WRE 2020
CONFERENCE PROGRAM

AUGUST 23-26, ONLINE

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Part I Welcome Speeches

Welcome Speech from Conference General Chair Prof. Machito MIHARA

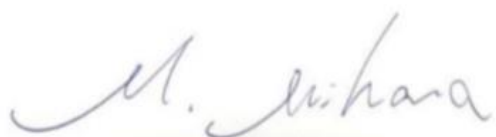**Distinguished Delegates, Distinguished Guests, Ladies and Gentlemen, and All Colleagues**

Please allow me to introduce myself at first; I am Machito MIHARA from Tokyo University of Agriculture, Japan. It is my great pleasure to give a welcome speech at this international conference in this special period.

The outbreak of COVID-19 since the end of 2019 has brought great changes in all aspects of our daily life. The "Social Distancing" and "Quarantine" policies make labor-oriented agriculture trap in the dilemma of migrant labor shortage and increase in daily wages sharply for some farming activities. Meanwhile, the supply chains in agriculture have been disrupted because of issues in transportation and market operation policy, farmers have to decline the price for wheat, crops and vegetables, but consumers need to pay more at markets. Agriculture around the world will undergo a difficult transition period to change production mode if the coronavirus-driven consumption patterns continue. In the meantime, large-scale of social distancing, the rupture of cargo logistics chains, and production shutdowns around the world have alleviated the pressure on the environment. The most obvious of these is that the emissions of carbon and nitrogen dioxide are reduced significantly, resulting in better air quality and clearer rivers and lakes. Besides, as people stay at home, animals have more room to roam.

WRE 2020 and ABS 2020 are international conferences that deal with environment and agriculture, they were primarily scheduled to be held at Tokyo University of Agriculture, Japan from 23rd to 26th August, and many works have been done since the late 2019. However, due to the COVID-19, we have to change them to online conference. I hope you will enjoy the videos presented and get yourself enlightened at WRE/ABS 2020!

After some discussion and consideration, we are happy to hold WRE/ABS conferences at Tokyo University of Agriculture, Japan in near future after the worldwide pandemic ends. I hope by that time, we can gather around freely, no more masks to wear.

Wish all of you stay safe and healthy! Wish you have a nice time with your families! Lastly, I do hope you have meaningful time during online conference of WRE 2020 and ABS 2020

Prof. Dr. Machito MIHARA

General Chair of WRE2020 & ABS2020,

Department of Bio-production and Environment Engineering,

Faculty of Regional Environment Science,

Tokyo University of Agriculture, Japan

Welcome Speech from Conference Technical Program Committee Chair Prof. Chih-Huang Weng

Distinguished Delegates,
Distinguished Guests,
Ladies and Gentlemen
and All Friends,

Good day. I am Chih-Huang Weng from I-Shou University. I am honored and delighted to serve as a chair of the Technical Program Committee of WRE conference. It's so nice to speak to all of you in this online conference. I hope that you all are going well and stay safe.

The outbreak of Covid-19 Pandemic has changed a lot in people's living style. Many cities are shutting down restaurants, shopping malls, gyms, and schools to try to stop the spread of this Pandemic virus, and people are needed to stay at home to avoid virus infection. However, social distancing and shutdown policies provide a positive impact on preventing the extend of pandemic spreading. Amazingly, as far as environmental quality concern, the air and water are getting better in many areas where the lockdown measures have been introduced.

Not doubted that, this pandemic apparently stops us to meet each other as this international conference supposed to be held in Tokyo. I can realize that many of you are not allowed from travelling city to city, country to country. Some of you may consider to be quarantined for a long certain period once you across the county border. However, there is no way to prohibit us from joining together in such a way because the passion of perusing the academic research and the desire to share research findings will never be eroded by this pandemic.

I am happy to know you all are fine, and it is my great honor and privilege to have you joining the 6th International Conference on Water Resource and Environment (WRE 2020). On behalf of the Organizing Committee of WRE2020, I would like to thanks to your cordially supports and cooperation in watching and sharing the videos of the online conference.

WRE conference debuted in 2015, when the first WRE was held in Beijing. The WRE conference highlighted the needs to maintain the sustainability of indispensable water resources under increasing uncertainty and to protect the fragile water environments under the growing concern of intensive use of water we are facing today. As an annually held conference, this conference has been successfully held in Shanghai, Qingdao, Kaohsiung, and Macau in the past years.

On this special occasion, I am happy to announce that a special issue entitled "Water Pollution Prevention and State of the Art Treatment Technologies" will be published in Environmental Science and Pollution Research volume 27, issue 28 (October, 2020) soon. This special issue includes a collection of 18 peer-reviewed articles that formally presented in our WRE2018 and WRE2019 conferences.

Following the continuing success of previous WRE meetings, this year conference we have received 479 submissions. We are happy to have 148 participants, including one keynote speaker (Prof. Jun Xia), from 26 countries and areas. We have collected 51 video presentations and 9 poster presentations,

covering a wide range of water resources, wastewater treatment technology, as well as climate changes adaptation and mitigation strategies, and ecological environments. I understand that all of you have spent precious time in preparation of the manuscript, video presentation, and poster presentation to participate this online meeting. On behalf of the committee of this conference, I'd like to express my appreciation to all the authors for the support of this conference.

The support of co-organizer, Tokyo University of Agriculture and I-Shou University are gratefully acknowledged. I would like to express our sincere acknowledgements to the organizing Committee members and the Technical Program Committee members who have given their professional guidance and valuable advices to the conference, and the reviewers who have helped us review the papers.

I am invited you to go to the conference website and watch the video and poster presentations. I do hope that you find this conference productive and enjoyable. Wish all of you enjoy the great and happy time staying with your families during this special period.

Now I would like to conclude my speech by declaring the conference open and wishing it a complete success.

Thank you.
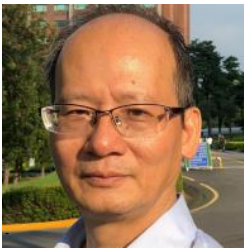
Prof. Dr. Chih-Huang Weng

Chair of Technical Program Committee of WRE2020
Department of Civil and Ecological Engineering
I-Shou University

Part II Keynote Speeches

Keynote Speech 1: Water security for changing environment in Yangtze River

Prof. Jun Xia

Chair Professor & Director, The Research Institute for Water Security, Wuhan University; Director, Center for Water Resources Research, Chinese Academy of Sciences

Biography: Prof. Jun Xia is the academician of Chinese Academy of Sciences (CAS), and Chair Professor & Director, The Research Institute for Water Security (RIWS), Wuhan University, also Director, Center for Water Resources Research (CWRR), CAS. He has ample experiences on leading hydrology, water resources research, managing and consulting jobs in China and international since 1987. He was severed as the President of International Water Resources Association (IWRA, 2009-2012), Board Governor of World Water Council (WWC, 2009-2015), Co-Chair, Inter Academy Council for Water Programme (2004-2010), Bureau Member for International Union of Geodesy and Geophysics (IUGG) since 2019. He was awarded "International Hydrological Prize -Volker Medal", given by IAHS, UNESCO and WMO in 2014, the 2017's State Natural Science Award in China and 2019's IUGG Elected Fellow.

Abstract: Yangtze River (YR) is the largest river in China and the 3rd largest river in the world with 6,397 km long and the area of 1.8million km2. It plays a key role for China socio-economic sustainable development due to occupying total 40% of both the population, and the GDP in China, 34% of water resources and food product. However, YR faces a big challenge on its green development due to water & environmental issue under the climate change and significant land use & cover change. Eco-water issue, particularly, becomes one of most important water issues at YR, such as, Chinese sturgeon has disappeared, finless porpoise & "four major domesticated carps" have been greatly reduced, lake nutrification and water environmental issue. Eco-water security becomes a most important issue and promotes the integrated system approach that gives solutions for eco-water security & wisely managing water. This paper addresses the issue of eco-water security and the green development that means to describe the effort to go about the process of developing a system model for a river system or city and country in a manner that takes into account the environmental and ecological needs of that community. Approach of eco-hydrology and its practice are proposed and applied to guidance to solution on how to assess and wisely managing Yangtze River through a system integration way, applied to multi-dimensional for water, biodiversity, ecological services, resilience, to maintain ecological and human development in a sustainably way. Some of case studies are given as expiations of Yangtze River Simulator, supported to ecohydrology.

Key Words: Eco-Water Security; Green Development; Integrated System Approach; Yangtze River

Speech URL: http://www.academicconf.com/Video/Details?paperId=32112

Part III Video Presentation Sessions

Video Presentation Guidelines

- The video uploaded should be in the format of **.mp4** and time duration should be 10-15 mins;
- Visit *Here* to know How to record a video with PowerPoint
- The video PPT could design as you like with requirements as below:
  - ✓ The conference logo should be added to each PPT slide
  - ✓ Title, presenter and affiliation information should be indicated in the first slide
  - ✓ Each slide should be concise, uncluttered and readable from a distance
  - ✓ Include only key words and phrases for visual reinforcement
- Signed and stamped electronic presentation certificate would be issued via e-mail after presentation

Best Video Presentations Selection

Three best video presentations will be selected based on the "**Votes**" received on the website;
This award consists of a certificate and free attendance to WRE2021.

Selection Criteria
A best presentation will be selected based on the following items:
- ✓ Research Quality
- ✓ Presentation Performance
- ✓ Presentation Language
- ✓ PowerPoint Design

Selection Procedure
- All video presentations will be updated on the conference website
- Audience could select best video presentations by clicking "**Vote for the Best Presentation**", and vote from the same IP would be counted only one time for each video presentation
- 10 video presentations will be selected based on the number of "**Votes**" till September 5th, 2020.
- TPC members of WRE 2020 (Who will not deliver video presentation) will choose the best three video presentations among the 10 selected video presentations and results will be demonstrated on the website on September 8th, 2020.

Session 1_ Water and Environmental Science

Please Click Paper ID to Access the Video Presentation.

WRE3742 *(Invited Talk)*	On the use of crop dynamic models for (sub-) optimal irrigation management *Prof. Raphael Linker, Israel Institute of Technology, Israel*
WRE3753	Assessing spatial and temporal patterns of surface-water quality with a multivariate approach: a case study in Uruguay *Dr. Angela Gorgoglione, Universidad de la República, Uruguay*
WRE3761	Impact of galvanic corrosion between lead and stainless steel on drinking water quality *Mr. Saroj Adhikari, Chaoyang University of Technology*
WRE3928	Social water environment governance innovation in China driven by big data: frontier trends, dilemma challenges and optimization paths *Dr. Liu Fang, Shandong Normal University, China*
WRE3995	Investigation in heavy metal contents of drinking water and fish from Darbandikhan and Dokan Lakes in Sulaimaniyah Province - Iraqi Kurdistan Region *Dr. Kosar Hikmat Hama Aziz, University of Sulaimani, Iraq*
WRE4038 *(Invited Talk)*	Effect of acid deposition on the mobility of nitrogen species in soil and its potential impact on surface and ground water *Prof. Julia Lu, Ryerson University, Canada*
WRE4054	Effect of retardant application and water-saving irrigation to reduce drought stress on growth and yield of job's tears *Dr. Fiky Yulianto Wicaksono, Padjadjaran University, Indonesia*
WRE4086 *(Invited Talk)*	Targeted Placement of Soil Erosion Prevention Works After Wildfires *Dr. George N Zaimes, International Hellenic University, Greece*
WRE4143	Macroalgae transplant as an effective biomonitoring approach to detect the occurrence of anthropogenic trace elements in tourist Mediterranean islands *Dr. Geraldina Signa, University of Palermo, Italy*
WRE3902	Exploring effects of natural minerals in drinking water on skeletal development and dental health: A cross-sectional study *Dr. Qi Zhang, Chongqing Municiple Center for Disease Control and Prevention, China*
WRE4029	A comparative analysis of urban water security condition in China's municipalities *Dr. Ya-Ju Chang, Shanghai Jiao Tong University, China*
WRE4141	Environmental health risk assessment of manganese and cadmium in the ground water around Cipayung Landfill in Depok, Indonesia *Ms. Ukik Agustina, Indonesia University, Indonesia*
WRE3998	Wind and current loads on a pipelaying crane vessel *Mr. Yingfei Zan, Harbin Engineering University, China*
WRE3953 *(Invited Talk)*	Feasibility of adaptive neuro-fuzzy inference system for daily reference evapotranspiration estimation in a tropical region with limited meteorological data: case study at Labuan, East Malaysia *Assoc. Prof. Yuk Feng Huang, Universiti Tunku Abdul Rahman, Malaysia*

WRE3765	Effect of hydrological regime on the sediment bacterial diversity and community structure in Sultanpur Lake, Gurugram, Haryana *Ms. Sandhya Bhat, ,Guru Gobind Singh Inderprastha University, India*
WRE4031	Draw on artificial neural networks to assess and predict water quality *Dr. Ana Fernandes, Universidade de Évora, Portugal*
WRE4074	Water quality evaluation used to function feasibility case study on Babon river in Semarang, Central Java, Indonesia *Prof. Slamet Imam Wahyudi, Diponegoro University, Indonesia*
WRE3694 *(Invited Talk)*	Emerging issues in monitoring drinking water quality from source to tap *Prof. Manuel J. Rodriguez, Université Laval, Canada*
WRE4142	Physical and Social Infrastructures: understanding holistic water poverty eradication in Indonesia *Ms. Ismu Rini Dwi Ari, Brawijaya University, Indonesia*

Abstracts of Session 1

WRE3742

On the use of crop dynamic models for (sub-) optimal irrigation management

Raphael Linker

Division of Environmental, Water and Agricultural Engineering, Faculty of Civil and Environmental Engineering, Technion, Israel Institute of Technology, Israel

Abstract. According to the Food and Agriculture Organization, by 2030 two-thirds of the world population could be living under water stress conditions, i.e. in regions in which water withdrawal exceeds the renewable water resources by more than 20%. In terms of global water withdrawal, agriculture is the largest consumer of freshwater, accounting for 70% of the global withdrawn. The inefficient use of the freshwater resources threatens not only sustainable agricultural development but also overall economic growth and global stability. Maximizing the efficiency of water use in irrigated crops is therefore crucial.

This talk will focus on ways to improve water use efficiency in agriculture by using mathematical crop models in the decision-making process. After presenting briefly the general mathematical framework, the talk will show through several examples how such models can be efficiently incorporated in decision-making processes at different levels, ranging from seasonal planning of water allocation between several crops to local, real-time irrigation scheduling in a specific field. The two main drawbacks commonly associated with such model-based frameworks - unreliable weather forecasts and imperfect models – will be discussed and ways to minimize the negative impact of these factors will be presented.

Keywords: Irrigation management; Model-based optimization; Decision support systems

WRE3753   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

Impact of galvanic corrosion between lead and stainless steel on drinking water quality

Saroj Adhikari and Ding-Quan Ng

Department of Environmental Engineering and Management, Chaoyang University of Technology

Abstract. The use of lead pipes in drinking water distribution has been banned since 1980s in Taiwan, and hence replacement of such pipes with stainless pipes is ongoing. Replacement works, however, are mostly partial being largely limited to public areas. This unavoidable partial replacement can result in galvanic corrosion between lead (Pb) and stainless steel, causing higher Pb release in drinking water supply. Similarly, if the stainless steel surface is activated under certain chemical conditions, reverse galvanic corrosion may be likely releasing Chromium (Cr), Iron (Fe) and Nickel (Ni), important constituents of stainless steel in drinking water. The release of Cr and Ni can pose exposure risks when significant amounts are released into drinking water supply. The study aims to investigate the mechanisms of galvanic corrosion and reverse galvanic corrosion and their impact on drinking water quality at the regions where lead and stainless steel pipes are in contact during partial lead pipe replacement. To simulate the galvanic couple between lead and stainless steel, 5 cm of pure lead (99.9%) and 304 stainless steel wires were connected by winding the lead wire round the stainless steel forming an "L" shape. The wires were rinsed with ultrapure water and suspended using polyester thread in 500-mL polyethylene bottles containing synthetic tap water as an electrolyte. The effects of different water parameters including pH, alkalinity, chloride, and sulphate concentrations were studied. Experiments were conducted for 7 days with periodic sampling and soluble and total concentrations of metals were measured using ICP-OES. Preliminary findings showed a higher concentration of Pb in galvanic couple. However, periodic spikes in the concentration of Fe were also observed which might imply that reverse galvanic corrosion may have occurred. During reverse galvanic corrosion, galvanic current flows in opposite direction resulting the corrosion of stainless steel. Total Pb concentration measured for reverse galvanic corrosion was lower than for galvanic corrosion because during reverse galvanic corrosion, lead wire is protected. To further elucidate the mechanism of reverse galvanic corrosion, concentration of total Fe in the solution was measured. Unlike total Pb, the concentration of total Fe was higher for reverse galvanic corrosion indicating the corrosion of stainless steel instead of lead. This will be further verified by measuring the concentration of total Cr and Ni which are important constituents of stainless steel. The findings can contribute evaluating the risk of potential secondary Cr, Ni and Pb contamination during lead pipe replacement.

Keywords: Partial Replacement; Reverse Galvanic Corrosion; Active Surface

To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

Effect of acid deposition on the mobility of nitrogen species in soil and its potential impact on surface and ground water

Julia Lu
Department of Chemistry and Biology, Ryerson University, Canada

Abstract. As a part of the research on evaluation and validation of lab methods to assess the effect of acid precipitate/deposition on the availability to plants and mobility of nutrients in soil, this presentation focuses on nitrogen species (i.e., NO_3^-, NO_2^-, and NH_4^+). Different chemical species of an element have different physical and chemical property, reactivity, leading to different mobility in the environment, bioavailability, and toxicity. Soil samples of 0-10. 10-20, and 20-30cm were collected, respectively, from biomass-growing fields in Ontario, Canada before and after fertilizer application and at biomass harvest. US EPA Synthetic Precipitation (with pH value relevant to the field region) Leaching Procedure (SPLP) was followed to simulate the leaching process of nitrogen species from the soils. Colorimetry was used for the analysis of the nitrogen species. Preliminary results show that NO_3^- is the predominant form of nitrogen leached from the soils by the acid precipitate and that depth variation of leachable nitrogen in the soils is indicated but not statistically significant, suggesting acid precipitate/deposition can move nitrogen from soil to both surface and ground water.

Keywords: Acid Rain; Soil; Chemical Speciation; Nutrients; Nitrogen

WRE4054

Effect of retardant application and water-saving irrigation to reduce drought stress on growth and yield of job's tears

Fiky Yulianto Wicaksono
Padjadjaran University, Indonesia

Abstract. Job's tears crop (Coix lacryma-jobi L.) is one of functional food crop that is developed to support food diversification program. The cultivated of this crop is in upland and the late maturity of this crop can lead to drought condition in tropical regions. Agronomy practices, such as retardant applications and water-saving technologies, is expected to maintain yields in lack of water condition. The purpose of this study was to examine the effect of retardant application frequency at various watering frequency on growth and yield of Job's tears plants. The study was experimental method in the field test. The experiment was conducted at the Experimental Garden of the Faculty of Agriculture, Universitas Padjadjaran, Indonesia at an altitude of 740 m above sea level. It started from May until October 2019. The treatment consisted of two factors. The first factor was retardant application frequency in plant vegetative phase that consisted of 4 levels (without retardant application, 1, 2, and 3 times). The second factor was the frequency of watering (every day, once every two days, and once every 3 days). Observations were made on the growth and yield components of Job 's tears plants. The results showed that there were interaction effect between retardant application frequency and frequency of watering on the number of tillers, number of productive tillers, and number of grains per plant, while there were no interaction effect on plant height, number of lateral branch, weight of 100 grains, and number of panicles per tiller. One-time retardant application could save water requirements of job's tears crop, so it can survive under drought condition.

Keywords: Water Requirements; Functional Food; Retardant

WRE4086   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE4143

Macroalgae transplant as an effective biomonitoring approach to detect the occurrence of anthropogenic trace elements in tourist Mediterranean islands

Geraldina Signa[1,2], Cristina andolina[1], Cecilia Tramati[1], Laura Ciriminna[1], Antonio Mazzola[1,2] and Salvatrice Vizzini[1,2]
[1]*Department of Earth and Marine Sciences, University of Palermo, Italy*
[2]*CoNISMa, National Inter-University Consortium for Marine Sciences, Italy*

Abstract. Marine pollution is one of the main threats affecting marine coastal systems worldwide, due to several anthropogenic activities. Macroalgae are acknowledged reliable bioindicators of anthropogenic impact in coastal areas, as they rapidly integrate environmental conditions over space and time. Active biomonitoring using macroalgae transplanting techniques from pristine to polluted sites is a powerful approach to detect sources and gradients of contamination over a short incubation period. Here, we applied this manipulative approach using macroalgae of the genus *Cystoseira* (Fucales), to detect the occurrence of trace elements (Cr, Hg, Pb and Zn) and their spatial and temporal variability in three tourist Mediterranean islands: Cyprus, Sicily (Italy) and Rhodes (Greece). Three coastal sites at a different density of tourist infrastructures, and three periods respectively before, during and after the high tourist season (i.e. August) were selected at each island. Increase in trace element concentration in the macroalgae tissues over the incubation period was observed mainly in August and varied, in percentage, from 50 to 300%. The increase in trace element concentration did not differ among sites in the three islands, except for a few cases, indicating that tourism represents a diffuse source of TE in small islands, irrespective of land-based activities. Moreover, considering that gasoline, paints and antifouling products are the main potential sources of Cr, Hg, Pb and Zn in the marine environment, the intense summer boating activities around the islands seem to play a role in the observed patterns. Main findings confirm the usefulness of biomonitoring using transplanted macroalgae, representing an efficient early-warning system for seawater quality, helpful for environmental managers. These findings confirm also the high vulnerability of small islands, due to intrinsic constraints, such as isolation, small spatial extent and fragile ecosystems, that may magnify the detrimental effects of tourism. Mediterranean islands are, indeed, one of the world's main tourist destination, and, although the great benefits for the local economies, tourism represents also a great burden for the marine coastal environment.

Keywords: Heavy Metals; Seaweeds; Pollution; Tourism; Environmental Impact; Monitoring

WRE3902   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

A comparative analysis of urban water security condition in China's municipalities

Ya-Ju Chang[1] and Demi Zhu[1,2]
[1] *School of International and Public Affairs, Shanghai Jiao Tong University, China*
[2] *China Institute for Urban Governance, Shanghai Jiao Tong University, China*

Abstract. Current urban water security studies failed to integrate sustainability topics and the aims of urban water management practices. China's municipalities, namely Shanghai, Beijing, Tianjin and Chongqing, have faced significant pressure on water security, however, their features and improvement needs of urban water security has not yet been clearly analysed to date. To cope with these challenges, this study suggested an urban water security assessment framework which addresses the features of urban water management transitions and sustainability dimensions to investigate and compare the urban water security condition of the four municipalities during 2011-2017. The results show that Beijing has had the best water security condition, followed by Tianjin, Shanghai and Chongqing. In addition, Shanghai has had the largest improvement of water security condition among the municipalities during the investigated period. The condition of water use efficiency, river quality, pollutant discharge, wastewater treatment capacity, green covered area and crop area affected by droughts and floods has showed a great variation between the municipalities. River quality improvement, and mitigation of droughts and floods damages have been recognized as top priority in Tianjin and Beijing. The Shanghai government should put great attention to the regulation of wastewater and pollutant discharges, and water use reduction. The Chongqing government should advance the coverage of sewage and drainage infrastructure, enhance water use efficiency and lower water intensity of economic activities to avoid damages on water security in the long run. The suggested framework and approach facilitate the investigation and communication of urban water security condition and can support tailoring policy measurements in different water security as well as urban development context.

Keywords: Urban Water Security; Urban Water Management; Sustainable Development; Municipalities

WRE4141   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3998   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3953   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3765

Effect of hydrological regime on the sediment bacterial diversity and community structure in Sultanpur Lake, Gurugram, Haryana

Sandhya Bhat and Pamposh
University School of Environment Management GGSIP University, India

Abstract. The present study focuses on the changes in sediment bacterial community structure and diversity of Sultanpur lake due to changes in its hydrological regime. The assessment of the bacterial community structure was done by using the Next generation sequencing of 16S rRNA amplicon, a bacterial phylogenetic marker. Sultanpur Lake is located in Sultanpur National Park Gurugram, in the state of Haryana, India. This place harbors great plant and animal biodiversity and serves as an important feeding, roosting and breeding ground for both resident and migratory avian fauna. Increasing pollution level and scarcity of water during summer months impose a great threat to the lake. Sediment bacteria are considered as reliable recorders of nutrient cycling and active mediums of biogeochemical processes and thus were assessed in this study. Wet and dry sediment samples were taken and analyzed for their bacterial community structure and diversity. The amplicon sequencing generated 881,118 reads which corresponded to 93 known species in case of dry sediments and 44 species in case of wet sediments. In dry sediments the top ten phyla were *Firmicutes* (26%), *Bacteroidetes* (14%), *Proteobacteria* (15%), *Cyanobacteria* (12%), *Parcubacteria* (7%), *Euryarcheota* (6%), *Actinobacteria* (5%), *Armatimonadetes* (5%), *Chloroflexi* (2%) *and Planctomycetes* (2%). In case of wet sediments, the top ten phyla were *Firmicutes* (35%), *Bacteroidetes* (22%), *Proteobacteria* (22%), *Actinobacteria* (7%), *Chloroflexi* (5%) *Parcubacteria* (3%), *Verrucomimicrobia (*3%*)* and*, Deinococcus-Thermus* (3%).There was change in the community structure at species level too with *Clostridium species* as the most dominant species in case of wet sediments and *Lactobacillus* species as the predominant one in dry sediments. This study provides an insight into the changes in the bacterial communities due to changes in hydrology and how this change will affect the health of this wetland as irregular water supply is a major stressor of this wetland.

Keywords: Bacterial Diversity; Bacterial Community; 16S rRNA Amplicon; Next Generation Sequencing

WRE4031   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE4074   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3694

Emerging issues in monitoring drinking water quality from source to tap

Manuel J. Rodriguez
Senior NSERC Industrial Research Chair in Surveillance and Management of Drinking Water Quality, Schoolt of Urban & Regional Planning, Université Laval, CANADA

Abstract. Emerging issues such as climate change impacts and the interest in new contaminants in water contribute to the need for more sophisticated water quality monitoring strategies. In Canada, most citizens live in municipalities where drinking water is supplied by surface water sources. Surface water vulnerability is particularly high during specific climatic events such as drought-rewetting cycles and freeze-thaw cycles. During sudden climatic events such as heavy rain, events of source water contamination can occur potentially impacting the performance of treatment plants and the quality of the distributed water to consumers. Indeed, climate events could affect the drinking water supply

system in several ways and through all its steps, including at the source and during treatment and distribution. To ensure safe drinking water for consumers at all times, monitoring strategies for water quality should consider the different components of the multi-barrier approach: the source watershed, the water treatment plant and the municipal distribution network. Such monitoring strategies must consider various types of contaminants and indicators (chemical, microbiological, physical), representative locations for data collection to describe the spatial variability of water quality, and representative periods and frequencies for data collection to describe the temporal and seasonal variability of water quality. In the last five years, our research group has developed approaches, methodologies and techniques for water quality monitoring that allow generating data and knowledge useful for decision-making purposes. Various tools have been elaborated for water quality assessment, detection of contamination events, prioritizing of operational interventions, and identification of vulnerable populations to potential water quality failures. Spatio-temporal databases for numerous water quality parameters, including contaminants of emerging interest, have been developed during field sampling programs. Based on these data, diagnostic and predictive models have been developed for early warning purposes, monitoring prioritization and population exposure assessment to contaminants.   In this conference, the approaches and phases for data generation, model development and decision-making tools elaboration will be presented. The presentation will be illustrated with real case studies in municipal drinking water utilities of Canada.

Keywords: Drinking Water; Water Quality; Monitoring; Decision-Making

WRE4142   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

Session 2_ Water Pollution and Wastewater Treatment

Please Click Paper ID to Access the Video Presentation.

WRE3731	Phosphorus adsorption onto sediment under reciprocating flow *Mr. Xian Zh, Hohai University, China*
WRE3772	Widespread nickel contamination in drinking water supplies due to use of stainless steel plumbing materials in distribution systems *Dr. Ding-Quan Ng, Chaoyang University of Technology*
WRE3867	Risk assessment of prevalence of antibiotics in drinking water and impacts on human health exposed to antibiotic contamination- China *Dr. Jia Lyu, Chinese Center for Diseases Control and Prevention, China*
WRE3908	Effectiveness of Alhagi Maurorum as natural coagulant aid in grey wastewater treatment study *Dr. Ali Jwied Jaeel, Wasit University, Iraq*
WRE3924	Performance analysis of a novel two-stage semi continuous anaerobic digester in co-digestion of fruit and vegetable wastes and activated sludge *Mr. Herald Wilson Ambrose, Indian Institute of Technology, India*
WRE4008 *(Invited Talk)*	Chemisorption character of sorption of hexavalent chromium ions by magnetite *Dr. Oleg D. Linnikov, Ural Branch of the Russian Academy of Sciences, Russia*
WRE4061	Drift patterns of plastic emissions in coastal areas *Prof. Karina Bakkeløkken Hjelmervik, University of South-Eastern Norway, Norway*
WRE4123	Microplastics in coral reefs: analytical challenges and citizen science *Prof. Francesco Saliu, University of Milano-Bicocca, Italy*
WRE4130	Prediction of octanol-water partition coefficients for alkyl-PAHs based on the solvation free energy *Dr. Wanran Li, Dalian Maritime University, China*
WRE4155	Bioadsorption of methyl orange and methylene blue contained in water using as bioadsorbent Natural Brushite (nDCPD) *Dr. E. Joaquin-Medina, Instituto Politécnico Nacional-UPIIG, México*
WRE4118	Effect of boron-doped diamond anode electrode pretreatment on UF membrane fouling mitigation in a cross-flow filtration process *Dr. Bin Liu, Hunan University, China*
WRE4071	Partitioning of organic pollutants sorbed onto plastics to sediments *Mr. Md Nazmul Hassan, Hiroshima University, Japan*
WRE4076	Ammonia, oil and grease, and COD reduction of septage wastewater via electrocoagulation using black iron electrodes *Dr. Kathlia D. Cruz, Mapua University, Philippines*
WRE3858 *(Invited Talk)*	Consolidating rural and water-scarce regions of emerging countries by reusing treated wastewater *Prof. Sonja Bauer, University of Applied Sciences, Germany*
WRE3869	Circular economy approach for wastewater treatment farming in Bangpakong River basin *Dr. Nawatch Surinkul, Mahidol University, Thailand*

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WRE4021	Treatment of leachate with the ROC process for the recovery of drinking water and saleable products *Mr. T. M. Mogashane, University of Limpopo, South Africa*
WRE4068	Transformations of oil pollutants in the membrane bioreactor depending on the operating parameters of activated sludge *Dr. Ewa Łobos-Moysa, Silesian University of Technology, Poland*
WRE3809	A GIS-based multi-criteria decision framework for selecting suitable locations of sustainable flood retention basins at the watershed scale: The case of the upper subcatchments of the Butuanon river watershed *Ms. Jonah Lee Bas, University of San Carlos, Philippines*

Abstracts of Session 2

WRE3731   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3772

Widespread nickel contamination in drinking water supplies due to use of stainless steel plumbing materials in distribution systems

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Abstract. Nickel contamination in drinking water supplies is less known due to the limited source availability. Stainless steel plumbing material is the primary source of nickel in drinking water distribution systems. However, the use of stainless steel is localized in certain regions, particularly in earthquake prone countries such as Japan, South Korea. These countries face tremendous challenges in water leakages caused by frequent earthquakes. The introduction of stainless steel plumbing materials saw a drastic decline in water loss. This success led to an increasing use of stainless steel materials around the region. Stainless steel pipes were connected with specially designed fittings such that pipes can move without breaking or leaking, unlike conventional fittings. However, the use of stainless steel has also raised public concerns due to the presence of toxic heavy metals such as chromium and nickel, both of which are key components in stainless steel. The use of stainless steel plumbing materials is expected to increase chromium and nickel levels in drinking water over time. Nickel is a known carcinogen and has a WHO guideline value of 70 µg/L in drinking water. Nickel is regulated in Taiwan and Japan, but not regulated in the US under the USEPA. Possible reason for such discrepancy may be that the use of stainless steel in drinking water distribution systems is rare in the US. At present, the majority of the Asian countries follow WHO guideline for nickel. In Taiwan, the maximum allowable limit for nickel in drinking water has been revised from 70 µg/L to 20 µg/L, effective from July 2019 by the Taiwan EPA.

This study aims to investigate the extent and magnitude of nickel levels in drinking water samples in Taichung, Taiwan. Preliminary results showed that drinking water samples collected from schools exhibited random spikes in nickel levels, suggesting potential widespread contamination in water supplies. Other supporting evidence in recirculating system and leaching experiments showed an increase in nickel release from stainless steel materials with increasing exposure time.

Keywords: Nickel; Stainless Steel; Drinking Water

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WRE3908 To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3924

Performance analysis of a novel two-stage semi continuous anaerobic digester in co-digestion of fruit and vegetable wastes and activated sludge

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Abstract. Anaerobic fermentation of fruit and vegetable wastes (FVWs) faces operational challenges such as rapid acidification and nitrogen depletion, due its high sugar content and volatile solids fraction. Various techniques are increasingly studied to overcome these limitations and improve the biodegradability of such organic wastes. Co-digestion of FVWs with complementary substrates such as kitchen waste, agricultural waste and activated sludge (AS) have been reported to improve biodegradability and biogas production. However, the conventional mesophilic digesters suffer instability during acidogenesis, and the mixing ratio of both substrates play an important role in determining the stability. To overcome the inhibitory effects of acidification and to improve biogas production, the separation of methanogenic population from acidifying microbiota is important. In the current study, a two-stage semi continuous anaerobic digester was developed to separate hydrolysis-acidogenisis and methanogenesis phases in two separate reactors. The set-up consists of a phase I reactor operated under thermophilic condition followed by a mesophilic phase II reactor. Two mixing ratios (M_1: 50% FVW + 50% AS and M_2: 25% FVW + 75% AS) were studied for digester stability and biogas production. M_2 achieved 1.6-fold increase in overall methane yield and showed improved digester stability compared to M_1. Application of a combined (microwave and hydrogen peroxide) pre-treatment on the feedstock M_2, further improved the biogas production by 2.17-fold. Enhanced buffer capacity achieved in the treated digester is mostly attributed to biopolymer release through pre-treatment. Overall, these results suggest that two-stage digestion with pre-treatment enhances overall anaerobic biodegradability of FVWs overcoming its inherent limitations.

Keywords: Two-Stage Anaerobic Digestion; Sludge Hydrolysis; Microwave; Hydrogen Peroxide and Superoxide

WRE4008

Chemisorption character of sorption of hexavalent chromium ions by magnetite

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Abstract. The problems of using magnetite as a sorbent for the removal of toxic hexavalent chromium ions from contaminated aqueous solutions are considered. It is shown that, unlike conventional sorbents, two processes simultaneously occur during the sorption of chromium(VI) by magnetite: (1) the usual adsorption and (2) the chemical interaction of chromium(VI) with magnetite (chemisorption), which is accompanied by the oxidation of iron(II) ions in magnetite to iron(III) and reduction of chromium(VI) to chromium(III) on the surface of magnetite with the formation in the surface layer of magnetite of a mixed compound of chromium(III) with iron(III). At this, iron(III) ions in the magnetite lattice can be replaced by chromium(III) ions, since they have close ionic radii.

The kinetics of the chemical reaction between chromium(VI) and magnetite is described by a first-order equation for concentration of chromium(VI) ions:

$$-\frac{dC}{d\tau} = k\frac{S}{v}\exp\left(-\frac{E}{RT}\right)\cdot C \tag{1}$$

where C is the concentration of chromium(VI) in solution; S is the total surface area of magnetite particles placed in solution v is the volume of the solution, m^3; k is the reaction rate constant; E is the activation energy of the chemisorption process, J/mol; R is the universal gas constant; T is the absolute temperature, K; τ is the time, s.

The parameters of Eq.(1) are determined by the temperature and the initial pH of the solution:

pH	k, m/s	E, kJ/mol	S_n, *kJ/mol*	n	R_c	F
3.3	5953.89	89.9	4.5	34	0.962	401.3
4.8	10855.69	113.7	7.3	40	0.929	240.8
7.5	$230.436\cdot10^5$	117.2	6.4	34	0.956	338.8
9.15	$2829.84\cdot10^5$	126.7	5.5	23	0.980	523.7
10.5	$25990.2\cdot10^5$	133.4	4.3	26	0.988	982.3

(S_n is the standard deviation of E, n is the number of experimental points, R_c is the correlation coefficient; F is the Fisher test.)

Keywords: Chromium(VI); Magnetite; Sorption; Chemisorption; Solution

WRE4061
Drift patterns of plastic emissions in coastal areas

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Abstract. Tiny round plastic pellets are found on many beaches all around the globe. Such plastic

pellets are the pre-production building blocks of nearly all plastic goods. Unfortunately, they become an environmental hazard if lost during transit. The pellets are mistaken for food by sea birds, fish and mammals. On the 26th of February 2020 a container ship loaded with around 26 tonnes of plastic pellets encoutered harsh weather conditions during transit from Germany to Norway. A month later the pellets started to wash up on beaches along the Oslo Fjord in the southern part of Norway.

The Oslo Fjord is approximately 100 km long and located in the south-eastern part of Norway with the capital city of Norway in the innermost part of the fjord. The fjord has a challenging flow pattern due to several river outlets, thresholds, complex topography, storm situations in the oceans outside of the fjord, and atmospheric forcing. The FjordOs model is a numerical ocean model applied on the Oslo Fjord. It is based on the Regional Ocean Model System (ROMS) which is an open source, free-surface, terrain-following, primitive equations ocean model system widely used by the scientific community. The applied grid in the FjordOs model is curvilinear allowing a variable grid resolution ranging from 300 meters in the wider parts of the fjord to 20 meters in the narrower parts.

In order to identify the coastal hotspots where the pellets are expected to accumulate, the FjordOs model is used together with the drift model OpenDrift. Since the pellets are washed on and off land during several months, the pellets can be found in several parts of the fjord. To model the concentration of pellets on land and in sea, particles were released in the model every hour from 1st of April to 15th of May 2020 from 10.3oE to 10.9oE and 58.97oN to 59.06oN. The impact of different time steps, wind drift factors, storm events and time of release are studied to better understand the impact of different factors.

The results reveal that some beaches are more exposed than others. The drift patterns are sensitive to the challenging flow pattern in the fjord.
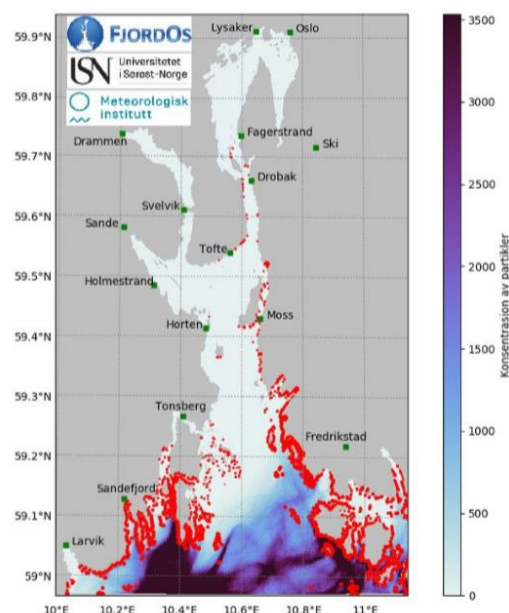

Figure 1 An extract of the results from the study, showing the concentration of particles at sea and the positions where the pellets are expected to wash up on land.

Keywords: Drift Patterns; Ocean Circulation; Environmental Issues

WRE4123
Microplastics in coral reefs: analytical challenges and citizen science

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Abstract. The environmental and ecotoxicological impacts of microplastics (MP) on coral reef environments are still larger unknown. The main concern arises by the possibility that MP act as carrier of contaminants adsorbed from the subsurface water that are then leached and accumulated in the food

web after ingestion by marine organism. Most of the data come from lab feeding trials and show that coral reef organism, including reef-building corals, may be affected by this contamination and face adverse health effects. Conversely, "on field" studies are scarce l limited. For this reason, we carried out several research projects devoted to highlight the correlation between the emerging presence of microplastic in Maldivian coral reefs and the health of the related marine organism. Due to the vulnerability of the investigated ecosystem we developed and employed alternative analytical approaches with the aim to lower the impacts of sampling activity. Specifically, we extensively implemented the use of solid phase microextraction as solvent free and non-lethal procedure, to be applied for biomonitoring with sensitive key species. Our surveys showed that MPs were mainly concentrated inside the atoll rims and highlighted a positive correlation between their presence and the presence of micropollutants in the selected organisms. A marked effect of monsoon circulation was also observed. Recently, due to the Covid19 pandemic, we also implemented a citizen science project to limit the spread of plastic contamination related to the use of face mask and hand gel sanitizer in the area.

Keywords: Microplastic; Maldives; Coral; Marine pollution

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WRE4155   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE4118

Effect of boron-doped diamond anode electrode pretreatment on UF membrane fouling mitigation in a cross-flow filtration process

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Abstract. In this study, electrochemical oxidation using a boron-doped diamond (BDD) electrode was employed as a pretreatment strategy to alleviate ultrafiltration membrane fouling. It was found that BDD based anodic oxidation effectively improved the removal efficiency of dissolved organic matters. Based on XAD resin adsorption experiment, the fraction of hydrophilic components significantly increased after the electro-oxidation pretreatment. In addition, the BDD based oxidation pretreatment was found to reduce the disinfection byproduct formation potential. A two-stage fouling model and the interfacial free energy were employed to investigate the fouling mitigation mechanisms via electrochemical oxidation pretreatment. The results show that membrane fouling was mitigated with increasing repulsive interactions and decreasing attractive interactions between humic acid molecules and the membrane surface after electrochemical oxidation. With longer electrochemical oxidation time, the dominant mechanism of membrane fouling shifted from complete pore blocking and cake filtration, mainly caused by hydrophobic humic acid compounds with higher molecular weight, to standard blocking and pore blocking, caused by hydrophilic humic acid compounds with low molecular weight.

WRE4071

Partitioning of organic pollutants sorbed onto plastics to sediments

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Abstract. Ubiquitous marine litter plastics fragments have been detected in bottom sediments in the marine ecosystem, and these have been reported to sorb various organic and inorganic pollutants. Since the plastics may act as a carrier for pollutants, behaviors of the sorbed pollutants should be well understood. In this study, we investigated partitioning of an aromatic organochlorine, 2,4,5-trichlorophenol, and an aliphatic organochlorine, 1chlorooctadecane, between plastics and sediment. Each organochlorine was sorbed onto the pieces of polyethylene (PE), polyvinyl chloride (PVC) and polyethylene terephthalate (PET), and then the plastic samples were buried in the river sediment with 5.20% of ignition loss. These organochlorines were partitioned to the sediment; however, the behaviors were dependent on the combination. The degree of migration of the aromatic organochlorine were in the order of PE, PVC, and PET, whereas the aliphatic organochlorine did not show the same trend. The sediments dissolve organic carbon (DOC) effects in migration was negligible but pH showed slightly acceleration on pollutants migration. The results provided the evidence that migration of pollutants might occur from plastics to sediment, and that chemical characteristics of pollutants and plastics are the factors determining the potential of migration.

WRE4076   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3858

Consolidating rural and water-scarce regions of emerging countries by reusing treated wastewater

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Abstract: Rural areas are generally characterized by agricultural land use and a low population density. Especially, in developing and emerging countries such regions often face the challenge of rural depopulation due to a lack of employment and access to basic infrastructural facilities (e.g. secure water supply and disposal). For instance, China, the most populous country in the world, with ever-increasing urbanization has to deal with this challenge. Approximately 90 % of Chinese villages have a lack of drainage channels and wastewater treatment facilities. Additionally, the effects of a worsening climate change such as increasing periods of drought will affect agricultural production. Nevertheless, China has to preserve the agricultural sector to feed its huge population. As agriculture is the greatest

global water user, with 70 % of available water required for this sector, reusing wastewater for irrigation is a possibility to contribute to food safety. In this context, China has by far the highest irrigation rates with untreated wastewater. As the use of treated wastewater in agriculture benefits human health as well as environmental and economic issues, water-reuse is becoming increasingly important. However, without the necessary "wastewater, and thus reuse water producers" like housing areas, there is not enough wastewater available that can be treated and provided for irrigation. Thus, a holistic water-reuse concept for rural areas could be developed. The case study of the city of Wuwei is taken into account to develop conceivable solutions. The city is located in a water-scarce region in northwest China. The region is also famous for growing fruits, vegetables and flowers. By implementing water-reuse, for instance, agricultural crops in horticultural tunnels can be irrigated with treated municipal wastewater. This drives the agricultural sector and will offer more jobs. This leads in turn to the development of new housing areas and hinders the rural depopulation.

Keywords: Water-Reuse Concepts; Rural Areas; Agricultural Sector; Rural Depopulation; Urbanization

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WRE4136   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE4021

Treatment of leachate with the ROC process for the recovery of drinking water and saleable products

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Abstract. South Africa is a water strained country. It is speculated on good grounds that the demand for water is already equal to or exceeds the supply. Acid mine drainage (AMD) from mining activities is a major environmental concern in South Africa as it requires neutralisation and desalination. Sludges generated during neutralisation are rich in metals such as Fe^{2+}, Fe^{3+}, Al^{3+}, Mn^{2+}, Co^{2+} and Ni^{2+} and must be handled as toxic waste. South African legislation requires that mine water should be treated to drinking water quality and ideally there should be zero-waste[1]. Sludge generated during desalination is often rich in $CaSO_4.2H_2O$ and $Mg(OH)_2$.

The ROC (Reverse Osmosis/Cooling) process was developed for treatment of mine water with the aim to overcome shortcomings such as scaling of the RO membranes with gypsum, problems with disposal of solids and brine waste streams and high treatment cost. In the ROC process, acidic or neutral mine water is treated with Na_2CO_3 and/or $NaOH$ and/or MgO in the pre-treatment stage to allow selective precipitation of metal compounds ($Fe(OH)_3$, $Al(OH)_3$, $CaCO_3$, MnO_2 and $Mg(OH)_2$). After pre-

treatment, the sodium-rich water is passed through a membrane stage to produce drinking water and brine. The brine has a sufficiently high TDS content to allow Na_2SO_4 crystallisation upon cooling[2,3].

The objectives of this study were to compare the feasibility of the ROC process when: (i) Na_2CO_3 and (ii) MgO are used for neutralization with the current situation where $Ca(OH)_2$ is used for neutralization prior to desalination.

Methods. The chemical dosage needed for removal of Fe^{3+} during the pre-treatment stage was determined by using: (i) Lime (conventional treatment) and (ii) Na_2CO_3 (ROC process). The *OLI ESP* software program was used to predict the water quality after raising the pH to 3.5 for Fe^{3+} removal and to pH 8.5 for removal of further metals.

Results. It was shown that only $Fe(OH)_3$ precipitated when Na_2CO_3 was used for raising the pH to 3.5. This offers the benefit that pigments can be produced from the $Fe(OH)_3$. In the case of lime neutralization both gypsum and $Fe(OH)_3$ precipitated. A feasibility study was carried out on Central Basin mine water (1000 mg/L Fe and 4 500 mg/L SO_4) when it is treated with Lime/RO and with the ROC process. In the case of lime pre-treatment the cost ($R22.29/m^3$) the value of the products ($R7.92 /m^3$ for water) by $R14.37/m^3$. It was found that the treatment cost in the case of Na_2CO_3 amounted to $R19.68/m^3$, i.e. less than the value of the products ($23.74/m^3$); ($R7.93/m^3$ for water; $R8.58/m^3$ for pigment; $R7.25/m^3$ for sodium sulphate). In the case of the ROC process the treatment costs can be covered by the value of the products (drinking water, pigment and Na_2SO_4 or $MgSO_4$). Water recovery amounted to 99% and the TDS of the treated water was less than 200 mg/L.

Conclusion. The ROC process can be used to treat AMD in a cost-effective way through recovery of drinking water and saleable products such as pigment and Na_2SO_4 or $MgSO_4$. A process configuration was proposed that will reduce the problems experienced with the current technologies used for neutralization and desalination.

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Keywords: Mine Water; Brine; Desalination

Transformations of oil pollutants in the membrane bioreactor depending on the operating parameters of activated sludge

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Abstract. The main and cheapest methods used for municipal wastewater treatment are biological methods, for example, activated sludge or bed bioreactor, but in the near future municipal wastewater will require different treatment. Various substances that are currently used at home make municipal wastewater a threat to the environment. Literature data shows that new anthropogenic pollutants contained in municipal wastewater may not be biodegradable and may still be found in treated wastewater as so-called refractive substances. These may degrade, but with the formation of more toxic products. They can also only adsorb onto the activated sludge flocs and in this way be removed from wastewater.

During the wastewater treatment by MBR, various phenomena can be observed, depending on whether one analyzes biodegradation on the basis of a decrease in the COD value or on the basis of a change in the content of specific organic pollutants. In the research on biodegradation of wastewater containing edible oil, raw wastewater, wastewater in the bioreactor and treated wastewater were analyzed and the indicators of organic pollution: COD, TOC, BOD_5 and long chain fatty acids (LCFA), determined.

The tests were carried out at F/M values in the range 0.25 - 0.33 $gBOD_5/g_{MLSS}$ and HRT 5 – 11 h. During wastewater treatment at the given F/M values, the following processes occur: wastewater components hydrolysis, degradation of the dissolved substrate by activated sludge and growth of microorganisms. With constant parameters of wastewater quality and their quantity, the final effect of treatment will depend on the time of contact of the microorganisms with the substrate.

During wastewater treatment, the best effects were obtained at the longest hydraulic retention time (HRT), i.e. 11 h, then the COD in the outflow was 50 mg/L and only palmitic acid appeared. For the shortest HRT, the COD in the outflow was 175 mg/L and all tested fatty acids appeared. Differences in bioreactor operation for individual HRT were found in the case of fatty acids. Although the COD ratio in MBR/COD in permeate was 1.5 at HRT 11 h and 1.8 at HRT 5 h, other fatty acids dominated in the wastewater taken from the bioreactor. At HRT 11 h, palmitic acid (<220 µg/L) and oleic acid (<200 µg/L) appeared most frequently, and at HRT 5 h it was palmitic acid (<370 µg/L) and linoleic acid (<400 µg/L).

Similarly, one can track the biodegradation of other pollutants from municipal wastewater, i.e. based on specific pollutants, e.g. drugs, cosmetics, etc.

Keywords: Wastewater Treatment; MBR; Long Chain Fatty Acids

WRE3809

A GIS-based multi-criteria decision framework for selecting suitable locations of sustainable flood retention basins at the watershed scale: The case of the upper subcatchments of the Butuanon river watershed

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Abstract. Sustainable flood retention basins (SFRBs) have gained popularity among planners and policymakers as a natural and sustainable approach to managing storm water runoff. However, there is a difficulty in selecting the most suitable locations for SFRBs at the watershed scale when considering several criteria. This paper proposed a decision framework by integrating analytic hierarchy process, geographic information system and rainfall-runoff modelling. This framework was applied to the upper subcatchments of the Butuanon River Watershed. Through the analytic hierarchy process, weights were assigned to five pre-selected criteria. Land use/land cover has the largest weight of 40.18%, followed by proximity to drainage line with 29.04%, watershed slope with 19.88%, infiltration capacity with 5.88% and soil type with 5.01%. Seven SFRB locations were identified after integrating the criteria weights to a geographic information system model. A rainfall-runoff model was developed for the study area and was rated with a Nash-Sutcliffe Efficiency (NSE) coefficient of 0.8449, a Root Mean Square Error-Standard Deviation Ratio (RSR) of 0.3938 and a Percent Bias (PBIAS) of -3.3686 during calibration and an NSE of 0.8948, an RSR of 0.3244 and a PBIAS of 8.2927 during validation. The SFRBs were integrated into the rainfall-runoff model and the resulting simulations showed that there is a decrease in peak discharge by approximately 22%, proving the effectivity of SFRBs in attenuating runoff. The decision framework provided a systematic and holistic approach that took into consideration several criteria such as land use/land cover, proximity to drainage line, watershed slope, infiltration capacity and soil type, as well as hydrological parameters such as peak discharge and runoff volume.

Keywords: Analytic Hierarchy Process; Geographic Information System; Rainfall-Runoff Modelling; Sustainable Flood Retention Basin

Session 3_ Climate and Ecological Environment

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WRE3703	Carbon sequestration potential in a lake-marsh wetland system facing climate change *Dr. Wuxia Bi, China Institute of Water Resources and Hydropower Research, China*
WRE3768	Evaluation of port unified efficiency based on RAM-DEA model for port sustainable development *Mr. Qiang Qi, Dalian University of Technology, China*
WRE3933	Typhoon wave modelling application for planning the harbor in Danang city, Viet Nam *Prof. Vo Ngoc Duong, Danang University of Science and Technology, Vietnam*
WRE3948 *(Invited Talk)*	Urban-biased land development policy and the urban-rural income gap: Evidence from Hubei Province, China *Prof. Tan Shukui, Huazhong University of Science and Technology, China*
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Abstracts of Session 3

WRE3697

Human and animal health risk posed by increased environmental selenium leached from karst coal deposits (Raša Bay, Adriatic Sea, Croatia)

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Abstract. The Raša Bay (north Adriatic Sea, Croatia) has been receiving inorganic and organic pollutants by inflowing streams laden with untreated coal mine wastewater discharges for decades. Local superhigh-organic-sulfur (SHOS) Raša coal is unique based on its anomalously high levels of S, Se, and U. The local area (some 600 km^2) has experienced adverse effects of SHOS coal mining, preparation, combustion, waste storage, and transport in the past. Soil is severely polluted with S (up to 4.00%), Se (up to 6.80 mg/kg), Cd (up to 4.70 mg/kg), U (up to 25 mg/kg), and PAHs (up to 13,500 ng/g). Moreover, they were found to be increased in sediment, surface water, locally grown vegetables, and local birds. Decreased Se values in a coal-combustion waste, exposed to rain, indicates on potential leaking problems. Namely, the study area belongs to vulnerable karst environment which promotes Se mobility due to high Eh/pH conditions. Marine coastal systems are particularly vulnerable to contamination transported and discharged by inflowing rivers. Moreover, the study area is vulnerable karst which is highly susceptible to pollution due to its complex hydrodynamics and low filtration capacity. Hereby, the aim of my study is to evaluate an impact of karst groundwater circulation patterns on uranium and selenium hydrogeochemistry. Additionally, the content of selenium in the local environment, food, and animals, constantly under the influence of Raša coal, will be investigated. The study will primarily determine the content of selenium (and other elements) in the tissues of wild birds, as well as eating habits of the local population to determine the possible adverse effect of increased concentrations of selenium in food on the health of consumers. Field-work will be conducted on water discharges from closed Raša coal mines which still host some 4 million tons of coal. Potential health

risks and the negative impact of both elements on human health are well documented in the literature. Coal is one of the significant sources of the two contaminants. Therefore, we will systematically investigate their behaviour and fate through a hydrogeochemical research. The study could have long term implications on canon of knowledge about the relevant research on metal(loid)s' (S, Se, U) cycles in natural water. The topic has not been addressed at all in terms of the study locality, partly due to analytical difficulties and lack of expertise, and partly due to a long period of restrictive regime in publishing papers on the problem of radioactivity in Croatia prior to 1990. The access to the locality was forbidden as certain horizons of SHOS coal were so radioactive that the Raša coal was planned to be exploited as a resource of uranium for nuclear power plants. This research will reveal levels of elements (primarily selenium) in tissues of wild birds and plant foods; based on eating habits of the local population, it will be possible to draw concrete conclusions about the possible adverse effects of the studied elements on their health.

Keywords: Coal; Selenium; Pollution; Birds; Food; Health, Risk Assessment

WRE3703   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3768   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3933   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3948

Urban-biased land development policy and the urban-rural income gap: Evidence from Hubei Province, China

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[2] *College of Public Administration, Huazhong University of Science and Technology, Wuhan, China*
[3] *School of Public Administration, China University of Geosciences, Wuhan, China*
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Abstract. Developing countries generally face the challenge of significant urban-rural divides during their process of industrialization and urbanization. Following the paradigm of the theory of urban bias (TUB), this article focuses on the urban-biased land development policy (UBLDP) in contemporary China, which refers that local governments expropriate rural land with the inadequate compensation and use a considerable share of net land revenue to develop urban areas instead of rural areas. On the basis of pointing out three practical facts about and proposing the technique to measure the UBLDP, its influence on the urban-rural income gap (URIG) is investigated by employing the GMM dynamic model along with panel data from Hubei Province over the period of 2010-2016. The results show that a 1% increase in the extent to which compensation deviates from the market value of expropriated rural land (ERL) leads to a 0.46% increase in the URIG, while this effect is attributed to an unbalanced urban-rural income growth associated with the land development. These findings not only generate a

broad of direct implications for Chinese policymakers but also provide lessons for other developing countries.

Keywords: Theory of Urban Bias; Urban-Biased Land Development Policy; Urban-Rural Income Gap; Dynamic Panel Model; Hubei Province; China

WRE4032   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE4044

Driving Microbial Sulfur Cycle for Phenol Degradation Coupled with Cr(VI) Reduction via Fe(III)/Fe(II) Transformation

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Abstract. The study presented here utilized magnetite as an Fe(III) source to enrich the chemolithotrophic sulphur-oxidizing bacteria to proceed the oxidation of elemental sulphur to sulphate, and further drove the whole sulphur cycle. The results showed that, under the low-concentration sulphate conditions, the performances of Cr(VI) reduction and phenol degradation in the reactor with magnetite were significantly higher than that without magnetite. EDX and XPS analysis showed that the content of sulphur in the aggregates without magnetite was lower than that with magnetite, suggesting the loss of elemental sulphur transformed from the sulphide. Conversely, in the presence of magnetite, the special enrichments, Thiobacillus species, proceeded the oxidation of elemental sulphur to sulphate, lowering the loss of sulphur.
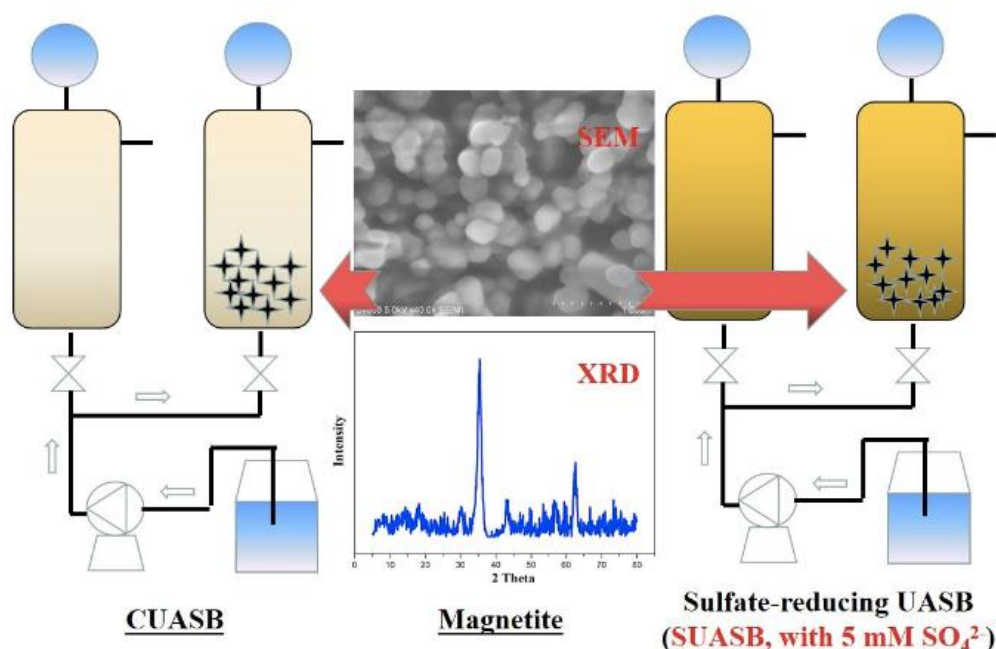
Keywords: Microbial Sulphur Cycle; Sulphur-reducing Bacteria (SRB); Fe(III)/Fe(II) Transformation

WRE4063   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

Atmospheric forcing of the upper ocean transport in the Gulf of Mexico: From seasonal to diurnal scales

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Abstract. The 2010 Deepwater Horizon oil spill in the Gulf of Mexico (GoM) was an environmental disaster, which highlighted the urgent need to predict the transport and dispersion of hydrocarbon. Although the variability of the atmospheric forcing plays a major role in the upper ocean circulation and transport of the pollutants, the air-sea interaction on various time scales is not well understood. This study provides a comprehensive overview of the atmospheric forcing and upper ocean response in the GoM from seasonal to diurnal time scales, using climatologies derived from long-term observations, in situ observations from two field campaigns, and a coupled model. The atmospheric forcing in the GoM is characterized by striking seasonality. In the summer, the time-average large-scale forcing is weak, despite occasional extreme winds associated with hurricanes. In the winter, the atmospheric forcing is much stronger, and dominated by synoptic variability on time scales of 3–7 days associated with winter storms and cold air outbreaks. The diurnal cycle is more pronounced during the summer, when sea breeze circulations affect the coastal regions and night-time wind maxima occur over the offshore waters. Realtime predictions from a high-resolution atmosphere-wave-ocean coupled model were evaluated for both summer and winter conditions during the Grand LAgrangian Deployment (GLAD) in July–August 2012 and the Surfzone Coastal Oil Pathways Experiment (SCOPE) in November–December 2013. The model generally captured the variability of atmospheric forcing on all scales but suffered from some systematic errors.

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New mathematical approach of the regional precipitation estimation

Alina Barbulescu
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Abstract. Rainfall estimating is important for flood forecasting, water balance computation, water resources and drought management. Estimating, modeling and predicting the precipitation evolution are of practical importance, especially in arid regions. Geostatistics offers a range of methods to estimate the precipitation at regional scale, but sometimes these methods require additional data that are not always available or very complicated algorithms. In this context, we present new approaches for estimating the regional precipitation evolution - the Most Probable Precipitation Method (MPPM) and its versions - easy to implement and use. The results are compared to the ordinary kriging, IDW and Thiessen polygons method on different case studies.

Keywords: MPPM; Precipitation; Regional; Trend

WRE4103   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE4075

Modelling salt transport at estuary under climate change - a case study Ve River, Quang Ngai Province

Long Bui Ta and Diep Thi My Le
Hochiminh City University of Technology, Vietnam

Abstract. The coastal area selected for this study is located in Quang Ngai Province, Vietnam. Thanks to nature's advantages and favorable geographic location, this area is experiencing relatively fast economic growth. However, in recent years, due to the impacts of climate change, saline intrusion in this area has been complicated, so this is the subject of some research projects. Although the mechanism of saline intrusion is very important for the ecological environment and water supply, their process is difficult to be assessed. Due to the limited observation time, as well as the influence of other factors, research by mathematical models is an important way to gain knowledge on this issue.

In the study, a modelling simulation of the river mouth is used to evaluate the extent and level of saline intrusion for both current situation and the climate change scenario. The novelty is the system of SWAT / NAM / MIKE 21 HD models was used to establish hydrological and hydrodynamics parameters suitable to the study area. To simulate saline transport, field measurements have been carried out, based on which validation of saline simulation results has been verified. From that, calculating saline prediction based on published climate change scenario of Vietnam Ministry of Natural Resources and Environment for the study area.

Keywords: Saline Intrusion; Hydrodynamics; Mike21; Climate Change; Coastal Area

WRE4159

4-Dimensional Rain Index (4DRI) against drought and flood

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Abstract. This study is recommended to everybody who starts any research activities that related with water amount and its distribution. The weaknesses of current water indexes (Drought index and flood index) are pointed out. Also, the weaknesses of current heavy rain warning systems each country are pointed out. As a solution, a revolutionary technique for water amount problems is suggested with whole related information. Summing up the Rainfall amount with the time dependent reduction function and using the sliding time scale are treated as the main technique. Additionally, many example studies that used the spatiotemporal distribution of the water resources are reviewed simply.

WRE4106   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

Dynamics of inorganic components in lacustrine ecosystems from Terra Nova Bay, Antarctica

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Abstract. Antarctica is one of the most pristine places on our Planet, where natural background levels of the elements can still be determined. The element distribution in the separate components of the Antarctic ecosystem represents the result of natural processes. The determination of element concentrations in different Antarctic lacustrine components for a relatively long period of time allows us to detect whether this ecosystem is polluted from human activities or, conversely, to confirm the absence of local and/or global anthropogenic contamination in the Antarctic areas investigated, to understand the biogeochemical cycle of the elements in this ecosystem and identify the baseline concentrations in these compartments. For these reasons, we have studied different Antarctic lacustrine matrices in several projects within the framework of the Italian National Antarctic Research Program. In particular, we have determined the element composition in water, sediment, algae and suspended particulate matter samples in six shallow Antarctic lakes located in Terra Nova Bay, namely Carezza, Edmonson Point 14 and 15a, Inexpressible Island, Tarn Flat and Gondwana, and in moss and soil samples collected near the these lakes.

In these studies, we found that the lake water composition is mainly influenced by sea spray and lake geographical position and partially by meltwater input. The lacustrine sediments and soils sampled around the lakes show a similar mineralogical and chemical composition, as evidence that rock- and soil-weathering processes occur only during the warm summer periods, when the lakes are partially ice-free. Finally, trace element levels, mainly those of heavy metals, are very low and this can be considered a confirmation of absence of local and global anthropic contamination due to metal ions. Our results represent new important data about metal concentrations in lacustrine systems in Antarctica, furnishing ranges of values that can be considered as a reference. These data, therefore, could be used to detect or monitor future local and/or global anthropogenic contaminations.

Keywords: Lacustrine Waters; Suspended Particulate Material; Lake Sediments; Terra Nova Bay (Antarctica); Elements; Pattern Recognition

WRE3989   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

Uncertainty quantification of inundation damage estimation for urban flood risk management

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Abstract. The study presents a method to quantify the uncertainty associated with inundation damage data for an urban catchment when undertaking stormwater drainage design and management. Usually flood damage is estimated by multiplying the inundated asset value by the damage rate corresponding to the inundation depth. Figure 1 shows an example of inundation depth – damage rate relation for the household articles of a private house as a logistic curve on the basis of a national government survey. The scatter of the data around the estimated curve that means the uncertainty of the damage rate can be represented by using a suitable probability distribution. The uncertainty of the damage rates and the asset values are described by probability distributions estimated from an analysis of actual flood damage data from the national government survey. With the presence of uncertainty in damage rate and asset value, the damage potential curve defining the damage-frequency relationship is no longer a deterministic single-valued curve. Through Monte Carlo simulation which incorporates the uncertainty of the inundation damage from the damage rate and asset value, a probabilistic damage potential relation can be established which can be expressed in terms of a series of curves with different percentile levels. The method is demonstrated through the establishment of probabilistic damage potential curves for a typical urban catchment, the Zenpukuji river basin in the Tokyo Metropolis, under two cases, namely, with and without a planned flood control reservoir.
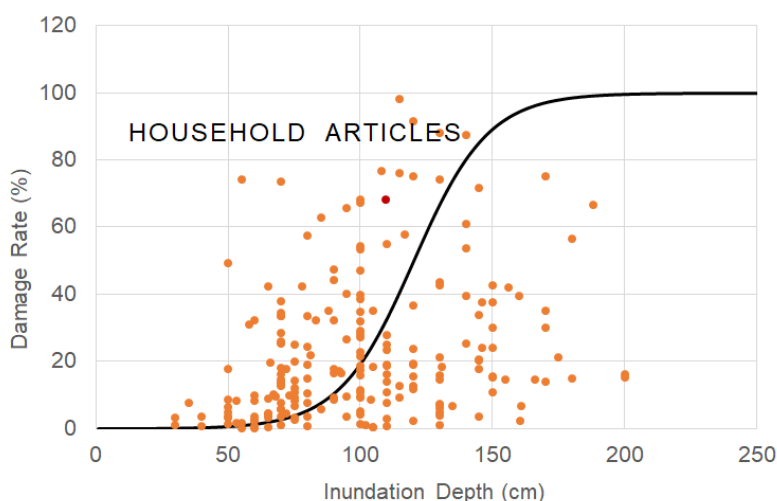
Figure 1 An example of inundation depth – damage rate curve

Keywords: Uncertainty; Asset Values, Damage Rates; Monte Carlo; Probabilistic Flood Damage Curves

WRE3802

Assessment of physical and economic coastal vulnerability of South Asia

Komali Kantamaneni
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Abstract. Coastal environments are specifically vulnerable to the effects of natural disasters; partly due to rapid urbanisation and related economic activities such as agriculture, aquaculture, tourism, industries, trades and transportation. In the current scenario, the environmental stresses on coastal

zones are increasing considerably in terms of physical, social and economic variables. Accordingly, this study examines coastal vulnerability factors and their influence along the South Asian coastal region. South Asia has been exposed to frequent natural disasters and diverse hazards due to variations in the geographical, geological, and bathymetric features. The current research analyses the drivers and effects of hazards and vulnerabilities in South Asia in both physical and socio-economic perspectives. The findings will be useful for stakeholders seeking to reduce or ameliorate the impact of hazards and coastal disasters and their impacts on the South Asian economy, environment, and population.

Part IV Poster Sessions

Poster Presentation Preparation

- There is no size constraint for the e-poster, if you have difficult to decide one, then A1 size (594mm×841mm) is recommended.
- Please send the poster at **.PDF** format. The Poster would be updated on the conference website after pre-review and confirmation.
- The Poster could design as you like with requirements as below:
    - ✧ The conference logo should be clearly shown in the header
    - ✧ Title, presenter, and affiliation information should be well indicated;
- Signed and stamped electronic presentation certificate would be issued via e-mail after the presentation is delivered.

Best Poster Presentations Selection

One best Poster presentations will be selected based on the "**Votes**" received on the website;
This award consists of a certificate and free attendance to WRE2021.

Selection Criteria
- ✓ Research Quality
- ✓ Poster Design

Selection Procedure
- All poster presentations will be updated on the conference website
- Audience could select best poster presentations by clicking "**Vote for the Best Presentation**", and vote from the same IP would be counted only one time for each poster presentation;
- Three poster presentations will be selected based on the number of "**Votes**" till September 5th, 2020.
- Conference General Chair will choose the best poster presentations among the three selected posters, and results will be demonstrated on the website on September 8th, 2020.

List of Posters

Please Click Paper ID to Access the Poster Presentation.

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WRE3880	Mercury distribution in liver and digestive gland in blue shark caught in Sagami Bay and cephalopods in East China Sea *Dr. Miho Tanaka, Tokyo University of Marine Science and Technology, Japan_*
WRE3881	Determination of ultratrace concentration of chromium(VI) using electrospray

	ionization-mass spectrometry *Ms. Miu Muto, Tokyo University of Marine science and Technology, Japan*
WRE3882	Development of determination method for trace concentration of ferrous ion using Electrospray Ionization-Mass Spectrometry *Mr. Kyohei Oda, Tokyo University of Marine Science and Technology, Japan*
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WRE4087	Pollution source localisation in a simple river branch *Dr. Marek Sokáč, Institute of Hydrology, Slovak Academy of Sciences, Slovakia*
WRE4127	Application of remote sensing to estimate river sediment transport in the Calabrian basins (Italy) *Prof. Giuseppe Barbaro, Mediterranea University of Reggio Calabria, Italy*
WRE4015	Cr(VI) ion adsorption behavior of polyethylene plates grafted with methacrylamide and 2-(dimethylamino)ethyl methacrylate in the two-step process *Mr. Yoshinori Kitao, Nihon University, Japan*
WRE3901	Study of effects of downhole conditions on the setting time and compressive strength of MOS settable system by orthogonal experimental design *Mr. Kaixiao Cui, China University of Petroleum, China*
WRE4129	Assessing the effect of different topographical data sources on the accuracy of 2-D flood modelling: a study in downstream of Kelani basin, Sri Lanka *Mr. A.C. Aslam Suja, University of Moratuwa, South Easter University, Sri Lanka*
WRE4020	Facies distribution of borehole DC01 in the west coastal plain of Bohai Bay since MIS3 using clayey water electric conductivity and grain size analysis *Miss Liping Zhang, Tianjin Normal University, China*

Abstracts of Posters

WRE3830   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE3880

Mercury distribution in liver and digestive gland in blue shark caught in Sagami Bay and cephalopods in East China Sea

Miho Tanaka[1], Hitomi Kazama[1], Yoshitaka Yamaguchi[1], Yono Harada[1], Naoki Kaneko[2], Hiroyuki Mizushima[2], Kotaro Tsuchiya[1], Masao Nemoto[1], Yuichi Takaku[3], Yu Vin Sahoo[4]
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Abstract. The toxicity of mercury (Hg), is generally known, and around 90% of Hg exist as methylmercury in the marine organism. Mercury concentrates in sharks and whales, which are at the top of the food chain as predators to squids and cuttlefishes. In addition, Hg is known to be accumulated not only in the digestive gland but also the muscle of sharks and large fishes. In addition, when selenium (Se) coexists with Hg in the digestive gland, Se enhances the detoxification function of methylmercury. Biologically, squids and cuttlefishes have different characteristics from sharks and whales. The concentrations of Hg in the liver and muscle of blue shark, caught in Sagami Bay in Kuroshio and in the digestive glands and mantles of *Todarodes pacificus*, *Sepia madokai,* and *Uroteuthis edulis* caught in East China Sea were measured and analyzed. Hg in the liver and the muscle of the shark were less than 500 ppb. And the Hg concentrations in the sharks, squids, and cuttlefishes were almost same as those in the other sea regions. In addition, the Hg concentration in the blue shark was higher in the muscle than in the liver. This description is explained by the fact that amino acids with the thiol groups and 'myosin' present in the liver enhance the stability of Hg. In *S. madokai* and *U. edulis*, Hg was accumulated in the digestive glands but not in the mantles. Although the Hg concentration in the digestive gland of *T. pacificus* was lower than those of *S. madkai* and *U edulis*, Hg concentration in the mantle was critically higher. The amount of Hg in the digestive gland of *T. pacificus* might be too large to store; thus, Hg is released to the mantle, whereas the nutrients in the digestive gland of *T. pacificus* are supplied to the gonads. It is considered that the muscle fiber of *T. pacificus* is strong; therefore, large amount of amino acids containing thiol groups and/or slightly higher "myosin" levels may be present in *T. Pacificus* than in *S. madokai* and *U. edulis*.

Keywords: Mercury; Distribution; Liver; Digestive Gland; Squid

WRE3881

Determination of ultratrace concentration of chromium(VI) using Electrospray Ionization-Mass Spectrometry

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[2] *Academic Research Institute, Tokyo University of Marine science and Technology, Japan*

Introduction. Chromium(VI)(Cr(VI)) in wastewater is one of the high toxic heavy metal ions, therefore, risk management is important. Diphenylcarbazide (DPC) absorption spectrophotometry is the official method for the determination of Cr(VI). However, this method has two problems, one is that accurate determination values cannot be obtained in solution with coexisting ions such as Cr(III) and iron(III) (Fe(III)). The other is that, it is difficult to measure concentration less than the values of tap water quality standard (0.05 mg/L, 1 µmol/L (µM)). Electrospray ionization mass spectrometry (ESI-MS) was used to measure Cr(VI) directly. The chemical species can be ideinfied by mass-to-charge ratio (*m/z*). Cr(VI) is separately determined from other chemical species as for the oxo acid ($[CrO_4]^{2-}$, $[HCrO_4]^-$), it can be stably soluble in the solution without depending on pH. With these backgrounds, by measuring the pH-controlled Cr(VI) solution by ESI-MS, the detection method of less than 1 µM is possible.

Experiment. The reagents, chromium oxide CrO_3 (Kanto Chemical Co. Inc.), tetramethyl ammonium hydroxide TMAH (Tama Chemical Industry Co. Ltd.), ultrapure water (18.2 MΩ) was used. Three

experiments were prepared: (1) [Cr] = 1 mM, pH 3.4, 3.6, 6.2, 7.2, (2) [Cr] = 0, 20, 25, 27, 47 µM (around pH 7), (3) [Cr] = 0, 0.1, 0.2, 0.5 µM (around pH 7). These solutions were measured with ESI-MS (SHIMADZU, LCMS-2010A and JEOL, JMS-700). ESI system of LCMS-2010A is a quadrupole-type detector, and that of JMS-700 is a sector type.

Results and Discussion. Experiment (1) Cr(VI) was mainly detected in the form of $[HCrO_4]^-$ (*m/z* 117) by ESI-MS (LCMS-2010A) at pH 7. Whereas the same species together with $[HCr^{VI}O_4Cr^{III}O_2]^{2-}$ (*m/z* 100.5) were detected by ESI-MS (JMS-700) at pH 7. By adjusting the pH 7 and measuring with LCMS-2010A, a good calibration curve with *m/z* 117 could be obtained.

Experiment (2) A linear calibration line for CrO_3 in solution, by ESI-MS (LCMS-2010A) was obtained up to 20 µM. Therefore, the detection limit was above the tap water quality standard.

Experiment (3) Using JMS-700, $[HCrO_4]^-$ (*m/z* 117) and $[HCr^{VI}O_4Cr^{III}O_2]^{2-}$ (*m/z* 100.5) were detected. The ratios of *m/z* 100.5 to *m/z* 117 were independent at several Cr(VI) concentrations. A calibration curve using *m/z* 117 was obtained (R^2 = 0.9981), and the detection limit was 0.004 µM. This concentration was almost of 1/10 of the tap water quality standard (1 µM), with sufficient counts per seconds. In this experiment, $[HCr^{VI}O_4Cr^{III}O_2]^{2-}$ (*m/z* 100.5) was also detected because Cr(VI) received electrons and was deoxidised when an ionization voltage was applied by the ESI-MS probe. The precise determination with mass resolution of less than 1 was not obtained and the species of *m/z* 100.5 could be identified as not only $[HCr^{VI}O_4Cr^{III}O_2]^{2-}$ but also $[Cr^{V}O_3]^-$. At least Cr(VI) was classified in two species using JMS-700. To improve this problem, we suggest two possibilities: the use of diphenylcarbazide for chelating Cr(VI), and the other is the improvement of detection condition by the decreasing the ionization voltage of ESI-MS. By these methods, it should be effective to create a more accurate calibration curve reducing the species at *m/z* 100.5.

Keywords: Chromium; ESI-MS; Determination

WRE3882

Development of determination method for trace concentration of ferrous ion using Electrospray Ionization-Mass Spectrometry

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[2]Academic Research Institute, Tokyo University of Marine Science and Technology, Japan

Introduction. Ferrous ion (Fe(II)) plays important roles in marine environmental organisms such as seaweed, and its primary production in coastal areas. River water is regarded as one of the major source of Fe(II) in coastal areas. We investigated the determination method of Fe(II) dissolved in river and seawater, using electrospray ionization mass spectrometry (ESI-MS; JMS700, JEOL). The chemical species are identified by preserving the dissolving state using soft ionization method with high sensitivity. 1,10- phenanthroline (phen) and $FeCl_2$ were dissolved in water, and the aqueos solution was measured by ESI-MS. The peaks of $[Fe(phen)_2]^{2+}$(*m/z* 208) and $[Fe(phen)_3]^{2+}$(*m/z* 298) were identified. A calibration line using these two species areas were obtained (R^2=0.9992) with detection limit (3.3σ/slope) with 13 nmol/L(nM). In seawater sample, Fe(II) ionization in ESI-MS is difficult

due to high concentration of salts. We have thus atempted to solve this problem by developing a method for Fe(II) determination using solvent extraction.

Experiment. <u>Extraction of Fe(II) complex using organic solvent</u>: In the first step, to prevent the oxidation of Fe(II) to ferric ion (Fe(III)), Fe (II) in samples were chelated with phen and ferrozine. Next, to eliminate the salt in seawater and to concentrate the Fe(II) ions, we examined the solvent extraction method under various conditions, and nitrobenzene was selected as the organic solvent, and phen as the chelating reagent. In addition, to increase extraction rates of Fe(II), sodium perchlorate ($NaClO_4$) was added to the aqueous phase as a counter ion of the Fe(II); but in the case of seawater, $NaClO_4$ was not necessary.

<u>Calibration line of Fe(II)-phen complex using nitrobenzene</u>: Solutions used for calibration line was prepared by diluting $FeCl_2$ and phen dissolved in nitrobenzene(NB). In order to determine the Fe(II) in river and sea water, a calibration line with high concentrations with these reagents were to be used. The NB solutions with 50 µM of phen were contained in Fe(II) concentration 0, 0.0076, 0.076 and 0.76 µM, respectively. Calibration line were obtained by determining the intensity of Fe(II) species in these solutions using ESI-MS.

Result and discussion. <u>Extraction of Fe(II) complex using organic solvent</u>: The Fe(II) species in NB solution was measured by ESI-MS, and the peaks of $[Fe(phen)_2]^{2+}$(*m/z* 208), $[Fe(phen)_2\text{-}NB]^{2+}$(m/z 270), and $[Fe(phen)_3]^{2+}$ (*m/z* 298) were identified. $[Fe(phen)_2\text{-}NB]^{2+}$(*m/z* 270) is formed with $[Fe(phen)_2]^{2+}$(*m/z* 208) and NB in gas phase.

<u>Calibration line of Fe(II)-phen complex using nitrobenzene</u>: Since the species $[Fe(phen)_2\text{-}NB]^{2+}$(*m/z* 270) and $[Fe(phen)_3]^{2+}$(*m/z 298*) detected in the NB solution were close to value of *m/z*, these peak areas were equivalent to the abundance. A calibration line using the areas of these two species were obtained (R^2=0.9991) with a detection limit of 17.6 nM. The detection limit 17.6nM using solvent extraction was higher than 13 nM prepared in aqueous solution. By this method, the sample containing seawater could be removed in organic phase. Therefore, we expect that the concentration of Fe(II) below the detection limit can be determined and seawater samples should be applied.

Keywords: Iron; Ferrous Ion; 1,10-Phenanthroline; ESI-MS; Solvent Extraction; Nitrobenzene

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WRE4087   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE4127   To avoid repeatability issue, this abstract will be available after the full paper is published in the conference proceedings.

WRE4015
Cr(VI) ion adsorption behavior of polyethylene plates grafted with methacrylamide and 2-(dimethylamino)ethyl methacrylate in the two-step process

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Abstract. Studies on removal of Cr(VI) from aqueous medium have been widely investigated due to strong oxidative activity and high toxicity to many living organisms. The adsorption process is well-known as a method for removal of Cr(VI) ions for operational advantages, particularly such as low cost and high removal efficiency. Our previous study reported that the Cr(VI) ion adsorption capacity of polyethylene (PE) plates photografted with 2-(dimethylamino)ethyl methacrylate (DMAEMA) was comparative to or higher than those of other adsorbents [1]. In the next step, here, a novel polymeric adsorbent was prepared by the two-step grafting of methacrylamide (MAAm) and DMAEMA, and the increment in the adsorption capacity of the PE plates two-step grafted with MAAm and DMAEMA, that is, (PE-g-PMAAm)-g-PDMAEMA plates was investigated in detail. Figure 1 shows the time courses of the adsorbed amount for a PE-g-PDMAEMA (G_{DMAEMA} = 8.0 µmol/cm^2), a PE-g-PMAAm (G_{MAAm} = 10 µmol/cm^2), and a (PE-g-PMAAm)-g-PDMAEMA plates (G_{MAAm} = 10 µmol/cm^2 and G_{DMAEMA} = 8.0 µmol/cm^2) immersed in a 0.20 mM $K_2Cr_2O_7$ solution at pH 3.0 and 30°C. Cr(VI) ions were little absorbed on the PE-g-PMAAm plate. On the other hand, the adsorbed amount of the PE-g-PDMAEMA and the (PE-g-PMAAm)-g-PDMAEMA plates increased with the immersion time, and the adsorption capacity of the (PE-g-PMAAm)-g-PDMAEMA plate was higher than that of the PE-g-PDMAEMA plate. The formation of the intermediate grafted layer of PMAAm is considered to lead to the increase in the Cr(VI) ion adsorption. The Cr(VI) ion adsorption behavior obeyed the pseudo second-order kinetic model and fitted to the Langmuir isotherm. This can suggest that the adsorption of Cr(VI) ions to the (PE-g-PMAAm)-g-PDMAEMA plates occurs through an electrostatic interaction between protonated dimethylamino groups and hydrocromate ions [2]. In addition, Cr(VI) ions were successfully desorbed in eluents such as NaCl, NaCl containing NaOH, NH$_4$Cl, NH$_4$Cl containing NaOH, and NaOH and (PE-g-PMAAm)-g-PDMAEMA plate were repeatedly used without loss of the adsorption-desorption ability.
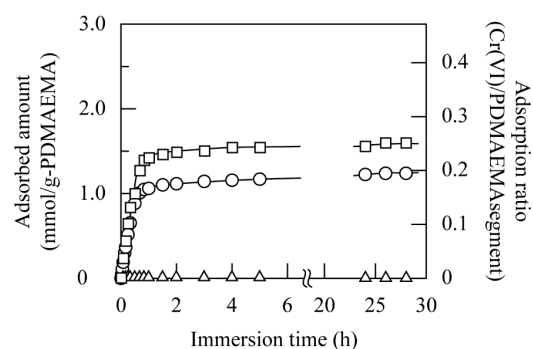
Figure 1 The time courses of the adsorbed amount for a PE-g-PDMAEMA (G_{DMAEMA}= 8.0 µmol/cm^2 : ○), a PE-g-PMAAm (G_{MAAm}= 10 µmol/cm^2 : △), and a (PE-g-PMAAm)-g-PDMAEMA plates (G_{MAAm}= 10 µmol/cm^2 and G_{DMAEMA}= 8.0 µmol/cm^2 : □) immersed in a 0.20

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Keywords: Two-Step Photografting; Polyethyelne; 2-(dimethylamino)ethyl methacrylate; Hexavalent Chromium; Adsorption; Desorption

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Below are the lists of the Technical Program Committee members. For those who contribute to the success of the conference organization without listing the name here, we would love to say thanks as well.

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