



# International Conference on Contaminated Sediments—ContaSed 2015

8–13 March 2015, Monte Verità, Ascona, Switzerland



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The International Conference on Contaminated Sediments (ContaSed 2015) took place at beautiful conference facilities with an amazing view on Lake Maggiore in the venue of *ETH Zurich—Congressi Stefano Franscini (CSF)*—located at Monte Verità, Ascona, Switzerland. About 80 researchers from different scientific disciplines and from 22 countries (Fig. 1) presented and discussed their recent results and novel approaches on the analysis, assessment and remediation of contaminated sediment. ContaSed 2015 offered 14 sessions over four and a half days, during which 44 talks and 29 posters were presented. All the sessions were introduced by a total of 13 invited keynote speakers covering different topics on Organic and Inorganic Contaminants, Effects and Risk Assessment, Remediation and Engineering as well as on Future Perspectives.

ContaSed 2015 was organized by the Division of Chemistry and the Environment of the European Association for Chemical and Molecular Sciences (EuCheMS) in cooperation with CSF and with the support of the Division of Analytical Sciences of the Swiss Chemical Society.

## Lake sediments: a relevant environmental compartment

With increasing concern on the occurrence and fate of chemical contaminants in the environment, recent sediments have become environmental compartments of high importance, since they can act as major sinks for pollutants in aquatic ecosystems. One key aspect is reflected by historic records of many legacy compounds preserved in dated sediment cores.

*Derek Muir* (Canada) presented novel approaches, which provide insights into both the past and current inputs and dynamics of atmospheric loadings of polycyclic aromatic compounds (PAH) through chemical and paleo-ecological analyses in the Athabasca oil sands development area (Alberta, Canada). Although, many substances have been banned or were severely restricted for several decades, today, their presence in the environment is still challenging, for example, in the case of dichloro-diphenyl-trichloroethane (DDT) in Lake Maggiore. *Licia Guzzella* (Italy) and *Diana Lin* (USA) discussed the DDT contamination of Lake Maggiore, where the source of pollution was attributed to a factory that produced DDT and for many years discharged contaminated wastewater effluents into the lake. In 2001, average DDT concentrations in sediments exceeded quality guidelines, posing a threat to benthic communities. However, contemporary sediments show a decrease of the residual levels of contamination.

*Christian Bogdal* (Switzerland) presented the occurrence of (re)emerging persistent organic pollutants release from melting Alpine glaciers and the relevance of the glaciers as secondary sources of legacy pollutants. As an example, data on polychlorinated biphenyls (PCBs) was presented from a sediment core dated from 1950 to 2010 obtained from a

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**Fig. 1** ContaSed 2015 participants in front of the Monte Verità main building



proglacial lake located below the terminus of the Silvretta glacier in the Swiss Alps. The data was complemented with passive samplers at two different locations downstream of the glacial lake. PCBs from Lake Silvretta are comparable with trends of PCB emissions into the environment. Elevated concentrations during the most recent 10 years were attributed to accelerate melting of the glacier. However, PCB concentrations in the stream water were not different to the non-glacier-fed streams, concluding that there is not a release of PCBs due to accelerated glacier melt.

The results of trace analyses of aquatic sediments have been used mostly to reconstruct historic archives for highly lipophilic chemicals. However, recent research has shown that sediments can also provide a sink for less lipophilic and amphiphilic contaminants. *Juliane Hollender* (Switzerland) showed how using target, suspect and non-target screening analytical approaches using state of the art technology has allowed the successful identification of different personal care products, pesticides, biocides, pharmaceuticals and bacteriostatic agents in two lakes in Switzerland.

Additionally, historical records of sewage-derived organic contaminants from Jamaica Bay (New York, USA) were presented by *Pablo Lara-Martin* (Spain). The vertical distribution of a wide range of surfactants and pharmaceuticals in dated sediment cores showed to be a powerful concept for monitoring the exposure of aquatic systems to wastewater over several decades. In both presentations, concentrations of many contaminants originating from wastewater correlate with wastewater treatment plant efficiencies, while concentrations of substances that only recently came into use or that their usage recently increased showed elevated sedimentary concentrations over the last decades.

*Marijan Ahel* (Croatia) gave an overview on vertical distribution profiles of aromatic surfactant-derived compounds in undisturbed sediments that provided excellent historical records of the prevailing usage patterns over the past several decades but also clearly reflected the effects of different risk reduction measures on the composition and exposure concentrations of surfactant residues. In addition, differences between the diagenetic fate of alkylbenzenesulfonates and of alkylphenolpolyethoxylates were discussed taking into

account both biotransformation processes and physico-chemical partitioning.

*Martin Reinhard* (Singapore) discussed trace organic contaminants in the urban water cycle of Singapore focusing on the behavior of pharmaceuticals and PFCs in the newly constructed Marina Reservoir in Singapore. Of particular interest is how sorption onto suspended solids affects contaminant behavior. Sorption can lead to contaminant burial in sediments and removal from the urban water cycle or to buffering of the reservoir concentration depending on the strength and reversibility of sorption.

*Vesna Micic* (Austria) investigated the molecular record in surface and core sediments from the Danube River and identified wax esters with 28 to 34 carbon atoms, being most likely of bacterial origin. The concentrations in surface sediments vary from 0 to 741  $\mu\text{g kg}^{-1}$  with a significant enrichment recorded at locations with high concentrations of organic nitrogen and total phosphorus. Furthermore, a relative high proportion of aquatic versus terrestrial organic matter pointing to high primary productivity was observed. In a 70-cm-long core of rapidly deposited sediment wax ester concentrations decrease significantly with depth leading to the speculation that the wax esters are markers for environmental stress.

## Effects and risk assessment

Emerging contaminants are very relevant due to their ubiquitous occurrence in many parts of the environment and because they can be potentially harmful to the biota and to humans. In the last years, antibiotic-resistant bacteria and the genes conferring antibiotic resistance (ARGs) are being discussed as another type of contaminants of environmental concern. *Helmut Bürgmann* (Switzerland) presented the contribution of ARGs in wastewater treatment plants, finding that ARG levels in sediments in close proximity to a sewage discharge point were up to 200 times higher compared to levels away from the sewage discharge. He highlighted the fact that only few research results are available about the risks associated with this type of biological contamination.

*Nadia Casatta* (Italy) showed patterns of sediment contamination in six coastal lagoons in the area of the Po River delta and its effects on Manila clams (*Ruditapes philippinarum*). The contamination observed with trace metals (Cd, Cr, Ni, Hg, Pb, As) and different nonpolar compounds like polybrominated diphenylethers (PBDEs), alkylphenols (APs), organochlorine compounds (PCBs, DDTs), polycyclic aromatic hydrocarbons (PAHs) and organotins (TPhT, TBT) suggests a spatial trend of contamination potential related to river transport with some chemical concentrations exceeding sediment quality guidelines.

*Aurea C. Chiaia-Hernández* (Switzerland) provided insights to understand the potential impact of organic contaminants on aquatic organisms relying on resting stages during their life cycle. First, a comprehensive screening analysis was presented on sediment extracts between 1950 and 2010 to reconstruct the environmental contamination of the lake. Then, the effect of selected compounds found in the lake was assessed in experimental studies using resting eggs (ephippia) produced by the *Daphnia longispina* species complex. Bioconcentration factors (BCF) obtained show that personal care products, pesticides, pharmaceuticals and biocides can be taken up by ephippia from the water column or the pore water in the sediment with highest estimated internal concentration (Clip) values for triclocarban, followed by tonalide and triclosan. Additionally, an increase in mortality and developmental abnormalities were observed in ephippia exposed to selected organic contaminants compared to controls.

## Petroleum hydrocarbons

Oil spills are of environmental concern due to the threats to aquatic ecosystems caused by petroleum hydrocarbons. *David Hollander* (USA) explained the oil-well blowout of *Deepwater Horizon* (DWH) in the northern Gulf of Mexico that released in 2010 5 million barrels of liquid petroleum hydrocarbons during 87 days. In his talk, *Hollander* explained the consequences of the spill due to the extreme depths, high pressures and low temperatures. He concluded that benthic habitats were significantly impacted as well as a substantial portion (4–12 %) of the DWH oil reached the seabed.

*Steven Rowland* and *Martin Jones* (UK) reported on the identification of aromatic acid metabolites produced by a 2-year laboratory biotransformation study of crude oil under sulfate-reducing and methanogenic conditions using GCxGC-MS analyses. Anaerobic biotransformation of the hydrocarbons of crude oils is an important alteration mechanism, both subsurface in geological reservoirs and in aquifers and in anoxic deep sea environments. Characterization of the products of such processes is therefore important. The products of both sulfate-reducing and methanogenic conditions were identified. This approach indicates the pathways of

transformation of up to three ring aromatic hydrocarbons with at least C3 alkylation in complex mixtures.

## Excursion to Monte Bré and Lake Lugano

After 2 days of very interesting oral and poster presentations, the conference group undertook an excursion by firstly riding in a bus from the conference venue to the bottom station of the cable car to Monte Bré near Lugano. After a 10-min ride and gaining more than 600 m of altitude, the conference participants could enjoy the fantastic panoramic view including the distant Monte Rosa and many summits of the Bernese and Valais Alps. The nice weather allowed for a great outdoor lunch with local food at the Osteria Funicolare followed by a wonderful downhill hike to the lake shore village Gandria and a boat cruise on Lake Lugano (Fig. 2).



**Fig. 2** ContaSed 2015 participants on Lake Lugano

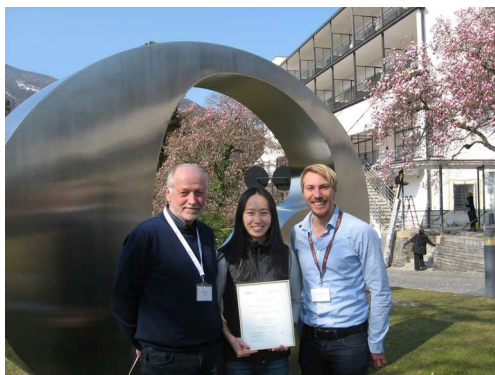
## Awards

The CSF award for the best presentation by a young scientist was granted to *Diana Lin* from Stanford University for her talk on “Field Assessment of Natural Attenuation from DDT in Pallanza Bay, Lake Maggiore” (Fig. 3).

The DCE award for the best poster presentation was given to *Lukas Mustajärvi* from Stockholm University for his poster on “Determining the release of hydrophobic organic contaminants from sediment by in-situ benthic flow-through chambers” (Fig. 3).

In addition, thanks to the financial supports of the Swiss National Science Foundation (Program SCOPES) and of the Organization for the Prohibition of Chemical Weapons (OPCW, Conference Support Program) it was possible to award travel and conference grants to eight junior and three senior scientists from five Eastern European countries.





**Fig. 3** The award winners Diana Lina and Lukas Mustajärvi with the conference chair Walter Giger (on the left)

### Future perspectives

The last session of ContaSed 2015 was devoted to a roundtable discussion, during which *Marc Babut* (France) and *Bernhard Wehrli* (Switzerland) emphasized various topics that need to be addressed in the future. With *Lee Ferguson* (USA) as moderator, the participants discussed several topics of current and future interest (Fig. 4). Among the emphasized aspects was the scarce knowledge about the effects of contaminants detected in



**Fig. 4** The discussion session on Future Perspectives

sedimentary environments. It is technically feasible to identify and quantify pollutants in sediments at trace levels. However, it is still largely unknown what toxic effects they can have and at which concentrations such effects start to occur.

### Conclusion

The attendants generally considered ContaSed 2015 as a great success enabling the exchange of a lot of very valuable information through a high-level scientific program and many fruitful discussions that helped to significantly enlarge scientific and personal networks.

The Congressi Stefano Franscini is very much acknowledged for hosting the ContaSed 2015 in its beautiful conference center and generously making available superb conference facilities. The financial support by Congressi Stefano Franscini and the Swiss National Science Foundation is greatly appreciated. Sincere thanks go to the organizing and scientific committee, partner institutions and last but not least to several generous sponsors. Gratefully acknowledged is the support of the member companies of the Kontaktgruppe für Forschungsfragen (KGF): BASF, Hoffmann-La Roche, Novartis Pharma and Syngenta Crop Protection. The conference organizers thank the Division of Analytical Sciences of the Swiss Chemical Society, the Swiss Federal Office for the Environment and the United States National Science Foundation for their financial contributions.

A Special Issue of the journal *Environmental Science and Pollution Research* is containing articles based on contributions to ContaSed 2015.

Abstracts and presentation files can be downloaded from the conference website: [www.contased2015.org](http://www.contased2015.org). In addition, a video of the Future and Perspectives session can be watched.