



## **A three-dimensional circulation model for Lake Van**

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Lake Van is situated on the high plateaus of the Eastern Anatolia (Turkey) at about 43 °E longitude and 38.5 °N latitude. It has a variable surface area of 3500-3650 km<sup>2</sup> and an average water depth of 170 m, reaching a maximum of 451 m at the middle of Tatvan Basin. Lake Van is the largest soda lake on earth and the fourth largest lake with a closed hydrological basin. Lake level and chemistry have been fluctuating drastically throughout the Quaternary and thus provide an important proxy climate record for this archaeologically important part of the world. Although the basin is not heavily industrialized, the lake receives domestic and agricultural pollution from bordering settlements, starting with the City of Van that has a rapidly increasing population due to rural immigration of recent years. This study aimed at providing a physical limnological framework to guide future environmental assessment efforts as well as paleoenvironmental reconstruction studies. Lake's circulation and thermal structure has been simulated using POM (Princeton Ocean Model), a three-dimensional sigma-coordinate primitive equation model with a free surface. Our simulations were conducted with a horizontal resolution of 1 km and 30 sigma levels. POM is forced with energy and water flux and air temperature fields obtained by dynamical downscaling of NCEP/NCAR Reanalysis data using a mesoscale atmospheric model (MM5). Data corresponding to 1995-2000 period has been downscaled to 9 km horizontal resolution and averaged to come up with a 'weekly climate' of flux and surface air temperatures. This 'climate' has been further interpolated to 1 km horizontal resolution and used to cyclically force the lake model until a steady state is reached based on total turbulent kinetic energy time series. Surface circulation patterns obtained are in good agreement with qualitative satellite observations. Similarly, spatial and temporal variations in the thermal structure seem to be in reasonable agreement with few available CTD observations.