Radioactive hydrogeochemical processes in North West basin of Chihuahua, Mexico

J.C. BURILLO[1], M. REYES[2], I. REYES[2], M.S. ESPINO[2], M. RENTERÍA[1] AND M.E. MONTERO[1]*

[1]Centro de Investigación en Materiales Avanzados, Mexico (jcburillo@yahoo.com.mx, marusia_30@yahoo.com.mx) (*correspondence: elena.montero@cimav.edu.mx)
[2]Facultad de Ingeniería, UACH, Mexico (mreyes@uach.mx, ireyes@uach.mx, mespino@uach.mx)

The basin formed by the Chuviscar and Sacramento rivers, from Chihuahua City, has at least two zones in which have been found rocks containing radioactive minerals anomalies: the Pastorias mountain range south-southeast and the San Marcos-Majalca zone in the northwest part of the city [1]. The last zone mentioned is the object of this study. The hypothesis is that the water and radioactive sediments coming from the San Marcos area, transported by the San Marcos-Sacramento River, are the contaminants of the aquifers from the northwest area of the hydrographic basin of Chihuahua.

The hydrologic basin is divided geomorphicaly in 3 principal sub-basins: The Sacramento River, the sub-basin of the Chihuahua dam and the sub-basin of the Chuviscar River. All groundwater for the consumption of the city is obtained from these basins. In waters of the Sacramento sub-basin the total uranium specific activity fluctuates between 460 and 1260 Bqm^{-3}. In the waters rich in organic matter, like in the case of the San Marcos Dam, up to 75% of the content of U may be incorporated in colloidal form suspended in particles.

Radioactive anomalies in stratified deposits and clay-sand lenses have been determined in wells of the NW zone of the Chihuahua valley. Then it is suggested that high radioactivity values found in the water of some deep wells are due to the presence of bodies of fine material with carbonate residue, possibly layers of sediment formed from flooding.

In the San Marcos Dam the presence of colloidal organic material is the cause of uranium built up. In the frame of the present work, the reported uranium specific activity values for waters and fish from the San Marcos Dam and some wells in the NW region of Chihuahua-Sacramento valley are high. They may be considered as contamination since their levels are higher than those reported by UNSCEAR 2000 as reference levels.

[1] Goodell (1985) In *Uranium Deposits In Volcanic Rocks*. Proc. Tech. Comm. MTG. El Paso Texas 2–5 April 1984 IAEA Vienna IAEA–TC–490 / 19, 97–124.

Southern Ocean radiocarbon through the last deglaciation as reconstructed from deep-sea corals

ANDREA BURKE AND LAURA F. ROBINSON

Woods Hole Oceanographic Institution, Woods Hole, MA, 02543 (aburke@whoi.edu, lrobinson@whoi.edu)

The Southern Ocean's role in the global carbon cycle and in glacial-interglacial atmospheric CO_2 variations is complex and not yet fully understood. Today, the Southern Ocean is a net source of CO_2 to the atmosphere, as CO_2-rich water upwells and gas is exchanged between surface waters and the atmosphere. During glacial periods, sea ice cover and/or stratification might have reduced this air-sea gas exchange in the Southern Ocean, potentially accounting for the lower atmospheric CO_2. Enhanced Southern Ocean upwelling of carbon-rich and radiocarbon-depleted waters has been proposed as a mechanism for the deglacial rise in atmospheric CO_2 [e.g. 1, 2]. Radiocarbon depth profiles from the Southern Ocean would provide a means of evaluating these hypotheses. In this study, we pair U-Th ages with radiocarbon measurements of fossil deep-sea corals (*D. dianthus*) collected from the Drake Passage to reconstruct radiocarbon at intermediate depths (300-1750 m) through the last deglaciation. Thus far, twenty-seven fossil corals have been U-Th dated, with ages ranging from modern to ~37, 000 y. All ^{232}Th concentations are less than 3.2 ng/g, so that corrections for initial ^{230}Th are less than 940 y and are typically 80 y. Out of the 27 fossils dated, 26 have $\delta^{234}U_{initial}$ values similar to modern sea water. All of our fossils have $\Delta^{14}C$ values between -120‰ and 550‰, with an overall trend from high to low values comparable to the decrease in atmospheric $\Delta^{14}C$. The most recent samples are ~ 90‰ lower than the modern atmosphere, consistent with direct analyses of seawater dissolved inorgnic carbon. During the last glacial, at ~ 25 ka, a fossil coral from 800 m depth is ~200‰ lower than the contemporaneous atmosphere, similar to the results from two Drake Passage corals from Heinrich Event 1 [3, 4]. This offset is larger than today and consistent with the hypothesis of reduced air-sea gas exchange during the glacial period. Corals from 13 ka and younger show offsets that are more similar to those observed in the modern ocean and tend to follow the atmospheric record.

[1] Marchitto *et al.* (2007) *Science* **316**, 1456–1459. [2] Anderson *et al.* (2009) *Science* **323**, 1443–1448. [3] Goldstein *et al.* (2001) *EPSL* **193**, 167–182. [4] Robinson & van de Flierdt (2009) *Geology* **37**, 195–198.