

Aquifer recharge estimation through atmospheric chloride mass balance at Las Cañadas Caldera, Tenerife, Canary Islands, Spain

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The atmospheric chloride mass balance (CMB) method was used to estimate net aquifer recharge in Las Cañadas Caldera, an endorheic summit aquifer area about 2000 m a.s.l. with negligible surface runoff, which hosts the largest freshwater reserve in Tenerife Island, Canary Islands, Spain. The wet hydrological year 2005-2006 was selected to compare yearly atmospheric chloride bulk deposition and average chloride content in recharge water just above the water table, both deduced from periodical sampling. The potential contribution of chloride to groundwater from endogenous HCl gas may invalidate the CMB method. The chloride-to-bromide molar ratio was an efficient tracer used to select recharge water samples having atmospheric origin of chloride. Yearly net aquifer recharge was 631 mm year⁻¹, i.e., 69% of yearly precipitation. This result is in agreement with potential aquifer recharge estimated through an independent lumped-parameter rainfall-runoff model operated by the Insular Water Council of Tenerife. This paper illustrates basic procedures and routines to use the CMB method for aquifer recharge in active volcanic oceanic islands having sparse-data coverage and groundwater receiving contribution of endogenous halides. © 2015 by the authors.

Aquifer recharge

Chloride mass balance

Cl/Br ratio

Las Cañadas

Tenerife

Aquifers

Calcium

Groundwater

Groundwater resources

Runoff

Aquifer recharge

Bulk depositions

Chloride contents

Chloride mass balance

Cl/Br ratios

Hydrological years

Rainfall-runoff modeling

Tenerife

Recharging (underground waters)

aquifer

bromide

chloride

estimation method

halogen

hydrochloric acid

mass balance

precipitation (climatology)

rainfall-runoff modeling

recharge

runoff

volcanic island

water table

Canary Islands

Las Canadas Caldera

Santa Cruz de Tenerife [(PRV) Canary Islands]

Spain

Tenerife

Tenerife