

SeCURE

Saltwater intrusion and climate change: monitoring, countermeasures and informed governance

Deliverable 3.3.4 – Thematic seminar on coastal
salinization

July 2023 – Final version

Contributing partners:

LP – UNIPD, PP1 – CNR-IGG, PP3 – UNIST, PP4 – DUNEA, PP5 – PIDNC, PP6 – CW

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1. Introduction

PPs (UNIPD, CNR-IGG, and UNIST) organized a session at the EGU General Assembly 2023 that was held in Vienna between April 23 and April 28, 2023. Another important event has been organized by the Croatian PPs (UNIST, DUNEA, PIDNC, CW) in Zagreb on February 22, 2023.


2. EGU 2023 session on saltwater intrusion

LP, PP1 and PP3 have planned and contributed to organize the session “HS8.2.6 Integrating understanding across the land-ocean continuum: multidisciplinary approaches to studying saltwater intrusion and submarine groundwater discharge” at the EGU General Assembly in Vienna (<https://www.egu23.eu/>). A print screen of the session abstract and conveners visible at the assembly website is shown in Fig. 1.

It must be noted that SeCure has favored the direct involvement in the session organization and management of three female ECSs (early career scientists) from LP (Ester Zancanaro), PP1 (Marta Cosma), and PP3 (Iva Aljinović).

HS8.2.6
[Integrating understanding across the land-ocean continuum: multidisciplinary approaches to studying saltwater intrusion and submarine groundwater discharge](#) ▶

Coastal aquifers are transitional zones that play a vital role not only providing water resources for coastal societies, but also controlling the exchange of water and chemical constituents between land and ocean and thus influencing coastal marine ecosystems. Traditionally, they have been approached by two different scientific communities, one which focuses on the sustainability of water resources and is particularly interested in sea water intrusion (SWI), and another which focuses on fluxes of solutes supplied by groundwater to the coastal ocean, i.e. submarine groundwater discharge (SGD). As a result, the understanding of the bidirectional groundwater-seawater fluxes is often partial and/or limited. Nevertheless, recent technological, methodological and knowledge advances (e.g. new (hydro)geophysics and (micro)biological approaches, improved (bio)geochemical analytical capabilities, development of new sensors and modelling tools) have allowed scientists to monitor and approach these coastal systems in comprehensive and integrative manner as never before. This session aims to bring together multiple disciplines and perspectives on coastal aquifers. We solicit studies involving SWI, SGD, or both, in order to advance a broad conceptual framework of groundwater in the land-ocean continuum, quantify the dynamic biogeochemical processes and model mechanisms and factors driving freshwater-saltwater dynamics that occur across local to regional scales; from the vadose zone to aquifer systems and submarine groundwater discharge. A better understanding of SWI and SGD from hydrogeologic and oceanographic perspective can help improve management of coastal groundwater and ecosystems and assess its current and future global importance.

Share: <https://meetingorganizer.copernicus.org/EGU23/session/46604> 












Convenor: Albert Folch Q | Co-conveners: Audrey Sawyer Q, Valentí Rodellas Vila Q, Holly Michael Q, Ester Zancanaro^{ECS} Q, Marta Cosma^{ECS} Q, Iva Aljinović^{ECS} Q 

Fig. 1 – Abstract and conveners of the HS2.8 session at EGU 2023 (<https://meetingorganizer.copernicus.org/EGU23/session/46604>).

2.1 Thematic session schedule

The thematic session on coastal salinization issues took place on Tuesday, 25 April 2023 and Wednesday, 26 April 2023 (Fig. 2) at the European Geosciences Union 2023 meeting (EGU2023) held in Vienna. PPs convened the session in collaboration with several international colleagues, including: Albert Folch (Universitat Politècnica de Catalunya), Audrey Sawyer (Ohio State University), Valentí Rodellas Vila (Universitat Autònoma de Barcelona), and Holly Michael (University of Delaware) and include both virtual and on site presentations in oral and poster formats (Fig. 2).

Convener: Albert Folch  | Co-conveners: Audrey Sawyer , Valentí Rodellas Vila , Holly Michael ,
Ester Zancanaro  , Marta Cosma  , Iva Aljinović  





▶ **Orals** | Tue, 25 Apr, 14:00–17:55 (CEST)  Room B, Wed, 26 Apr, 08:30–10:10 (CEST), 10:45–12:20 (CEST)  Room B
▶ **Posters on site** | Attendance Wed, 26 Apr, 16:15–18:00 (CEST)  Hall A
▶ **Posters virtual** | Wed, 26 Apr, 16:15–18:00 (CEST)  vHall HS

Fig. 2 – Thematic session conveners and schedule
(<https://meetingorganizer.copernicus.org/EGU23/session/46604>).

2.2 Thematic session program

The thematic session program included a total of 61 scientific communications, of which 35 were oral presentations and 26 were poster presentations, both on-site and virtual. This session aimed to bring together multiple disciplines and perspectives on coastal aquifers. Studies involving sea water intrusion (SWI), submarine groundwater discharge (SGD), or both, were solicited, in order to advance a broad conceptual framework of groundwater in the land-ocean continuum, quantify the dynamic biogeochemical processes and model mechanisms and factors driving freshwater-saltwater dynamics that occur across local to regional scales; from the vadose zone to aquifer systems and submarine groundwater discharge. A better understanding of SWI and SGD from hydrogeologic and oceanographic perspective could help improve management of coastal groundwater and ecosystems and assess its current and future global importance.

Main topics of the communication included: seawater intrusion, fresh groundwater offshore, submarine groundwater discharge, and dynamics, characterization and biogeochemical processes of coastal groundwater.

Session also welcomed three solicited speakers, Jiu Jimmy Jiao (Professor of Hydrogeology, The University of Hong Kong), Gualbert Oude Essink (senior hydrogeologist at Deltares and associate professor at the Utrecht University) and Alicia Wilson (Professor of Hydrogeology, University of South Carolina). The detailed programme of oral and poster communications can be found hereafter.

2.2.1 Oral presentations

The session was divided in four time-blocks for oral presentations (Fig. 3 - Fig. 6).


14:00–14:05	5-minute convener introduction
14:05–14:25 EGU23-10443 solicited On-site presentation	Evolution of the groundwater system in the northern continental shelf of South China Sea since Late Pleistocene Jiu Jimmy Jiao, Chong Sheng, ShengChao Yu, and Xin Luo
14:25–14:35 EGU23-9399 On-site presentation	COST action (OFF-SOURCE, CA21112)- Offshore Freshened Groundwater: An unconventional water resource in coastal regions? Wei-Li Hong, Aaron Micallef, Claudia Bertoni, Michela Giustiniani, Katrin Schwalenberg, Ariel Thomas, Elizabeth Quiroga-Jordan, and Hiba Wazaz
14:35–14:45 EGU23-4573 On-site presentation	How long can offshore fresh groundwater support onshore abstractions? Connor Cleary, David Dempsey, and Leanne Morgan
14:45–14:55 EGU23-15503 On-site presentation	Numerical investigation of offshore freshened groundwater reservoirs in the East China Sea Ariel Thomas, Shuangmin Duan, Zhihui Zou, and Aaron Micallef
14:55–15:05 EGU23-13371 On-site presentation	Ecosystem services derived from SGD: a perspective from traditional and academic knowledge in Mediterranean societies Aaron Alorda-Kleinglass, Isabel Ruiz-Mallen, Valentí Rodellas, Sergio Rossi, Genuario Belmonte, Marc Diego-Feliu, and Jordi Garcia-Orellana
15:05–15:15 EGU23-2163 On-site presentation	Submarine groundwater discharge strengthens acidification in the coastal areas Yi Liu, Yurong Song, and Jiu Jimmy Jiao
15:15–15:25 EGU23-8510 On-site presentation 	The Direct Effect of Submarine Groundwater Discharge on the Concentration of Dissolved Oxygen in Estuarine and Coastal Waters Willard Moore, Samantha Joye, Ryan Sibert, Alan Shiller, Amy Moody, and Claudia Benitez-Nelson
15:25–15:35 EGU23-15067 On-site presentation	Riverine and submarine groundwater discharges into the Mediterranean Cilician Basin and their impact on the marine water and nutrient budget Korhan Özkan, Burak Kuyumcu, Serhat Ertuğrul, İdil Ilgaz Kaya, C. Serdar Bayari, S. Fatih Özmen, Kanchan Maiti, Koray Özhan, and Ekin Akoglu

Fig. 3 – Time block 1: Coastal groundwater: Fresh groundwater offshore and SGD implications.

16:15–16:35 EGU23-15232 solicited On-site presentation
New developments in the field of global coastal groundwater salinity modelling and mapping ▶
Gualbert Oude Essink, Daniel Zamrsky, Jude King, Joost Delsman, Jarno Verkaik, and Marc Bierkens
16:35–16:45 EGU23-2859 ECS On-site presentation
Assessing the impact of climate change and anthropogenic factors on future salinization of a low-lying coastal groundwater system (Northwestern Germany) ▶
Stephan L. Seibert, Janek Greskowiak, Leena Karrasch, Bernd Siebenhüner, Gualbert H.P. Oude Essink, Joeri van Engelen, and Gudrun Massmann
16:45–16:55 EGU23-9457 ECS On-site presentation
Using a surface water hydrodynamic model to understand how spatial variability in ocean surge affects groundwater salinization in Delaware Inland Bays ▶
Rachel Housego, Anner Paldor, Ryan Frederiks, Fengyan Shi, and Holly Michael
16:55–17:05 EGU23-9687 ECS On-site presentation
Groundwater resources in barrier islands are vulnerable to storm-surge salinization through various dominating processes, as revealed by data-based modeling ▶
Ryan S. Frederiks, Anner Paldor, Lauren Donati, and Holly A. Michael
17:05–17:15 EGU23-17249 ECS On-site presentation
Effects of surface water boundary condition scaling on modelled groundwater salinity and salt fluxes ▶
Ignacio Farias, Gualbert H.P. Oude Essink, Perry de Louw, and Marc F.P. Bierkens
17:15–17:25 EGU23-12120 On-site presentation
A large-scale laboratory experiment of seawater intrusion in heterogeneous aquifers affected by drought periods ▶
Paolo Salandin, Enrica Belluco, Luigi Bottegal, Matteo Camporese, Elena Crestani, Giovanna Darvini, Pietro Giaretta, and Tommaso Trentin
17:25–17:35 EGU23-7607 ECS On-site presentation
A study on the suitability and quantitative potential of aquifer storage and recovery and brackish water extraction in Dutch coastal areas ▶
Ilja America - van den Heuvel, Jude King, Huite Bootsma, Joost Delsman, Gualbert Oude Essink, and Ida de Groot - Wallast
17:35–17:45 EGU23-15557 ECS On-site presentation
Detailed monitoring and simulation of groundwater salinity in response to extractions in a coastal aquifer system ▶
Thijs Hendriks, Gualbert Oude Essink, Marios Karaoulis, and Marc Bierkens
17:45–17:55 EGU23-13948 ECS Virtual presentation
Numerical investigations of change in hydrodynamics of a coastal aquifer due to saline groundwater pumping ▶
Dhanya Narayanan and Eldho t i

Fig. 4 – Time block 2: Coastal groundwater: Seawater intrusion


08:30–08:50 EGU23-8357 solicited On-site presentation
Where is the freshwater-saltwater interface in offshore coastal aquifers?
Alicia Wilson
08:50–09:00 EGU23-5524 ECS On-site presentation
The quantitative meaning of resistivity data in a coastal setting: a Belgian case study
Marieke Paepen, Wouter Deleersnyder, Kristine Walraevens, and Thomas Hermans
09:00–09:10 EGU23-7567 ECS On-site presentation 
Turbulent transport and mixing of discharged groundwater on structured surfaces at the coastal benthic seafloor
Helena Klettke, Leonie Kandler, and Martin Brede
09:10–09:20 EGU23-2263 ECS On-site presentation
Towards global quantification of seawater circulation in coastal aquifers
Yehuda Levy and Yael Kiro
09:20–09:30 EGU23-12823 ECS On-site presentation
Assessing different methods to quantify Submarine Groundwater Discharge
Júlia Rodríguez-Puig, Valentí Rodellas, Marc Diego-Feliu, Aaron Alorda-Kleinglass, Irene Alorda-Montiel, Marisol Manzano, Andrés Alcolea, Joaquín Jiménez-Martínez, and Javier Gilabert
09:30–09:40 EGU23-15562 ECS On-site presentation
Fingering Flow in the Subterranean Estuary under Tidal Influence
Rezwana Binte Delwar, Nele Grünenbaum, Janek Greskowiak, and Gudrun Massmann
09:40–09:50 EGU23-14176 On-site presentation
Seawater Intrusion and Submarine Groundwater Discharge studies at the Argenton site in Spain
Jesús Carrera, Laura Martínez-Pérez, Linda Luquot, Tybaud Goyetche, María Pool, Andrea Palacios, Laura del Val, Philippe A. Pezard, Marc Diego-Feliu, Valentí Rodellas, Juanjo Ledo, and Albert Folch
09:50–10:00 EGU23-15408 ECS On-site presentation
Automated vertical Self Potential gradient logging and analysis for the tracking of Saline Intrusion
Tom Rowan, Raymond Flynn, Adrian Butler, Matthew Jackson, Gerard Hamill, and Shane Donohue
10:00–10:10 EGU23-13500 ECS On-site presentation
How are radiotracers shaping the research in submarine groundwater discharge?
Marc Diego-Feliu, Valentí Rodellas, Aaron Alorda-Kleinglass, Júlia Rodríguez-Puig, Irene Alorda-Montiel, and Albert Folch

Fig. 5 – Time block 3: Coastal groundwater: Dynamics, characterization and biogeochemical processes (I).

10:45–10:55 EGU23-15792 ECS On-site presentation
A coupled hydrogeological and multi-isotopic approach to investigate saltwater intrusion in a coastal groundwater system (Sardinia, Italy) ▶
Maria Chiara Porru, Stefania Da Pelo, Claudio Arras, Francesca Lobina, Rosa Cidu, Francesca Podda, and Riccardo Biddau
10:55–11:05 EGU23-16742 ECS On-site presentation
Water table dynamics in coastal aquifer sediments alter nitrogen fate: Observations from soil column experiments ▶
Christian Roumelis, Fabian Willert, Maria Scaccia, Susan Welch, Rachel Gabor, Jesús Carrera, Albert Folch, Miquel Salgot, Alycia Insalaco, and Audrey Sawyer
11:05–11:15 EGU23-9177 ECS On-site presentation
Seasonal dynamics of submarine groundwater discharge from a rewetted coastal peatland ▶
Erwin Don Racasa, Jakob Kienzler, Sate Ahmad, Cheryl Batistel, Simeon Choo, Miaorun Wang, Anna-Kathrina Jenner, Bernd Lennartz, and Manon Janssen
11:15–11:25 EGU23-12009 ECS On-site presentation
Visualizing reaction zones in tidal subterranean estuaries using physical tank experiments ▶
Nele Grünenbaum, Janek Greskowiak, Rezwana Binte Delwar, and Gudrun Massmann
11:25–11:35 EGU23-5781 On-site presentation
The effect of dynamic hydro(geo)logical boundary conditions on redox-zoning in high-energy subterranean estuaries ▶
Janek Greskowiak, Stephan Seibert, Vincent Post, and Gudrun Massmann
11:35–11:45 EGU23-6488 ECS Virtual presentation
Behavior of Li, S and Sr isotopes in the subterranean estuary and seafloor pockmarks of the Hanko submarine groundwater discharge site in Finland, northern Baltic Sea ▶
Juuso Ikonen, Nina Hendriksson, Samrit Luoma, Yann Lahaye, and Joonas Virtasalo
11:45–11:55 EGU23-7125 ECS On-site presentation
Submarine groundwater discharge and methane seepage driven by Fennoscandian Ice Sheet dynamics offshore northern Norway ▶
Sophie ten Hietbrink, Ji-Hoon Kim, Arunima Sen, Aivo Lepland, Beata Szymczycha, Seyed Reza Saghravani, Jochen Knies, and Wei-Li Hong
11:55–12:05 EGU23-7303 On-site presentation
Molecular characterization of dissolved organic matter in groundwater of a coastal aquifer: microbial processing of sediment sourced organics ▶
Yan Zheng, Peng Zhang, Xuejing Wang, Yinghui Wang, Hailong Li, and Junjian Wang
12:05–12:15 EGU23-1962 On-site presentation
Groundwater flow impacts on microbial communities and biogeochemistry in seafloor pockmarks ▶
Lotta Purkamo, Cátia M. Ehlert von Ahn, Tom Jilbert, Muhammad Muniruzzaman, Annette Kock, Herrman Bange, Anna Jenner, Michael E. Böttcher, and Joonas Virtasalo

Fig. 6 – Time block 4: Coastal groundwater: Dynamics, characterization and biogeochemical processes (II).

One oral presentation was presented by SeCure partners (Fig. 7): “A large-scale laboratory experiment of seawater intrusion in heterogeneous aquifers affected by drought periods”. The talk showed the design and the realization activities developed to reproduce a controlled heterogeneous porous media in a laboratory flume, aimed at defining the influence of the hydraulic conductivity spatial variability on the density-dependent transport in coastal phreatic aquifers.



Fig. 7 – LP oral presentation at the session at EGU2023.


2.2.2 Poster presentations

One time block was devoted to poster presentations, both oral and virtual. The schedule of poster presentation can be seen in Fig. 8.

A.149 | EGU23-321 | On-site presentation


[Coastal Groundwater Discharge Simulations/Models for Mobile Bay](#)▶

John Richins, Kevin Befus, and Kirk Rodgers

A.150 | EGU23-1372 | ECS | On-site presentation | 

[Estimating Freshwater Lens Volume based on Island Circularity](#)▶

Lena Thissen, Janek Greskowiak, and Gudrun Massmann

A.151 | EGU23-1392 | ECS | On-site presentation | 

[Hydrogeochemical modelling of water-sediment interactions during infiltration of monovalent-partial desalinated water into different dune sediments](#)▶

Mareike Schloo, Laura Braeunig, Victoria Burke, Janek Greskowiak, and Gudrun Massmann

A.152 | EGU23-2160 | ECS | On-site presentation

[Occurrence of offshore freshened groundwater in the Pearl River Estuary and adjacent continental shelf](#)▶

Chong Sheng, Jiu Jimmy Jiao, Xin Luo, Jinchao Zuo, Lei Jia, and Jinhe Cao

A.153 | EGU23-2505 | ECS | On-site presentation

[Groundwater Flow Mechanisms and Related Carbon Sink Potential in Coastal Blue Carbon Ecosystems](#)▶

Xiaogang Chen and Ling Li

A.154 | EGU23-2506 | On-site presentation

[Comparing dual porosity approach and discrete fracture network for modelling seawater intrusion in fractured porous media](#)▶

Husam Baalousha, Behshad Koohbor, Marwan Fahs, and Anis Younes

A.155 | EGU23-3293 | On-site presentation

[Evaluating subsurface dams for the sustainable use of groundwater in remote small islands](#)▶

Ji Won Hwang, In Wook Yeo, and Dae Hyoung Lee

A.156 | EGU23-3641 | ECS | On-site presentation

[Estimating saltwater intrusion using remote-sensing datasets and analytical approaches](#)▶

Kyra H. Adams, Benjamin Hamlington, Cedric David, John Reager, Audrey Sawyer, Brett Buzzanga, and Jacob Fredericks

A.157 | EGU23-3786 | On-site presentation

[Impact assessment of seawater intrusion on shallow coastal groundwater in eastern Saudi Arabia using a multidisciplinary approach](#)▶

Mohammed Benaafi, Sani Abba, and Isam Aljundi

A.158 | EGU23-4624 | **ECS** | On-site presentation

Loading effect on wave pumping driven seawater-groundwater circulation in submarine aquifer▶

Shengchao Yu, Xiaolang Zhang, Jiu Jimmy Jiao, and Hailong Li

A.159 | EGU23-5121 | On-site presentation

Widespread occurrence of high radium concentrations in bottom waters of the Eckernförde and Kiel bays (Western Baltic Sea): Are these related to submarine groundwater discharge?▶

Jan Scholten, Jan Schroeder, Feng-Hsin Hsu, and Volker Liebetrau

A.160 | EGU23-6141 | **ECS** | On-site presentation

Effects of variable beach morphology, storm surges and aquifer parameters on the salinity distribution in the deep subsurface of a high energy beach – a generic modelling approach▶

Rena Meyer, Janek Greskowiak, and Gudrun Massmann

A.161 | EGU23-7483 | **ECS** | On-site presentation

Tidal effects on groundwater levels in Maputo, Mozambique▶

Xue Meng, Yangxiao Zhou, Jinguo Wang, Tibor Stigter, Fatima Mussa, Dinis Juízo, and Yun Yang

A.162 | EGU23-10144 | On-site presentation

Dynamics of trace elements during seawater intrusion in a sedimentary aquifer of western Mexico▶

Abrahan Mora and Jürgen Mahlknecht

A.163 | EGU23-10384 | On-site presentation

Quantitative estimation of fresh submarine groundwater discharge in Jeju island using geographic information system▶

Il Hwan Kim and Sunwoo Chang

A.164 | EGU23-10642 | On-site presentation

Effects of freshwater injection on tidally influenced coastal unconfined aquifers▶

Xiayang Yu, Pei Xin, Zhaoyang Luo, and Li Pu

A.165 | EGU23-11444 | On-site presentation

3D groundwater salinity mapping of the global coastal zone▶

Gualbert Oude Essink, Daniel Zamrsky, Jude King, Joost Delsman, Jarno Verkaik, and Marc Bierkens


<p>A.166 EGU23-11976 On-site presentation Evaluation of surface and groundwater quality and identification of saltwater sources by hydrogeochemical analysis in river Neretva coastal aquifer system▶ Ivan Lovrinovic, Iva Aljinovic, and Veljko Srzic</p>
<p>A.167 EGU23-12125 ECS On-site presentation Approaches and methodologies to monitor and mitigate saltwater intrusion in the Adriatic coastal plains▶ Marta Cosma, Ester Zancanaro, Iva Aljinović, Francesco Morari, Veljko Srzić, Pietro Teatini, Luigi Tosi, Alessandro Bergamasco, Anna Botto, Matteo Campoprese, Chiara Cavallina, Cristina Da Lio, Sandra Donnici, Ivan Lovrinović, Ivan Racetin, Luca Zaggia, Claudia Zoccarato, and Paolo Salandin</p>
<p>A.168 EGU23-16042 ECS On-site presentation Combining terrestrial and marine electrical resistivity methods to improve data acquisition in the land-sea transition zone.▶ Jose Tur-Piedra, Juanjo Ledo, Pilar Queralt, Alex Marcuello, Marc Diego-Feliu, Aaron Alorda-Kleinglass, Valentí Rodellas, and Albert Folch</p>
<p>A.169 EGU23-17061 ECS On-site presentation Temporal variations of groundwater tables and implications for submarine groundwater discharge: a case study the Mediterranean Spanish coast▶ Guillem Buxó-Escapa, Gustavo Cárdenas Castellero, Alejandro Adán, Michal Kuráž, and Albert Folch</p>
<p>A.170 EGU23-15750 ECS On-site presentation Detailed characterization of biogeochemical processes in coastal aquifers: variations along the subterranean estuary-mixing zone at the MEDISTRAES experimental site▶ Bella Almillategui, Albert Folch Sancho, Valentí Rodellas Vila, Maarten Saaltink, Alejandro Adan, Jose Tur-Piedra, Clara Ruiz-González, Daniel Romano Gude, Marc Diego Feliu, and Jesús Carrera</p>
<p>A.171 EGU23-17530 On-site presentation Potentially toxic element input into Mar Menor coastal lagoon (Spain) through submarine groundwater discharge▶ Carlos René Green Ruiz, Valentí Rodellas, Júlia Rodríguez-Puig, and Juan Santos-Echeandía</p>
<p>vHS.23 EGU23-1849 ECS Virtual presentation  A multi approach study of Groundwater level fluctuation, Sea surface temperature anomaly and Physicochemical parameters to assess Seawater Intrusion and Submarine Groundwater Discharge along Odisha coast, India.▶ Soumya Kanta Nayak and N Janardhana Raju</p>
<p>vHS.24 EGU23-5604 Virtual presentation Natural and anthropogenic factors for activation of marine intrusion on the Bulgarian Black Sea coast▶ Olga Nitcheva, Albena Vatrlova, and Donka Shopova</p>
<p>vHS.25 EGU23-9655 Virtual presentation Potential Water Resources in the North-Eastern Adriatic Sea▶ Michela Giustiniani, Martina Buseti, Michela Dal Cin, Erika Barison, Aurélie Cimolino, Giuseppe Brancatelli, and Luca Baradello</p>

Fig. 8 – Poster presentations of EGU session.

Two poster presentations were presented by SeCure partners (Fig. 9):

1. “Approaches and methodologies to monitor and mitigate saltwater intrusion in the Adriatic coastal plains” showed results of the research activities including the development of specific tools for the management of agriculture-related activities and freshwater resources in coastal areas including vulnerability assessment, mitigation plans, and countermeasures against salt contamination. These results were obtained by integrating the findings gained on both sites,

considering differences and peculiarities of the specific areas that are representative of many low-lying plains located on both sides of the Adriatic coast.

2. “Evaluation of surface and groundwater quality and identification of saltwater sources by hydrogeochemical analysis in river Neretva coastal aquifer system” showed results of hydrogeochemical analysis surface and groundwater samples taken in River Neretva Valley during dry and rainy period of year 2021.

Both poster presentations highlighted contribution from the EU cofinancing and the Interreg Italy–Croatia Cross Border Collaboration (CBC) Programme 2014–2020 (Priority Axes: Safety and Resilience) through the European Regional Development Fund as a part of the projects MoST (AID: 10047742) and SeCure (AID: 10419304).



Fig. 9 – Project partners at the poster session at EGU2023.

2.3 Session participation

The EGU23 General Assembly was held from 23 till 28 of April 2023 in Vienna, Austria and online. It welcomed more than 18 000 attendees with 16,357 presentations given in 938 sessions.

Session HS8.2.6 “Integrating understanding across the land-ocean continuum: multidisciplinary approaches to studying saltwater intrusion and submarine groundwater discharge” was highly participated, with hundreds of scientists of the international community. Only the contributing authors came from more than 90 different institutions based in Europe, Asia, Oceania, North America, and Africa (Fig. 10).

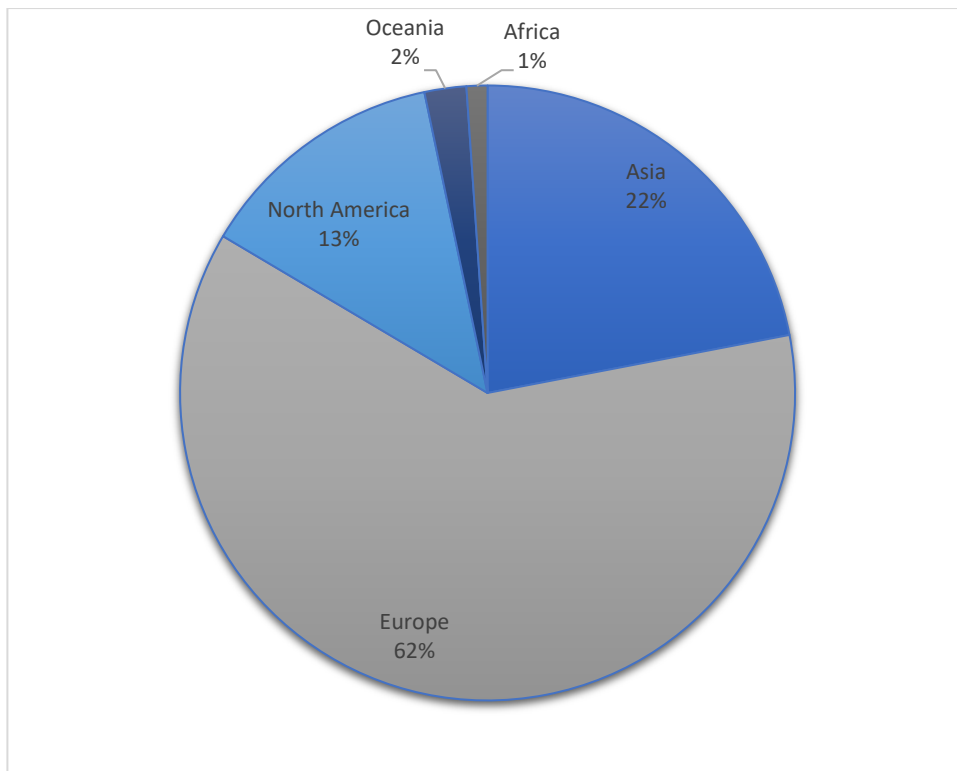


Fig. 10 – Provenance of contributing authors.

3. High-level seminar in Zagreb

The seminar entitled “Climate Change and Phenomena of Soil and Water Salinization” was organized in Zagreb by the Croatian PPs of the SeCure project on February 22, 2023. The poster developed to promote the event is shown in Fig. 11



Fig. 11 – Poster developed by CW to promote the event held in Zagreb.

The agenda of the various contributions presented in the seminar is the following:

1. Krešo Pandžić – “The contributions of Intergovernmental Panel on Climate Change Working Groups to the IPCC Sixth Assessment Report about climate status and projections by the end of the 21st century”;
2. Josip Rubinić – “Water resources in the Neretva river basin and climate change impact”;
3. Josip Terzić – “Hydrogeological relations in the karst ground of the right catchment of the Neretva River and impact of seawater on karst aquifers”;
4. Davor Dolar – “Pressure membrane processes to mitigate climate change”;
5. Veljko Srzić, Ivan Lovrinović, Iva Aljinović – “Model analyses of the response of the Neretva valley coastal aquifer to climate change and implementation of potential mitigation measures”.

A few photos of the participants are provided in Fig. 12. A large number of attendees from public/governmental institutions and private companies participate in-presence and on-line to the event. The signature list of the participants is attached (Annex A).



Fig. 12 – Photos of the participants to the event on saltwater intrusion and climate change held in Zagreb in February 2023.