

Use of ^{223}Ra and ^{224}Ra as chronometers to estimate the residence time of Amazon waters on the Brazilian continental shelf

PIETER VAN BEEK¹, MORGANE LÉON², JAN
SCHOLTEN³, WILLARD S MOORE⁴, MARC SOUHAUT⁵,
JOSELENE DEOLIVEIRA⁶, CATHERINE JEANDEL⁷,
PATRICK SEYLER⁸ AND JULIEN JOUANNO⁹

¹LEGOS (Laboratoire d'Etudes en Géophysique et
Océanographie Spatiales)

²Laboratoire d'Etudes en Géophysique et Océanographie
Spatiales (LEGOS), Université de Toulouse,
CNES/CNRS/IRD/Université Toulouse III Paul Sabatier

³Kiel University

⁴University of South Carolina

⁵Laboratoire d'Etudes en Géophysique et Océanographie
Spatiale (LEGOS), Université de Toulouse,
CNES/CNRS/IRD/Université Toulouse III Paul Sabatier

⁶Instituto de Pesquisas Energéticas e Nucleares (IPEN)

⁷Université Toulouse III - Paul Sabatier

⁸HydroSciences Montpellier (HSM), IRD/CNRS/UM

⁹Laboratoire d'Etudes en Géophysique et Océanographie
Spatiales (LEGOS), Université de Toulouse, CNES/CNRS/IRD

Presenting Author: vanbeek@legos.obs-mip.fr

We report ^{223}Ra and ^{224}Ra activities that were determined in the Amazon River mouth and along the Amazon plume that extends off the coasts of Brazil and French Guyana into the Atlantic Ocean. We summarize Ra data from AmasSeds (1991), AMANDES-GEOTRACES process study (GApr01; 2007-08) and M147 project (2018), which were conducted in different seasons corresponding to different Amazon discharge rates. We determined the $^{224}\text{Ra}_{\text{ex}}/^{223}\text{Ra}$ activity ratios (AR) along the Amazon plume to derive apparent ages that we use to estimate the residence time of the Amazon waters on the Brazilian continental shelf. Our data suggest that it takes 9-14 d for the Amazon waters to reach the northern continental shelf off French Guyana and 12-21 d to reach the eastern part of the Brazilian continental shelf. These time scales are in good agreement with those derived from a high-resolution numerical simulation of the regional ocean dynamics. Using the apparent ages along the plume, we estimate an average velocity of 30 cm s^{-1} for the northward transport of the Amazon waters on the continental shelf.