



HAL
open science

Arsenic in agricultural soils-water systems: transfer mechanisms, remediation options and recommendations for risk management

Fabienne Battaglia-Brunet, Ingo Müller, Celia Jones, Mark Elert, Marina Le Guedard, Jennifer Hellal, Hugues Thouin, Isabel Jordan, Ritta L. Keiski, Jana Pinka, et al.

► To cite this version:

Fabienne Battaglia-Brunet, Ingo Müller, Celia Jones, Mark Elert, Marina Le Guedard, et al.. Arsenic in agricultural soils-water systems: transfer mechanisms, remediation options and recommendations for risk management. Goldschmidt 2022, Jul 2022, Honolulu, United States. hal-03660184

HAL Id: hal-03660184

<https://brgm.hal.science/hal-03660184>

Submitted on 5 May 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Your Abstract Submission Has Been Received

PRINT/SAVE THIS PAGE

You have submitted the following abstract to Goldschmidt2022. A confirmation email has been sent to the submitter and all named authors. Receipt of this notice does not guarantee that your submission was complete or free of errors.

Abstract Title: Arsenic in agricultural soils-water systems: transfer mechanisms, remediation options and recommendations for risk management

Authors (presenting author in bold): Fabienne Battaglia-Brunet¹, Ingo Müller², Celia Jones³, Mark Elert³, Marina Le Guédard⁴, Jennifer Hellal¹, Hugues Thouin¹, Isabel Jordan⁵, Ritta L. Keiski⁶, Jana Pinka⁵, Auli Turkki⁶, Esa Turpeinen⁶, Hanna Valkama⁶, Tarja Hatakka⁷, Timo Tarvainen⁷, Juha Kaija⁷ and Kirsti Loukola-Ruskeeniemi⁸, (1)BRGM, (2)Saxon State Office for Environment, (3)Kemakta Konsult AB, (4)LEB Aquitaine Transfert-ADERA, (5)G.E.O.S. Ingenieur-gesellschaft mbH, (6)University of Oulu, (7)Geological Survey of Finland, (8)Geological Survey of Finland,

Abstract Text:

Chronic exposure to arsenic (As) through food crops is a major health issue. Our AgriAs project [1] evaluated soil-water-crop transfer mechanisms and proposed remediation options. Two sites, one polluted by a former factory of WWI ammunition destruction (Verdun, France), and another contaminated by historical mining activities (Freiberg, Germany) were chosen for the elaboration and evaluation of methodologies [2]. These sites represent different agronomical conditions and the source and distribution of As contamination (hot spots versus large-scale). Spring barley was chosen to study the influence of fertilizers and As-adsorbent on As transfer from soil to plants or water. Bio-indicators including the Omega-3 Index ecotoxicological test and microbial parameters were implemented to monitor As-related processes [3]. Experiments highlighted the potential of a biologically synthesized adsorbent (sorpP) to decrease the mobility of As and the soil toxicity for plants. Effects of fertilizers on the biogeochemical behavior of As differed between soils and redox conditions. Concerning water treatments, reverse osmosis membrane systems, adsorption and coagulation–filtration processes were compared in terms of feasibility and sustainability. Research outcomes contributed to design the conceptual sketch of a health risk assessment model [4]. AgriAs project thus contributed to define recommendations including either the adaption of agricultural and soil

management to prevent exposure or remediation measures tailored for different sites and land use.

[1] *AgriAs project website*: <http://projects.gtk.fi/AgriAs/>; *AgriAs was co-funded during 2017-2019 by the EU and the Academy of Finland, L'Agence nationale de la recherche, Bundesministerium für Ernährung und Landwirtschaft and Forskningsrådet FORMAS under the ERA-NET Cofund WaterWorks2015 Call. ERA-NET is an integral part of the 2016 Joint Activities developed by the Water Challenges for a Changing World Joint Programme Initiative (Water JPI).*

[2] *Tarvainen T. et al. (2020), J Geochem Exploration 217, 106606.*

[3] *Battaglia-Brunet et al. (2021), J Haz Mat 409, 124580.*

[4] *Loukola-Ruskeeniemi K. et al. (2022), J Haz Mat 424, 127677.*

Primary Session:

13g: Geochemistry of arsenic in the environment: source, fate, and remediation

Submitter's E-mail Address:

f.battaglia@brgm.fr

Submitter Full Name:

Fabienne Battaglia-Brunet

Preferred Presentation Style:

Oral

Conference Attendance:

Remote

Newsworthy:

This abstract is marked as newsworthy.

Newsworthy Reason:

Chronic exposure to arsenic through crop may be detrimental to health but no globally accepted regulation exists for arsenic in agricultural soil and water. We developed health risk assessment and risk management for two agricultural sites in Europe: the WWI ammunition destruction site near Verdun, France, and an area contaminated by historical mining activities in Freiberg, Germany. Our results can be applied in some other regions in the world. We chose spring barley to study the influence of fertilizers and As-adsorbent on As transfer from soil to plants and water.

Submission Permission and Copyright:

I grant non-exclusive copyright for my abstract and any related uploaded content to the Conference Exchange and the conference owners. I give permission for my details to be stored in the conference database. I, and the presenting author (if different than the submitter), agree to be contacted by the conference organizers about this submission. I agree to the recording and online streaming of any presentations scheduled as a result of this submission. I confirm all listed authors have agreed to these terms.

Keywords:

agricultural soil and arsenic

First Presenting Author***Presenting Author***

Fabienne Battaglia-Brunet

Email: f.battaglia@brgm.fr

BRGM

Dr.

BP 36009

Orléans 45060

France

Second Author

Ingo Müller

Email: Ingo.Mueller@smekul.sachsen.de

Saxon State Office for Environment

Agriculture and Geology

Halsbrückerstr. 31a

Freiberg 09599

Germany

Third Author

Celia Jones

Email: celia@kemakta.se

Kemakta Konsult AB

Box 126 55

Stockholm 112 93

Sweden

Fourth Author

Mark Elert

Email: mark@kemakta.se

Kemakta Konsult AB

Box 126 55

Stockholm 112 93

Sweden

Fifth Author

Marina Le Guédard

Email: marina.le-guedard@u-bordeaux.fr

LEB Aquitaine Transfert-ADERA

71. Avenue Edouard Bourlaux

CS20032

Villenave d'Ornon 33140

France

Sixth Author

Jennifer Hellal

Email: j.hellal@brgm.fr

BRGM

BP36009

Orléans 45060

France

Seventh Author

Hugues Thouin

Email: h.thouin@brgm.fr

BRGM

Dr.

BP 36009

Orléans 45060

France

Eighth Author

Isabel Jordan

Email: i.jordan@geosfreiberg.de

G.E.O.S. Ingenieur-gesellschaft mbH

Postfach 1162

Freiberg 09581

Germany

Ninth Author

Ritta L. Keiski

Email: riitta.keiski@oulu.fi

University of Oulu

Environmental and Chemical Engineering Research Unit

P.O. Box 4300

Oulu FI-90014

Finland

Tenth Author

Jana Pinka

Email: j.pinka@geosfreiberg.de

G.E.O.S. Ingenieur-gesellschaft mbH

Postfach 1162

Freiberg 09581

Germany

Eleventh Author

Auli Turkki

Email: auli.turkki@oulu.fi

University of Oulu

P.O. Box 4300

Oulu FI-90014

Finland

Twelfth Author

Esa Turpeinen

Email: esa.turpeinen@oulu.fi

University of Oulu

P.O. Box 4300

Oulu FI-90014

Finland

Thirteenth Author

Hanna Valkama

Email: Hanna.Valkama@oulu.fi

University of Oulu

P.O. Box 4300

Oulu FI-90014

Finland

Fourteenth Author

Tarja Hatakka

Email: tarja.hatakka@gtk.fi

Geological Survey of Finland

Environmental Solutions

Geologist

P.O. Box 96

Espoo 02151

Finland

Fifteenth Author

Timo Tarvainen

Email: timo.tarvainen@gtk.fi

Geological Survey of Finland

P.O. Box 96

Espoo FI-02151

Finland

Sixteenth Author

Juha Kaija

Email: juha.kaija@gtk.fi

Geological Survey of Finland

P.O. Box 96

Espoo FI-02151

Finland

Seventeenth Author

Kirsti Loukola-Ruskeeniemi

Email: Loukol Kirsti.loukola-ruskeeniemi@gtk.fi

Geological Survey of Finland,

P.O. Box 96

Espoo FI-02151

Finland

If necessary, you can make changes to your abstract submission up until the abstract submission deadline on 1 March 2022 (23:59 CET).

To access your submission in the future:

- If you are listed as an author on this abstract, you can access the submission via 'My Goldschmidt' on the Goldschmidt2022 website.

- If you are not listed as an author, use the direct link to your abstract submission given in one of the automatic confirmation emails that were sent to you during the submission. Note that you will need to log in to your Goldschmidt2022 account to access the submission.

Any changes that you make will be reflected instantly in your submission. You DO NOT need to go through all of the submission steps again in order to change just one part. For example, if you want to change only the abstract title, go to the submission, click on the "Details" tab in the abstract submission menu, edit the title, and then click on save/submit on that step and your changes will then be saved.

Help and Contacts

For any technical queries related to your submission, your Goldschmidt account, or use of the online submission system or website, please contact goldschmidt@confex.com.

For any queries related to the science program in general, please contact scienceprogram@goldschmidt.info.

When you have completed your submission, you may close this browser window.

[Tell us what you think of the abstract submission process](#)

[Home Page](#)