past 720 years. These results reinforce the premise of a severe long-term drought in the tropics of Southern Hemisphere associated with the anthropogenic warming.

References

Stríkis, N.M.; Buarque, P.F.S.M.; Cruz, F.W.; Bernal, J.P.; Vuille, M.; Tejedor, E.; Santos, M.S.; Shimizu, M.H.; Ampuero, A.; Du, W.; Sampaio, G.; Sales, H.R.; Campos, J.L.; Kayano, M.; Apaèstegui, J.; Fu, R.R.. Cheng, H.; Edwards, R.L.; Chaves, V.; Franscischini, D.S.; Arruda, M.A.Z.; Novello, V.F. Modern anthropogenic drought in Central Brazil unprecedented during last 700 years. Nature Communications, v.15, p. 1728, 2024.

Chagas, V.B.P.; Chaffe, P.L.B.; Blöschl, G. Climate and land management accelerate the Brazilian water cycle. Nature Communications, v. 13, p. 5136, 2022

APPLICATION OF NOBLE GASES AND THEIR ISOTOPES IN THE HYDROGEOLOGY WITH EMPHASYS ON THE GUARANI AQUIFER SYSTEM IN BRAZIL

noble gases, regional aquifers, environmental tracers, residence times, recharge temperatures
https://proceedings.science/p/184061?lang=en

KIRCHHEIM, Roberto

As the demands for water increase, it is imperative to better assess the dynamics of groundwater circulation in aquifers, information that is considered indispensable for sustainable management. The techniques involving environmental tracers and, among these, specifically those inherent to noble gas isotopes, provide valuable information, such as groundwater residence times and recharge paleo-temperatures. Because they are inert, noble gases do not undergo chemical and isotopic changes in water-rock interactions. Their presence in groundwater can be interpreted as mixing of atmospheric and non-atmospheric components (radiogenic and/or terrigenous). While the atmospheric component keeps records of past dynamics associated with recharge processes and, therefore, of paleoclimate, the non-atmospheric components, essentially associated with He isotopes (^{3}He and ^{4}He), as well as radiogenic isotopes, including ^{81}Kr, ^{85}Kr and ^{39}Ar, provide valuable chronological information. This study presents a review on the meaning of the concentration of noble gases dissolved in water, their respective components and the methodological paths used to extract hydrogeological information. In the same way, field sampling practices, analytical strategies and methodological paths for data treatment are presented. Recent noble gas analytical efforts in the Guarani Aquifer System (GAS) confined areas and the use of the combined Kr and He chronometers will be discussed. Representative wells with known constructive logs and aligned according to regional flow lines as established by the current conceptual model were selected. Partial noble gases components were estimated with Inoble 2.7, generating estimates on terrigenic ^{4}He, excess air component and recharge temperatures. The quantification of the residence times was performed using the calculation of in-situ accumulation rates, continental crustal basal flows and basal flow calibration modeling. Pre-determined Kr age determinations were used for the calibration and error minimization procedures for each one of the blocks used to group GAS noble gas and Kr results. Paleoclimate insights were also given through stable isotopes and recharge temperatures. The use of noble gases as carried out in this research inaugurates new approaches for the understanding the dynamics of regional aquifers, such as the GAS.