



3D spatial variation in salinity of shallow to deep groundwater in the Dutch on- and offshore

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Knowledge on the distribution of groundwater salinity, and the associated groundwater density, is important for hydrodynamic analysis of groundwater flow systems. In addition, knowledge of groundwater salinity has several direct applications, including the evaluation of deeper groundwater resources for water supply, evaluation of geothermal and fossil energy resources, and of storage sites for CO₂ and energy, and last but not least it plays a role in assessing the impact of resource development on the environment.

The focus of this paper is on groundwater salinities in the deeper subsurface. The salinities are largely derived from an integrated database of quality controlled data on pressure, water chemistry and temperature of 1145 oil and gas wells. The salinity values are calculated from water chemistry data, petrophysical log analyses, and analyses of pressure gradients. The spatial distribution of groundwater salinities show large vertical and lateral variations. For example, groundwater is only fresh at very shallow depths in onshore Netherlands, at depths of > 2.5 km the salinity ranges between about 100 000 and 350 000 mg/l, while the least saline groundwater in pre-Cenozoic units (\ll 100 000 mg/l) occur in the southern onshore and offshore parts of the Netherlands.

This paper presents the approach to calculate salinity and the assessed spatial variation in groundwater salinity in the Dutch on- and offshore in relation to the spatial variation of its lithostratigraphic and structural framework and hydrodynamic conditions.