Geophysical Research Abstracts, Vol. 9, 09098, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09098

K, Th and U contents in Central Apennines continental crust: a contribution to the determination of the geoneutrinos flux at LNGS

R. Boraso (1), M. Coltorti (1), G. Fiorentini (2), F. Mantovani (2), M. Morsilli (1), A. Riva (1), G. Rusciadelli(3)

(1) Earth Science Department, Ferrara University, (2) INFN Ferrara, (3) Earth Science Department, Chieti University

A model for the geoneutrinos flux expected at the LNGS (Laboratori Nazionali del Gran Sasso) site detector (Borexino) was recently proposed (Mantovani et al., 2004), based on the average K, Th and U contents in the main silicatic layers of the earth (Upper and Lower Mantle, Upper and Lower Crust, Sedimentary Cover) available from the literature. The model is more sensible in the neighbourhood of the detector (˜ 200 Km), where a more accurate knowledge is necessary. The aim of this study is to refine the global estimates of these elements for the area around the LNGS, taking into consideration the volume of 170 x 220 x 35 Km (depth) where one third of the whole terrestrial geoneutrinos flux is generated. Based on CROP seismic profile (Finetti et al., 2005), a 3D model of the geological structure of the volume was elaborated. A pretty extensive sampling was carried out for the sedimentary sequence outcropping around the Gran Sasso and their relative proportion measured. They were grouped in four geochemical reservoirs, each characterized by a particular content of radionuclides, their relative proportions calculated, and in turn grouped into two main layers, Cenozoic and Permo-mesozoic sedimentary successions. This allow to determine the mean composition of the whole sedimentary cover, which is: 0.67% K, 2.85ppm Th, 1.11ppm U. As it is known basement rocks do not outcrop around the Gran Sasso area, or in the central Apennines. Assuming an homogeneous composition of the South-Alpine domain basement, the rocks of the Lower and Upper Crust outcropping in the Ivrea-Verbano and Valsugana zones were sampled and analysed. Magmatic and metamorphic rocks were grouped into two groups, mafic and felsic. Their relative proportions were inferred based on field observations, refraction seis-

mic profile and ultrasonic wave experiments (Holbrook et al., 1992; Christensen & Mooney, 1995) and heat flow data from the area (Della Vedova et al., 2001). The calculated radionuclides content for the Upper crust is 1.93% K, 7.38ppm Th, 1.45ppm U, while for the Lower crust is 1.39% K, 5.06ppm Th, 0.41ppm U. These estimates are similar to those of Gao et al., (1998), while some discrepancies may be observed, mainly for Th contents, with respect to the estimates of Wedephol (1995) and Rudnick & Fountain (1995) for UC and LC respectively. The chemical budget calculated for sedimentary cover, upper and lower crust may help in understanding the composition and relative amounts of crust material involved in subduction zone and recycled within the mantle wedge.

References:

- F. Mantovani, L. Carmignani, G. Fiorentini and M. Lissia. (2004). Phys. Rev. D 69, 013001.

- Finetti (ed.) (2005). CROP Project: “Deep seismic exploration of the central Mediterranean and Italy” I.R.. Amsterdam; Boston, Elsevier.

- Holbrook, W.S., Mooney, W.D., and N.I. Christensen, (1992). The seismic velocity structure of the deep continental crust, in Lower Continental Crust, D.M. Fountain, R. Arculus, and R. Kay, (eds.), Elsevier, Amsterdam, p. 1-43.

- Christensen, N. and Mooney, W. (1995). Seismic velocity structure and composition of the continental crust: A global view. Journal of Geophysical Research 100(B6): doi: 10.1029/95JB00259. issn: 0148-0227.

- Della Vedova B., Bellani S., Pellis G., Squarci P. (2001) - Deep temperatures and surface heat flow distribution. In: Anatomy of an orogen, The Apennines and adjacent Mediterranean basins, Vai G.B., Martini I.P. (eds), Kluwer Acad. Publ., Dordrecht, The Netherlands, pp. 65-76.

- Gao, S., Luo, T.-C., Zhang, B.-R., Zhang, H.-F., Han, Y.-W., Zhao, Z.-D. and Hu, Y.-K. (1998). Chemical composition of the continental crust as revealed by studies in East China. Geochimica et Cosmochimica Acta 62: 1,959-1,975. doi: 10.1016/S0016-7037(98)00121-5.

- Wedepohl, K.H. (1995). The composition of the continental crust. Geochimica et Cosmochimica Acta 59: 1,217-1,239

- Rudnick, R.L. and Fountain, D.M. (1995). Nature and composition of the continental crust - a lower crustal perspective. Reviews in Geophysics 33: 267-309.