Long-term monitoring of 36Cl in precipitation in the Adamawa Plateau (center-north Cameroon).

Souleyman Abba*†[1], Pierre Deschamps[1], Bruno Hamelin[1], and Yannick Garcin[1]

[1]Centre européen de recherche et d'enseignement des géosciences de l'environnement – Institut de Recherche pour le Développement, Aix Marseille Université, Collège de France, Institut National des Sciences de l'Univers, Centre National de la Recherche Scientifique, Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement, Institut de Recherche pour le Développement : UMR$_D$161, $AixMarseilleUniversité : UM34, CollègedeFrance :$
$UMR7330, CentreNationaldelaRechercheScientifique :$
$UMR7330, InstitutNationaldeRecherchepourl'Agriculture, l'Alimentationetl'Environnement :$
$UMR1410 - -France$

Abstract

Cosmogenic isotopes are widely used as geochemical tracers in Earth sciences. 36Cl, for instance, owing to the advances in accelerator mass spectrometry has increasingly been used to study hydrological processes. Particularly, it is a powerful tool in estimating hydrological parameters such as groundwater residence time, mixing of water sources, flow paths, aquifer recharge, and water transit times within catchments. Most of these applications rely on the knowledge of the atmospheric input function, which remains poorly constrained in areas such as tropical Africa. This limitation hampers the use of 36Cl in areas where it may constitute an alternative to classical hydrology methods.

To contribute in addressing this gap, we conducted a six-year monitoring of 36Cl in rainwater from a site located in the Center-North of Cameroon, in central Africa. The measurements reveal an average 36Cl deposition flux of 100 at/m2/s, one order of magnitude higher than model predictions for the region (11 at m^2 s^1), clearly tagging with bomb-36Cl footprint. In addition, the 36Cl/Cl ratio (ranging from 150*10-15 to 850*10-15at/at) shows a seasonal variability, with high values at the beginning and peak of the rainy period. This pattern could be explained by the dry deposition and precipitation amount effects.

These findings provide constraints on the atmospheric input of 36Cl in the region and will support the use of this tracer in hydrological studies in this data-scarce environment. The results also challenge model predictions highlighting the need to reassess the estimates.

Keywords: 36Cl, atmospheric flux, precipitation, Adamawa plateau, Cameroon.

*Speaker
†Corresponding author: abba@cerege.fr