University of Groningen

Fast regional-scale technical shallow geothermal energy potential calculation with a steady-state solution of the finite line source

Miocic, Johannes; Schleichert, Lukas; Ven, Adinda Van de; Koenigsdorff, Roland

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2023

Link to publication in University of Groningen/UMCG research database

Fast regional-scale technical shallow geothermal energy potential calculation with a steady-state solution of the finite line source

Johannes Miocic[1], Lukas Schleichert[2], Adinda Van de Ven[2], and Roland Koenigsdorff[2]
[1]Energy and Sustainability Research Institute, University of Groningen, Groningen, Netherlands
[2]Institute for Building and Energy Systems, Biberach University of Applied Sciences, Biberach, Germany

The heating and cooling sector needs a large-scale transformation to achieve the climate neutrality goals by 2050 as outlined in the European Green Deal. Heat pumps coupled with a borehole heat exchanger (BHE) are a frequently discussed option for reducing greenhouse gas emissions from the heating and cooling of residential buildings. The thermal interference between BHEs makes the calculation of the technical potential on a regional scale computing intensive. Here, we use a steady-state solution of the finite line source to rapidly calculate the technical geothermal energy potential for a study area of ~35.000 km² and for up to 8.6 million BHEs. The results show that the proposed methodology can be used to calculate the potential of ground source heat pumps for heating on a regional scale with a high accuracy. Limitations of the study include the random placement of BHEs within parcels (with regulatory restrictions applying), and the non-consideration of ground water flow.