l'Italia (con il Lago Maggiore e il Lago di Tovel), più 3 istituzioni non COST (Stati Uniti, Nuova Zelanda e Australia). Nel poster vengono presentati gli obiettivi generali dell'azione, e, come *case-study*, il Lago di Tovel, in Trentino Alto Adige, gestito dalla Fondazione E. Mach.

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9. Latitudinal distributions of pHT25 and calcium carbonate saturation states in the central Mediterranean Sea

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In 2008 the carbonate system properties were determined in the central Mediterranean Sea during two seasonal surveys (winter and late summer) through the Adriatic and Ionian basins. Surveys have been carried out on board of R/V Urania, within the SESAME-EU-FP6 project and the Italian national VECTOR project. The studies about CO₂ variables in the Mediterranean Sea are relatively scarce (Alvarez et al., 2012) despite the significant contribution of this basin to the storage of anthropogenic carbon (Schneider et al., 2010)]. An overview of the large scale distributions (from the North to the South) concerning either measured and derived CO₂ properties can be very informative, although limited to two seasonal snapshots. A *latitudinal* section along the Mediterranean Sea actually includes the full length of the Adriatic Sea, which hosting dense water formation sites (ADW) and being affected not by not negligible CO₂ fluxes (Cantoni et al., 2013) may represent a key region for the seawater chemistry of inorganic carbon system. The vertical distributions of water masses, described by their carbonate system properties, will be presented in several sections, and will be discussed with a particular focus on the ocean acidification process. In addition Adriatic dense waters and their occurrence at the Otranto Strait and further South into the Ionian Sea will be described. In February-March, dense waters have been formed on the North Adriatic shelf and in the Southern Adriatic during an open sea deep convection event.

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10. Benthic trophodynamics and biodiversity as influenced by ecosystem engineers: a comparison between coral forests and mounds

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Though amongst the less explored marine regions, the mesophotic zone is inhabited by several ecosystem engineers, nowadays severely threatened by climatic change and human activities. We investigated the effects of the presence of coral forests (one characterised by the gold coral *Savalia savaglia* and another one characterised by the hydroid *Lytocarpia myriophyllum*) and coral mounds on sedimentary organic matter composition and meiofaunal biodiversity in the surrounding incoherent bottoms. We show that the presence of all of these structures have significant effects on sedimentary organic matter concentrations and benthic biodiversity, but also that these effects are not spatially consistent in the different coral forests or mounds. While the presence of *S. savaglia* and of coral mounds exerts an increased availability of organic substrates, the sediments just below the forests dominated by *L. myriophyllum* are characterised by a higher variability in the food availability of sedimentary organic matter. Overall, meiofaunal taxa and nematode species richness decreased from below to outside the coral forests and mounds, suggesting that these habitats have a prominent role in controlling the levels of benthic 'alfa' (point) biodiversity at different levels of taxonomic organization. The presence of both coral forests and mounds is also associated with an enhanced turnover diversity between coral colonized sediments and neighbouring incoherent bottoms. This result indicates that these habitats, as previously observed for deep-water coral grounds (e.g., *Lophelia pertusa* banks), promote high levels of gamma (regional) diversity. The prominent role of these habitats in controlling biodiversity of surrounding incoherent bottoms claims for an increased effort to identify adequate measures for their conservation.

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11. Assessing temporal dynamics of phytoplankton biomass in two different coastal areas: the Gulf of Trieste (North Adriatic) and the Bay of Sozopol (Western Black Sea), for the definition of good ecosystem status (GES)

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Phytoplankton biomass (in terms of chlorophyll a), together with phytoplankton bloom intensity and frequency, is among the mandatory variables used to evaluate ecological status according to the European Policies (Water Framework Directive 2000/60, Marine Strategy Framework Directive, 2008 2008/56/EC). It is also one of the fundamental metrics in defining and classifying the trophic conditions of surface waters (Spatharis and Tsirtsis, 2010; Ferreira et al., 2011). The assessment of the reference conditions is a prerequisite to evaluate the target for Good Environmental Status and requires availability of long time series of data. Therefore, long-term ecological research (LTER) sites provide valuable information to identify the typical dynamic of an ecosystem and its intrinsic and site-related variability. The object of this research is to assess the temporal dynamics of phytoplankton biomass, by decomposing the inter-annual, seasonal and “residual” components, in two contrasting coastal areas. The LTER station in the Gulf of Trieste, North Adriatic Sea has been compared with the time – series station in Sozopol Bay, Western Black Sea, which represent sites of opposite trophic regimes and contrasting energetic environments. The North Adriatic Sea is experiencing an overall oligotrophication, with a general decrease in phytoplankton boom frequency and intensity, and it is a highly dynamic system due to strong wind mixing. The Black Sea is one of the most isolated European seas characterized by strong vertical stratification, extensive drainage basin and great number of inflowing rivers, which make this sea particularly sensitive to anthropogenic impacts and leading to shifts in the annual dynamics of phytoplankton biomass.

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12. Benthic trophic web in a severely contamination site of the Grado-Marano Lagoonal system

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Sediment samples were collected within the dock of the Caffaro factory (Grado and Marano Lagoon, North Adriatic Sea) to assess how benthic communities respond to chemical contamination in a lagoonal system. Three sites (St. Ca1, Ca2 and Ca3), characterized by different depths and hydrodynamism, were sampled in March 2012. The structure of benthic communities (prokaryotes, primary producers, meiofauna, macrofauna) together with other chemical parameters (total nitrogen, TN; total organic C, TOC; biopolymeric C, BPC) were analysed. Three different situations were highlighted. At St. Ca1 sediments were enriched in TOC but contained a low BPC fraction. The microalgal community, mostly composed of diatoms with a small percentage of Chlorophyceae and Cyanobacteria, reached a valuable biodiversity. In contrast, the abundant macrobenthic community was exclusively composed of polychaetes. The deepest St. Ca2 was an accumulation site of freshly produced organic matter as suggested by the highest BPC and pheopigment contents. At this station the microalgal community was poorly structured and dominated by the epiphytic diatom *Cocconeis placentula* (44.9%). At St. Ca3 both microalgal and meiobenthic communities were abundant probably due to the low predation pressure exerted by macrobenthos. BPC content was high, consisting primarily of highly energetic macromolecules such as proteins. Despite the location inside the Caffaro dock and the homogeneous level of contamination, the sampled stations showed different trophic conditions characterized by poorly structured benthic communities.

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13. Determinazione dei parametri chemiodinamici per valutare l'accumulo degli idrocarburi policiclici aromatici (IPA) nei sedimenti profondi dell'Adriatico Settentrionale

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Le principali aree inquinate dagli IPA sono localizzate in prossimità di attività antropogeniche, di aree portuali e industriali e dello scarico di fiumi. Pertanto, per valutare la persistenza e l'accumulo degli IPA nel sedimento costiero e in mare aperto, è stata scelta come area di studio l'Adriatico settentrionale. Questo sub-bacino poco profondo del Mar Adriatico caratterizzato dalla presenza di vari fiumi che dopo aver attraversato regioni agricole e industriali con un alta densità di popolazione (pianura padana) scaricano in mare inquinanti organici quali gli IPA. Durante il percorso dalla costa verso il mare aperto, condizioni chimico-fisiche variabili influenzano la cinetica di accumulo e degradazione degli IPA. Attraverso il calcolo della costante di degradazione (K_{deg}) e del coefficiente di ripartizione (K_d) è stato possibile valutare come gli IPA, una volta raggiunto il mare, tendono ad essere più persistenti nelle zone più a largo rispetto alle aree costiere. In particolare, si è visto che l'aumento della salinità e la diminuzione di temperatura e luce vanno a modificare i valori del K_d e K_{deg} , aumentando la persistenza degli IPA nel sedimento. Inoltre, dalla costa verso il mare aperto cambia anche la granulometria del sedimento. Pertanto, i sedimenti profondi dell'Adriatico settentrionale più fini e ricchi di carbonio organico tendono ad avere una maggiore capacità di adsorbimento ($K_d > 20$) rispetto a quelli più grossolani ($K_d < 20$). Gli idrocarburi, raggiunto il mare, si associano alle particelle organiche in sospensione e vengono trasportati dalle correnti nei sedimenti profondi più argillosi. Qui gli IPA si accumulano diventando meno biodisponibili. La biodisponibilità degli IPA in queste aree più profonde dell'Adriatico Settentrionale è limitata anche dalle condizioni oceanografiche: bassa temperatura, scarsità della luce e maggiore salinità, che provocano un maggiore accumulo di IPA nei sedimenti profondi dell'Adriatico Settentrionale.

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14. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ of the particulate organic matter during summer period in two different years as tool for evaluation of anthropic input in Venice lagoon

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The particulate organic matter (POM) was characterised in water samples from Venice lagoon by analysing stable carbon and nitrogen isotope ratios ($\delta^{13}\text{C}$ and $\delta^{15}\text{N}$) and C/N, in order to use them as "signatures" to identify and quantify anthropogenic sources. Data were collected during summer season (August 2011 and 2012) in low regime river flow at 30 stations defined by the application of the Water Frame Directive (Directive 2000/60/EC) in the water bodies of the Venice lagoon. The mean values of $\delta^{13}\text{C}$, $\delta^{15}\text{N}$ and C/N in the whole basin were respectively -22.89 ± 1.12 ‰, 9.07 ± 2.99 ‰ and 6.07 ± 2.41 in 2011 survey, whereas -22.15 ± 1.01 ‰, 7.63 ± 2.36 ‰, 4.27 ± 0.63 in 2012. $\delta^{13}\text{C}$ values generally indicated mixed sources (autochthonous and allochthonous) of POM with no significant differences between the two years. On the contrary $\delta^{15}\text{N}$ of POM differed between the two summer seasons, with slightly lower values in 2012. This can be probably related to the major influence of marine water entering in the Venice lagoon as suggested by the higher salinity values. Furthermore the low C/N ratios indicated the possible influence of urban discharges enriched in bacterial biomass (high N content) suggesting the next future incoming of degradative processes. By combining isotopic values and C/N ratios of lagoon POM using a mixing model source approach (ISOSOURCE), it was evidenced that a high contribution of marine and anthropogenic organic matter (treated and untreated urban sewage) seemed to generally feature Venice lagoon POM in summer season. This preliminary study suggested the possibility of using the isotopic carbon and nitrogen signatures to identify and quantify the contribution of different sources of POM in transitional environments, in the summer period when dystrophic events can likely occur.

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15. Lake Garda: diatom-based reconstruction of past lake ecological evolution

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Within the “Central European EuLakes project” (European Lakes Under Environmental Stressors, Supporting lake governance to mitigate the impact of climate change, Nr. 2CE243P3) lake’s sediments from Lake Garda have been investigated in order to reconstruct lake evolution at secular scale and to determine the lake reference conditions before higher human impact. In fact, the deepest basin (350 m) of the lake is less impacted by human activities and it is thus suitable for reconstruction of long-term environmental variability, including climate change and its effects on lake ecology. On the other side, the shallowest basin (81 m) is strongly affected by tourism and intensive agriculture, and thus it is more suitable for studies on lake eutrophication. The main aim of this contribution is to evaluate the vulnerability of Lake Garda, the largest Italian lake, respect to specific human stressors (e.g. nutrients, hydroelectrical exploitation) in a climate change scenario and through a palaeolimnological approach. It focuses on changes in sub-fossil diatom assemblages in two short sediment cores collected from the deepest point of the two basins and on diatom-based reconstruction of lake trophic status. The core collected at 350 m presents two discontinuities. The deepest one dates in the mid 1940s and shows a decrease in benthic taxa, which might be related with the intensive hydroelectrical exploitation of the catchment area. The second discontinuity is in early 1960s and coincides with an increase in Fragilariaceae respect to centric taxa, which is the result of nutrient enrichment and climate change. The core from the shallower basin does not show discontinuities, though the diatom assemblages show a decrease in both mesotraphentic Fragilariaceae and *Cyclotella* spp. since the middle 1960s. A preliminary diatom-based reconstruction of lake TP concentration over the last 200 years confirm the trends showed by limnological data collected during the last few decades.

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16. Diversità e attività antibatterica delle comunità batteriche associate a due pennatulidi mediterranei : *Pennatula phosphorea* E *Pteroeides spinosum* (Anthozoa: octocorallia)

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Scopo principale di questo lavoro è stato studiare le comunità batteriche associate a due specie di pennatulidi mediterranei *Pennatula phosphorea* e *Pteroeides spinosum*. Gli organismi ed i campioni ambientali sono stati prelevati all'interno della Rada di Taormina (Mar Ionio Centrale) ad una profondità di circa 33 metri. Le comunità batteriche associate agli organismi (tessuti e muco) e agli ambienti circostanti (sedimenti ed acqua) sono stati confrontati, in primo luogo tramite una tecnica molecolare di fingerprinting, e la diversità delle comunità associate alle pennatule è stata analizzata mediante sequenziamento del 16S rRNA di cloni batterici. Inoltre, gli isolati batterici associati al muco ed ai tessuti sono stati sottoposti a screening per rilevare eventuale attività antibatterica contro organismi indicatori.

L'analisi ARISA ha mostrato una marcata differenza tra i coralli (tessuti e muco) e l'ambiente circostante (sedimenti e acqua) suggerendo una compartimentazione tra le comunità microbiche associate. Inoltre, dai risultati conseguiti è emerso come *P. phosphorea* e *P. spinosum* presentino comunità batteriche associate distinte, ad indicare la presenza di batteri associati specie-specifici. Solo pochi filotipi sono risultati condivisi tra il muco ed i tessuti dello stesso organismo, il che suggerisce una sorta di partizionamento dei microhabitat tra le comunità microbiche associate. La predominanza di *Alfaproteobatteri* è stata osservata per le comunità associate sia ai tessuti che al muco di *P. phosphorea* (rispettivamente 84 e 58,2% delle sequenze totali). Al contrario in *P. spinosum* la comunità batterica nello strato di muco è risultata dominata da *Alfaproteobatteri* (74,2%), mentre quella dei tessuti è risultata dominata da *Gammaproteobatteri* e *Mollicutes* (40,6 e 35,4%, rispettivamente).

L'attività antibatterica di 78 isolati batterici è stato analizzata contro organismi indicatori di inquinamento. Gli isolati attivi (15,4%) principalmente provenienti dal muco dei pennatulidi sono risultati prevalentemente affiliati a *Vibrio* spp..

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17. Distribuzione spazio-temporale della comunità batterica nel lago salmastro meromittico di Faro (Messina, Italia)

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Il Lago di Faro (Messina, Italia) è un bacino meromittico salmastro costiero caratterizzato da una stratificazione permanente e da uno strato di acqua rossa, costituito da batteri fotosintetici anossigenici, che separa le acque ossigenate del mixolimnio da quelle del monimolimnio contenenti H₂S. Tale peculiare ambiente costiero, come dimostrato anche in recenti lavori, risulta estremamente interessante come sito modello per lo studio dei processi legati ai maggiori cicli biogeochimici. Nel presente lavoro viene studiata la distribuzione verticale della componente batterica in relazione con le forzanti ambientali nell'arco temporale di un anno (Gennaio - Dicembre 2010).

I campioni sono stati raccolti mensilmente lungo la colonna d'acqua di una stazione situata al centro del lago (profondità massima ~ 30 m), dividendo la colonna in strato ossigenato (mixolimnio), di transizione (chemoclino) e anossico (monimolimnio). Lo studio della struttura spazio-temporale delle comunità microbiche in relazione alle variabili ambientali ed alle condizioni di mescolamento è stato effettuato usando la tecnica di fingerprinting ARISA (*Amplified Ribosomal Intergenic Spacer Analysis*) e la tecnica CARD-FISH (*Catalyzed Reporter Deposition - Fluorescence In Situ Hybridization*). Le analisi della comunità batterica hanno mostrato come la distribuzione verticale delle comunità sia strettamente regolata dalla localizzazione dello strato anossico. Infatti, durante l'inverno del 2010 alcuni subphyla, quali i *Deltaproteobatteri* e gli *Epsilonproteobatteri*, non sono stati riscontrati a causa dell'assenza dello strato anossico, presente invece negli altri mesi esaminati. Gli *Epsilonproteobatteri*, insieme ai *Gammaproteobatteri* e ai *Bacteroidetes*, invece, hanno costituito la frazione più abbondante nei mesi primaverili ed estivi. L'analisi statistica applicata ai dati ARISA ha mostrato come la struttura delle comunità differisse tra le diverse stagioni ed i differenti strati (mixolimnio, chemoclino e monimolimnio), indicando come il potenziale redox e la concentrazione di NH₄⁺ siano le forzanti che regolano la strutturazione delle comunità batteriche del Lago di Faro.

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18. An alternative procedure for the biomonitoring of the effects of wastewater treatment plants discharges on the ecosystem using freshwater Ostracoda (Crustacea): a case study from Ledra river basin (NE Italy)

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This study examines the potential of analyzing ostracod communities to detect changes in water quality in lotic waters. We linked community structure of recent freshwater ostracods (Crustacea: Ostracoda) with physical, chemical and microbiological parameters at stations located before and after the discharge of wastewater treatment plants in a river basin. In particular, this research aims to present preliminary results on heavy metals impact on the abundance species richness, and species composition of ostracod communities. The study area covers all the Ledra River basin (21 km long), localized in Friuli Venezia Giulia (NE Italy). This basin includes a variety of habitat typologies as lowland springs, channels and streams, characterised by different levels of anthropogenic impact. In the study area 27 sampling stations were selected and sampled twice, on September 2008 and March 2009. A total of 22 ostracod taxa were identified from both disturbed and undisturbed locations. The possible association of individual ostracod taxa and the community composition with environmental gradients was examined using Canonical Correspondence Analysis. Wastewater treatment plant discharges to the aquatic environment proved to have a negative effect on the ostracod diversity, species composition and abundance. The results show that monitoring ostracods is a valuable approach for biomonitoring, for two reasons: (i) communities appeared to be well differentiated even at small geographical scale, indicating that they can provide sufficient resolution to pick up even minor impacts, and (ii) despite the seasonal succession in species composition, spatial differentiation was consistent over time, suggesting that ostracods provide a time-integrated picture of the water quality of investigated sites. Conversely, discharges did not affect the physical or chemical environment based on the repeated snapshot samplings. These results suggest that the monitoring of ostracods provides an integrated picture of the water quality of a lotic system, even on a local scale.

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19. Seasonal and inter-annual variability of the sea ice formation in Terra Nova Bay polynya (Antarctica) - Preliminary modelling results

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Terra Nova Bay polynya (Ross Sea - Antarctica) is an important site of sea ice production and is believed to be a contributor to the formation of High Salinity Shelf Water (HSSW). Part of the HSSW is known to move northward along the western sector of the Ross Sea and takes part in the formation of Antarctic Bottom Water that plays a major role in the global meridional overturning circulation affecting the global climate system. The present work aims to simulate the seasonal and inter-annual variability of the sea ice concentration and thickness in the polynya area. For this purpose a coupled ocean-sea ice model has been employed to simulate the seasonal cycle of sea ice formation in, and export off, the polynya. The model resolves the sea ice dynamics using an elastic-viscous-plastic rheology to simulate the ice-ice interactions within the ice pack. The sea ice thermodynamics estimates sea ice growth/decay computing the heat fluxes at the different exchange interfaces. The oceanic circulation is described by one reduced gravity layer model, in which the active layer (mixed layer) moves above a lower stagnant layer of infinite depth. The domain resolution is of 1 km, which is sufficient to represent the salient features of the coastline geometry, notably the Drygalski Ice Tongue. The model is forced by a combination of ECMWF reanalysis and in-situ data from automatic weather station, and also by in situ oceanic data. The modelled sea ice production proves to be very sensitive to the atmospheric and oceanic forcing as well as to the parameterization of the surface heat fluxes, especially turbulent heat ones. Hence, the availability and the resolution of the forcing represent a crucial factor to obtain realistic simulations of the polynya evolution and its extent and the net ice production within the polynya.

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20. Variabilità di mesoscala della dinamica costiera del Tirreno sud-orientale

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Il Tirreno sud-orientale, per le sue caratteristiche geografiche e topografiche, rappresenta una zona unica dal punto di vista dinamico. La circolazione generale è legata alla presenza di tre principali masse d'acqua ed alla formazione di strutture di mesoscala sovrainposte alla circolazione generale a scala di bacino, oltre che fenomeni di più breve periodo. L'analisi dei dati raccolti da profilatori correntometrici ancorati tra la Sicilia e la Campania nel periodo Febbraio-Settembre 2008, evidenzia un generale comportamento barotropico delle correnti lungo la costa. In particolare, durante specifiche condizioni atmosferiche, è stata evidenziata la presenza di una corrente superficiale relativamente energetica a nord dello Stretto di Messina. L'evidenza di questo tipo di struttura è stata valutata anche utilizzando i dati di Mean Sea level Anomaly (MSLA) forniti dall'AVISO (Archiving, Validation and Interpretation of Satellite Oceanographic Data). Le mappe altimetriche dell'area di studio e la serie temporale di MSLA mostrano una intensa depressione della superficie del mare che si sviluppa contemporaneamente alla corrente costiera osservata a partire dalla sella dello Stretto di Messina, per poi espandersi verso l'interno del Mar Tirreno meridionale. Al fine di individuare i principali periodi di variabilità delle correnti è stata utilizzata l'analisi wavelet che risulta particolarmente adatta ai segnali di natura geofisica con caratteristiche non stazionarie. Questa tecnica è stata applicata nella nostra zona d'indagine alle serie temporali delle correnti residue, quindi private delle componenti astronomiche della marea. I risultati preliminari hanno evidenziato, nell'area in prossimità dello Stretto di Messina, la presenza di frequenti oscillazioni inerziali e sub-inerziali del campo dinamico, con periodi tra 3 e 20 ore. Tali periodi sono tipici del disaccoppiamento tra la marea nello Ionio e nel Tirreno, nonché di fenomeni di formazione di “bores” e di conseguenti oscillazioni del campo di massa a causa di onde interne.

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21. Distribuzione delle alghe potenzialmente tossiche nelle aree di mitilicoltura della Sardegna

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In Sardegna la molluschicoltura è un'attività ampiamente diffusa nelle aree lagunari e marino-costiere, che focalizza l'attenzione di interessi sia economici che sociali. La gestione degli ambienti interessati da parte delle comunità locali e delle imprese è strettamente dipendente dalla qualità delle acque, garantita da un costante monitoraggio, previsto dalla normativa comunitaria (Reg. CE n. 853/2004), che comprende anche la ricerca delle alghe potenzialmente pericolose. In questo lavoro vengono riportati i risultati dei controlli effettuati su campioni provenienti da diverse aree di mitilicoltura dal 1992 ad oggi, allo scopo di mappare la distribuzione delle alghe fitoplanctoniche potenzialmente tossiche e, per i siti in cui è possibile, anche la loro dinamica pluriennale. In particolare, maggiore attenzione viene prestata al Golfo di Olbia, una delle stazioni della rete italiana di ricerche ecologiche a lungo termine (LTER-Italia). Lo studio ha messo in evidenza che, con il passare degli anni e con l'aumentare delle aree controllate, quindi con l'aumento complessivo delle osservazioni, la lista delle specie potenzialmente tossiche si è notevolmente allungata. Di questa fanno parte specie appartenenti ai generi *Alexandrium*, *Prorocentrum*, *Dinophysis* e *Pseudo-nitzschia*. Nonostante il genere *Dinophysis* sia stato quello più diffuso e frequentemente riportato, gli eventi di positività nei mitili alle loro tossine sono stati limitati e poco frequenti. Le fioriture più problematiche sono state causate invece da specie del genere *Alexandrium*. Inoltre, negli anni più recenti, i contemporanei controlli sull'accumulo delle tossine nei mitili, hanno evidenziato la necessità di approfondimenti tassonomici sulle specie di *Pseudo-nitzschia* presenti nelle aree di mitilicoltura della Sardegna. Nel corso del 2011, infatti, nell'ambito degli accertamenti biotossicologici previsti dal Piano regionale di sorveglianza e controllo sanitario sui molluschi bivalvi di produzione regionale, è stata riscontrata la presenza di acido domoico, responsabile dell'Amnesic Shellfish Poisoning, in 18 campioni provenienti da allevamenti situati nella Laguna di Santa Gilla (Cagliari).

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22. Distribution of *Engraulis encrasicolus* eggs in the western Adriatic Sea

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Eggs distribution may be considered a proxy for adult anchovy immediate distribution and more directly, for anchovy spawning area identification. During the small pelagic acoustic survey carried out in September 2011, eggs of *Engraulis encrasicolus* were sampled in 52 stations distributed on the western part of the Adriatic Sea, from the Gulf of Trieste to the Gargano promontory. Sampling was performed by vertical hauls using two different nets: a Hansen net (330 μm mesh) in all the stations and a WP2 net (200 μm mesh) only in 35 stations. Hauls were made from bottom to surface, considering a maximal sampling depth of 100 m. At each station CTD casts were carried out: temperature and salinity, considered as average in the water column sampled by the plankton nets, ranged from 17.17 to 26.99 $^{\circ}\text{C}$ and 34.52 to 38.63 respectively. A total of 801 anchovy eggs were sorted and expressed as abundance (n/m^2). Although September typically represents the final period of anchovies reproduction in the Adriatic Sea, eggs were found in 42 stations (only 10 stations were negative). Anchovy egg abundance ranged from 0 to 477.75 egg/m^2 , with maximal value recorded close to the Po delta. A comparison of the efficiency of Hansen and WP2 net in catching anchovy eggs revealed no significant difference between the egg abundance obtained with the two nets. This study was supported by the projects MEDIAS and RITMARE.

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23 Systems biology in the study of xenobiotic effects on marine organisms for evaluation of environmental health status: biotechnological applications for potential recovery strategies

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Problems on monitoring and remediation of the contaminated sites have become one of the focus of the national strategies for territory management, not only for the environmental and health consequences, but also for the strong social and economic impacts of deindustrialization of large productive areas. This problem interested in particularly those areas subjected to intensive industrialization along the coastline. The aim of this work is to provide a detailed picture of marine ecosystems subjected to high anthropogenic impact. The project will be articulated into seven steps within two main phases: the first is proposed to studying the effects of toxic contaminants, such as heavy metals and hydrocarbons, on sentinel organisms representing different stages of the evolutionary scale (with particular reference to mussels); the second phase will involve the exposure of the same sentinel species used in first phases to mixtures of hydrocarbons and heavy metals. In the second phase, besides, will be also prepared series of experiments in mesocosms for the development and implementation of various technologies such as environmental remediation bioremediation, the application of a system with micro and nano bubbles and zero valent iron nanoparticles (Ferrogel) for the decontamination of water and marine sediments of hydrocarbons and heavy metals. Each phase will be developed through the collaboration in synergy among the 8 research units involved in the project. The research project will lead to a understanding of the induced or modified biological processes in the aquatic species subjected to various types of contamination, and to identify effective solutions for controlling and reduction of marine pollution through application of biotechnologies. The aims proposed by the 8 operative units of the research

project fit with the objectives of Horizon 2020. This aspect confers a multidisciplinary to the research project, which is proposed with an innovative approach in an international scenario.

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24. Nuova valutazione della compatibilità ambientale di materiali, manufatti ed altri prodotti immersi in ambiente marino NU.VA.CO. (S.h.a.r.m. Supporting Human Assets in research and Mobility)

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Con il progetto NU.VA.CO. si è proposto di mettere a punto un metodo sperimentale per valutare la compatibilità ambientale di materiali, manufatti ed altri prodotti immersi in mare. Attualmente i materiali utilizzati in questi contesti vengono testati prevalentemente per l'attività anti-fouling. Eventuali test sull'eco-compatibilità vengono eseguiti mediante saggi ecotossicologici utilizzando singoli organismi target. L'obiettivo di questo studio è stato quello di utilizzare un approccio "ecologico" di forte connotazione innovativa, per testare il grado di tossicità di prodotti provenienti dai settori operanti in ambito marino su popolamenti naturali di procarioti appartenenti alle classi dimensionali del picoplancton (0,2 - 2 μm), mediatori d'importanza centrale nei processi biogeochimici nell'oceano e costituenti il maggior serbatoio di biomassa e biodiversità del pianeta. Il protocollo delineato, che consente di valutare l'eco-compatibilità basandosi sul grado di perturbazione nel tempo indotto sulle comunità microbiche marine da esposizione a matrici artificiali in condizioni controllate, si dimostra in grado di rilevare la tossicità di antivegetativi "biocidi" presenti sul mercato e la maggior eco-compatibilità di prototipi, dichiarati "a basso impatto ambientale". Tra le comunità biologiche naturali impiegate nel test risulta che la frazione eterotrofa interpreta al meglio l'alterazione ambientale. La sperimentazione sul prototipo di antivegetativo non biocida svolta in stagioni diverse (estate-inverno) ha evidenziato risultati comparabili in condizioni standard di temperatura, irradianza e fotoperiodo. In entrambi i periodi indagati, la vernice anti-fouling induce un'alterazione della comunità batterica rilevabile nel breve periodo (48-72 ore). Il protocollo risulta riproducibile e attendibile nell'evidenziare anche i minimi impatti ambientali in atto; una valutazione di questo tipo, rispetto alle metodologie classiche, è di fondamentale importanza al fine di intervenire prontamente, nelle aree marine soggette a possibile rischio ambientale, evitando in tal modo che effetti potenzialmente dannosi agli organismi presenti alla base della rete trofica marina si ripercuotano nel tempo a livello ecosistemico.

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25. Size-fractionation of microbial enzymatic activities in some Sicilian lakes: a seasonal study

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A seasonal study (autumn 2008 and spring 2009) was performed in some Sicilian lakes (Ganzirri, Faro, Marinello, Mergolo, Verde and Porto) to investigate the contribution of bacterial, phytoplanktonic and dissolved fractions of leucine aminopeptidase (LAP), beta-glucosidase (B-GLU) and alkaline phosphatase (AP) to the decomposition of proteins, polysaccharides and organic phosphates, respectively. Enzymatic activity rates were measured on surface waters, after filtration through 3 and 0.45 μm pore-size membranes, using fluorogenic substrates, together with temperature, salinity, dissolved oxygen, nutrients, chlorophyll-*a*, total suspended matter, particulate organic carbon, particulate nitrogen, total prokaryotic abundance. During autumn, in most of the lakes, LAP was associated to microorganisms in the 3-0.45 μm cell size (i.e. bacteria). Only in Faro, the >3 μm fraction (i.e. phytoplankton) contributed to 57 % of the total LAP. In Porto and Ganzirri the dissolved (<0.45 μm) fraction was also abundant (63 and 44% of the total, respectively). Also during spring, the bacterial component was the most active, particularly in Faro. The C/N ratios from particulate carbon and nitrogen confirmed in Marinello, Mergolo and Verde the highest contribution of the bacterial biomass within the organic matter pool. During spring, total suspended matter explained 74% of the variance in phytoplankton-associated LAP. B-GLU occurred mostly in the dissolved fraction during autumn, while, in the successive season, it was associated to phytoplankton and bacteria. Temperature explained 90% of variance in phytoplankton-associated B-GLU during spring. During autumn, AP was mostly associated to bacteria in Verde, Mergolo and Porto (72, 97 and 48% of the total AP, respectively), while in Marinello the dissolved fraction accounted for 90% of the total. During spring, the dissolved fraction was still the most active in Marinello, Mergolo and Porto; phytoplankton contributed to 75% of the total AP in Ganzirri. During both seasons, chlorophyll-*a* and particulate organic carbon both explained over 90% of variance in phytoplankton and bacterial-associated AP.

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26. Secular ecological evolution of Lake Ledro (Trentino) as outlined by paleolimnological studies

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Lake Ledro ($z_{\max}=48$ m) is an hardwater, mid-altitude (650 m a.s.l.) lake located in SW Trentino (Eastern Italian Alps). It has been modified for hydroelectric exploitation since the late 1920s and at present represents a relevant socio-economic resource for the region in relation to recreation and summer tourism. The lake underwent anthropogenic eutrophication from the 1970s to the 1980s, which has been followed by water quality improvement over the past two decades, after the sewage treatment of municipal wastewater. Despite the present lake mesotrophic conditions, cyanobacteria contribution recently increased, culminating in a very intense bloom of *Planktothrix rubescens* in autumn-spring 2009/2010. The Autonomous Province of Trento promoted a multidisciplinary research project aimed at understanding the environmental and biotic factors driving the development of *P. rubescens* populations in Lake Ledro. Within the project, a complementary paleoecological investigation was conducted in order to reconstruct the lake secular trophic evolution (thus identifying its reference conditions) and the variations of *P. rubescens* in relation to climatic variability, human impact and lake basin management. Several short sediment cores were retrieved from the deepest point of the lake in winter 2011. The master core (83 cm long) was dated based on Pb and Cs radioisotopes, and subsamples were analysed for basic geo-chemical proxies (i.e. wet density, and water/organic content). Biological proxies included sub-fossil algal and cyanobacteria pigments and diatom remains. A parallel sediment core (78 cm long) was opened longitudinally in order to analyse the varved structure of the sediment and to identify the records of major hydrological related events occurred during the last few centuries. The present contribution reports the preliminary results obtained during the study of the sediment cores. The results are discussed comparing the secular trends with the data recently recorded during the limnological surveys.

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27. I laghi di montagna come indicatori dei cambiamenti globali: le ricerche nei siti della rete LTER-Italia

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Il sito "laghi di montagna" (IT_009-000-A) fa parte della rete italiana per le ricerche ecologiche a lungo termine (LTER). Comprende due siti nell'Appennino Settentrionale (Lago Santo Parmense e Lago Scuro Parmense), due nelle Alpi Centrali (Laghi Paione Inferiore e Superiore), uno nelle Dolomiti del Brenta (Lago di Tovel), e tre nella Provincia di Bolzano (Lago di Anterselva, Lago di Braies, Lago Piccolo di Monticolo). I siti sono rappresentativi di diverse tipologie di ambienti lacustri montani disposti lungo un ampio gradiente altitudinale (da quote collinari fino oltre il limite della vegetazione arborea) e differenti per origine, geologia dei bacini, morfologia delle cuvette lacustri, stato trofico delle acque, caratteristiche ed intensità degli impatti antropici. Le tematiche di ricerca a lungo termine comuni a tutti questi ambienti riguardano soprattutto lo studio del chimismo delle acque e dei popolamenti planctonici. I laghi di montagna sono apparentemente poco interessati dall'impatto antropico diretto, per via della loro collocazione in aree remote o poco antropizzate. In realtà sono ecosistemi vulnerabili agli effetti di numerose pressioni, quali la rideposizione di inquinanti atmosferici, l'introduzione di specie aliene ed i cambiamenti climatici. Questi ultimi sono particolarmente importanti per le aree di montagna, dove il riscaldamento climatico è risultato (e si prevede) essere più accentuato rispetto alle basse quote. I fattori climatici possono influenzare gli aspetti idrologici, la criosfera (ghiacciai e permafrost), i cicli biogeochimici degli elementi, con effetti sia a breve che a lungo termine sugli ecosistemi acquatici nel loro complesso. Nei siti della rete LTER sono in corso ricerche volte a evidenziare gli effetti di tali pressioni sulle caratteristiche qualitative delle acque e sui popolamenti platonici e bentonici. Nel poster sono presentati alcuni *case-studies* che dimostrano l'importanza della ricerca a lungo termine su questi ambienti, ottimi indicatori dei cambiamenti globali.

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28. Five years of ocean acidification studies at PALOMA station, Gulf of Trieste

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The Gulf of Trieste (GoT) is a shallow bay (< 25 m) lying in the northernmost part of the Adriatic Sea, connected to it at the SW side. Meteorological conditions exhibit a pronounced seasonal cycle, determining wide variations in the physical properties (seawater temperature and salinity) and affecting the water column stratification through the year. Thermal stratification occurs from spring to autumn and is enhanced by several factors, as the relatively high sea surface temperature (SST) in summer, freshwater advection, and the Isonzo river loads. In winter the water column is mostly homogeneous, due to the severe surface cooling and to the frequent mixing induced by intense NE Bora wind events. In January 2008 the monitoring activity here described has been started at the dynamic pylon PALOMA – Advanced Oceanic Laboratory Platform site, managed by CNR-ISMAR. The pylon, equipped with a meteorological station, is located in the centre of the Gulf. The study is based on real-time meteorological data, on monthly measurements of pH_T , total alkalinity and the main physical chemical parameters (nutrients, dissolved organic carbon, dissolved oxygen). In the last period, time series have been enhanced with measurements of dissolved inorganic carbon (DIC) and phytoplankton species composition. In addition, the collection has been implemented with continuous measurements of seawater pCO_2 , temperature and salinity at 3 m below the surface. Analysis of the data collected in the first two years pointed out the intense seasonal and vertical variability of inorganic carbon chemistry and of water column biogeochemical properties and stressed the role of wide SST seasonal variability in controlling the annual cycle of surface pCO_2 (Cantoni et al. 2012). In this work we present the complete set of five years results, highlighting main findings and the effect of Bora wind events on the air-sea CO_2 exchange and acidification.

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29. La sedimentazione biosilicea nell'area a est dell'Iselin Bank (Mare di Ross, Antartide): primi risultati del progetto Rosslope

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Il progetto Rosslope (Dinamica sedimentaria passata ed attuale nel Mare di Ross: un approccio multidisciplinare allo studio della scarpata continentale, PNRA 2011-2013) ha lo scopo di investigare le relazioni tra la circolazione attuale e passata delle masse d'acqua attraverso lo studio di successioni sedimentarie tardo cenozoiche nella piattaforma esterna e scarpata continentale del Mare di Ross.

Vengono qui presentati i risultati relativi allo studio di tre carote prelevate ai margini del Hillary Canyon, a est dell'Iselin Bank, che rappresenta una delle vie di uscita di fredde acque di fondo (ISW – Ice Shelf Water) che alimentano la circolazione circum-antartica. In quest'area, la scarpata continentale è caratterizzata da gullies, profondi canyon, nicchie di distacco e depositi gravitativi. L'analisi di linee sismiche suggerisce che la dorsale situata a SE dell'Hillary canyon abbia un'origine prevalentemente deposizionale e rappresenti un enorme accumulo sedimentario, costituitosi in varie fasi. Tale accumulo, formato prevalentemente da processi gravitativi nell'area prospiciente una delle maggiori valli glaciali scavate dalla West Antarctic Ice Sheet (WAIS), è intimamente legato alle fasi di avanzata e ritiro degli ice streams sulla piattaforma.

L'analisi micropaleontologica delle successioni sedimentarie prelevate ha mostrato un'associazione dominata da diatomee, con rari silicoflagellati (*Distephanus speculum*). Le diatomee risultano per lo più frammentate e rappresentate principalmente da specie caratterizzate da un maggior grado di silicizzazione (*Stephanopyxis* spp. e *Paralia sulcata*). In totale sono stati determinati 24 generi e 44 specie di diatomee polari, con *range* stratigrafici compresi tra l'Attuale ed il Pliocene Inferiore. Dalle analisi micropaleontologiche condotte risulta assai complessa la ricostruzione di un quadro biostratigrafico, vista la presenza contemporanea, all'interno di uno stesso livello, di specie di diatomee temporalmente separate. Tali risultati concordano con i dati sismici che evidenziano la natura rimaneggiata del sedimento.

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30. The 2012 event of dense water formation in the Adriatic: carbonate system key properties

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Overflow and cascading of dense shelf waters are recognized as major processes that regulate the shelf – deep ocean exchanges, contributing to the ventilation of intermediate and deeper sea environments and also to the transfer of dissolved organic and inorganic compounds. The cold spell hitting Northern Adriatic during February 2012 produced Northern Adriatic Dense Water (NAdDW), potentially enriched of anthropogenic CO₂ because of the combined effects of low seawater temperatures (down to 4.31 °C in the Gulf of Trieste) and strong winds. The data collected during the ODW2013 survey further allowed the characterization of NAdDW veins starting the cascading event and provided the first characterization of CO₂ variables, including saturation states of calcite and aragonite, in the bottom waters on the continental slope and along the expected pathways of dense water cascading. In this study, the carbonate system properties in 2012 are discussed in relation to air-sea CO₂ fluxes occurred on the Northern Adriatic shelf and the results are compared with those of February 2008 (VECTOR winter campaign) when other dense waters were formed but under less extreme conditions.

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31. I coccolitoforidi in un sito costiero del Golfo di Trieste

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I coccolitoforidi sono microalghe nanoplanctoniche che producono uno scheletro esterno di minute placche carbonatiche. Sono presenti in tutti gli oceani, dalle zone equatoriali a quelle sub-polari, e in condizioni favorevoli possono proliferare in dense ed estese fioriture. Sono considerati tra i principali produttori primari marini, rappresentando circa il 15% della biomassa totale del fitoplancton. Inoltre, rivestono un ruolo importante nel controllo delle variazioni climatiche, giocando un ruolo fondamentale nel ciclo dello zolfo per la produzione di dimetilsolfuro e in quello del carbonio grazie ai processi di fotosintesi e calcificazione. Studi recenti sull'acidificazione degli oceani, dovuta all'aumento di anidride carbonica in atmosfera, hanno messo in evidenza un possibile impatto sulla calcificazione dei coccolitoforidi. Nell'ambito del progetto MedSea (Mediterranean Sea Acidification in a changing climate, EU-FP7, 2011-in corso), si è proposto di approfondire le conoscenze sulle associazioni a coccolitoforidi in un sito costiero del golfo di Trieste, dove esiste una serie temporale (C1-LTER, 1986-2013) di dati sul plancton. Scopi principali del lavoro sono valutare il contributo dei coccolitoforidi all'interno della comunità fitoplanctonica, anche in relazione alla serie storica disponibile per il sito, identificare la distribuzione stagionale delle diverse specie durante un anno di campionamento (agosto 2011-agosto 2012) e confrontare i risultati dell'analisi dei coccolitoforidi ottenuti attraverso diverse metodologie (microscopia ottica a contrasto di fase e a luce polarizzata e microscopia elettronica a scansione). I coccolitoforidi mostrano un'alta variabilità interannuale e un tipico andamento stagionale, con concentrazioni massime in autunno-inverno e minime in estate. Nell'intervallo analizzato, l'associazione a coccolitoforidi è dominata in autunno-inverno da *Emiliana huxleyi*, seguita da *Acanthoica quattrospina*, *Syracosphaera pulchra* e alcune specie minori (presenti solo in autunno, e.g. *Ophiaster hydroideus*, *Calciosolenia brasiliensis*, *C. murrayi*, *Michaelsarsia adriaticus*); in primavera l'associazione è dominata da olo-coccolitoforidi e subordinata *E. huxleyi*; in estate sono presenti principalmente *E. huxleyi*, *Syracosphaera* spp., *Rhabdosphaera clavigera* e olo-coccolitoforidi.

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32. Microbial community structure in the Southern Tyrrhenian Sea: distribution, composition and activity

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Taxonomic composition of bacterial assemblages, their metabolic activity and their temporal and spatial dynamics in the oceans have revealed to be of major importance for marine ecosystems. In November 2010, 32 stations were sampled to estimate heterotrophic bacteria and picophytoplankton abundance, bacterial community composition and bacterial metabolic activity in the Gulf of Naples and along the Latium Region coast along coast-offshore transects. Cell concentrations were estimated by flow cytometry for three main groups of autotrophs (Synechococcus, Prochlorococcus and picoeukaryotes) as well as for the heterotrophic bacteria. Prochlorococcus represented the most abundant group of autotrophic picoplankton, with an average of 1.88×10^4 cell ml⁻¹ (SD 1.10×10^4), Synechococcus were on average 1.50×10^4 cell ml⁻¹ (SD 1.07×10^4) and picoeukaryotes were 7.59×10^2 cell ml⁻¹ (SD 6.20×10^2). Heterotrophic bacteria were the most abundant group on average 6.01×10^5 cell ml⁻¹ (SD 3.88×10^5). At the surface all the three groups of autotrophs were more abundant near the Sele river (1.98×10^4 cell ml⁻¹, 4.89×10^4 cell ml⁻¹, 3.31×10^3 cell ml⁻¹, Prochlorococcus, Synechococcus and picoeukaryotes, respectively). Heterotrophic bacteria concentration varied from 1.48×10^5 and 2.17×10^6 cell ml⁻¹ and their distribution followed the coastal offshore gradient with higher concentrations near the rivers confirming their role as remineralizers of organic matter and as nutrient recyclers. Heterotrophic bacteria community composition was analysed by CARD-FISH. 75% (SD 8.4%) of total cell counts were detected with the EUB 338 probe. The overall most abundant group was Alphaproteobacteria 56% (SD 6.7). The second group in terms of abundance was Cytophaga-Flavobacterium-Bacteroides 30% (SD 5.4). Gammaproteobacteria were on average 22% (SD 5.0). Along the Sarno and the Volturno river Cytophaga and Gammaproteobacteria showed an increase from the offshore stations (22% SD 2.1 and 19% SD 1.8 CFB and Gamma, respectively) to the coastal ones (30% SD 1 and 24% SD 2 CFB and Gamma respectively). On the contrary Alphaproteobacteria showed an opposite trend with higher concentration offshore (55% SD 2.0) and lower near the coast (44% SD 3.2). Among the Alphaproteobacteria, SAR11 was the most abundant clade (up to 30% of total Eubacteria counts). The less abundant clade in all the stations sampled was Roseobacter (9% SD 3.4). Results of the analyses of the entire dataset on the community composition, the metabolic activity estimated by MAR-CARD-FISH, and the metagenomics comparative analysis from two sites will be discussed with the aim of providing integrated tools for the assessment of biological properties of coastal areas.

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33. Effect of scaling in simulation of microbial oil weathering: comparison between microcosms and mesocosms systems

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Petroleum hydrocarbons are major pollutants of marine environments as result from accidental spills during transportation, from storage sites, from dumping of tanker ballast water and from petroleum run-off. Many physical, chemical and biological technologies have been developed to remove hydrocarbon pollutants from the marine environment however, these techniques often are not able to fully remove pollutants from environment. New trends of environmental ecology, would like all of these techniques were focused on the recovery of impacted ecosystems, rather than simply reducing the massive volume of oil released into the sea (*clean up*). Different study shown as better result was obtained using bioremediation (bioremediation or biostimulation) strategies mainly because of the low environmental impact, the costs (in general cheaper than other cleanup technologies). The knowledge of oil weathering processes, biological dynamics [variation of the microbial community, the selection of hydrocarbonoclastic bacteria (HCB), protozoan grazing...], rates of degradation of hydrocarbons are basic guidelines for the application of bioremediation techniques for the recovery of polluted marine environments. In this study, microcosms (100 L) and mesocosms (10.000 L) systems were used to simulate process of oil spill in Sea Mediterranean marine pelagic environment. Effect, in marine environment, of two oils with different chemical-physical characteristic (a paraffinic Oil and an aromatic Oil) were carried out; presence and/or absence of commercial dispersant was also studied. In order to monitor the changes occurring in the structure and composition of seawater natural microbial communities caused by load of crude oil, for a period of 90 days, measures of bacterial density (total bacteria, culturable bacteria, most probable number), microbial activity (Biochemical Oxygen Demand and screening of functional genes) were carried out. Heterotrophic nanoflagellates density (total count) and measure of percentage of oil degradation were also carried out.

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34. Biodegradation of Crude Oil by Individual Strains and a Mixed Bacterial Consortium in Simulation of Marine Environment

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Petroleum hydrocarbons are the most widespread contaminants in the marine environment. The fate of petroleum in sea water is largely controlled by mechanical, physical and chemical factors which influencing the natural transformation of petroleum (oil weathering) and oil bio-degradation. On the basis of these considerations, bioremediation techniques have been developed and improved for cleaning up oil-polluted marine environment as alternative to chemical and physical techniques. To elucidate the cooperative action of mixed microbial populations in the biodegradation of crude oil, we constructed artificial consortia composed of two to three bacteria (*Alcanivorax borkumensis* strain SK2, *Rhodococcus erythropolis* HS4 and *Pseudomonas stutzeri*SDM) capable to degrade oil hydrocarbons. Using these consortia, we investigated the mechanism by which efficient biodegradation of crude oil could be accomplished by the mixed populations for application in natural environment (bioaugmentation). All experiments were carried out in microcosms systems containing seawater (with and without inorganic nutrients) and oil was used as sole carbon source. All data obtained (Total DAPI Count, Live/Dead staining, Card-FISH and GC-FID hydrocarbons analysis) confirmed the fundamental role of bacteria belonging to *Alcanivorax* genus in degradation of linear hydrocarbons in oil polluted environments. Indeed, in all experimentations carried out in seawater with or without inorganic nutrients showed as rates of oil degradation are almost total in presence of this bacterium.

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