

Borehole Heat Exchangers: a potential trigger for aquifer cross-contamination?

*Original*

Borehole Heat Exchangers: a potential trigger for aquifer cross-contamination? / Casasso, Alessandro; Ferrantello, Natalia; Pescarmona, Simone; Sethi, Rajandrea. - ELETTRONICO. - (2023), pp. 1-1. (Intervento presentato al convegno EGU General Assembly 2023 tenutosi a Vienna nel 23-28 aprile 2023) [10.5194/egusphere-egu23-2940].

*Availability:*

This version is available at: 11583/2985398 since: 2024-01-26T08:03:19Z

*Publisher:*

EGU

*Published*

DOI:10.5194/egusphere-egu23-2940

*Terms of use:*

This article is made available under terms and conditions as specified in the corresponding bibliographic description in the repository

*Publisher copyright*

(Article begins on next page)

EGU23-2940, updated on 26 Jan 2024

<https://doi.org/10.5194/egusphere-egu23-2940>

EGU General Assembly 2023

© Author(s) 2024. This work is distributed under the Creative Commons Attribution 4.0 License.



## Borehole Heat Exchangers: a potential trigger for aquifer cross-contamination?

**Alessandro Casasso**, Natalia Ferrantello, Simone Pescarmona, and Rajandrea Sethi

Politecnico di Torino, Dipartimento di Ingegneria per l'Ambiente il Territorio e le Infrastrutture (DIATI), Torino, Italy  
(alessandro.casasso@polito.it)

The number of Ground Source Heat Pumps (GSHPs) has been growing steadily in the last 20 years, and so has the number of Borehole Heat Exchangers (BHEs), which perform the heat exchange between the ground and the heat pump. BHEs are generally about 100 m deep and, hence, they can cross different aquifers. Concerns have been raised about the possible preferential flow of contaminants that can occur through boreholes, also known as cross-contamination. The strength of such phenomenon depends on the vertical hydraulic gradient between the aquifers and the hydraulic conductivity of the grout filling. Therefore, we developed a numerical flow and solute transport model in severe conditions to assess to which extent a BHE can induce cross-contamination between a shallow contaminated aquifer and a deep uncontaminated one, separated by an aquiclude. The results show that the leakage flow and the contaminant spatial distribution in the deep aquifer are well reproduced with analytical formulae, which can therefore be used to assess the potential impact of cross-contamination. Results also confirm that the geothermal grouts available in the market, with hydraulic conductivities well below  $10^{-6}$  m/s, guarantee a sufficient protection from preferential flow through borehole heat exchangers.