Title: A hydrogeochemical model for simulating salt dissolution and precipitation in Lake Urmia

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Abstract

In hypersaline lakes, the process of salt dissolution and precipitation is complex, necessitating data collection and salinity modelling. This hydrogeochemical model uses two-layer fluid theory and geochemical equations to examine how evaporation, precipitation, surface water input, and flow through a breach in a causeway that divides Lake Urmia affect precipitation and salt dissolving. This model has the ability to investigate the fate of seven major ions (SO_4^{2-}, Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, Cl^{-}, and HCO_3^{-}) in lake water. This model is compared to the concentration of ions and salt deposited on the lake bed, and the trend of the volume density hysteresis diagram is interpreted. The simulations showed a close connection between salt precipitation and dissolving, evaporation, and surface water. From 5/1/2013 to 12/31/2017, the simulation revealed that 73 cm of salt was deposited in the north part and 10 cm dissolved in the south part.

Key words: Slat precipitation and dissolution, Lake Urmia, bathymetry dynamics, hydrogeochemical model, Pizer equations

Highlights:

- A model for salt precipitation and dissolution in a hypersaline lake is presented.
- The model is applied to Lake Urmia in Iran's northwestern region.
- The model can be used for the management and restoration of Lake Urmia.
- All hydrological factors influence the salt precipitation and dissolution process.
- Pitzer equations are used in the model.

1. Introduction

Saline lakes are closed lakes whose hydrological and geochemical development are highly dependent on water evaporation, salinity, and mineral salt deposition in these regions (Krumgalz, 2001). The salinity of these lakes is caused by the inflow of saline water, evaporation exceeding