CHAPTER-6

CONCLUSIONS AND SCOPE FOR THE FURTHER STUDY

1. The ambient gamma radiation exposure levels recorded in the Granite and Sand Quarries located in and around Malnad Biosphere region are comparable with the levels observed at other parts of the world as well as in India.

2. Based on the gamma activity measurements of $^{226}\text{Ra}$, $^{232}\text{Th}$ and $^{40}\text{K}$ in soil, granites and minerals, it can be concluded that we have recorded higher concentration of $^{226}\text{Ra}$, $^{232}\text{Th}$ and $^{40}\text{K}$ (much above the global average range) in a few places like areas around Chitradurga fort, Chandravalli, Hanagal particularly in the vicinity of granitic regions. And not in the areas of basement rocks consisting of gneisses and schistose rocks belonging to the Archaean age. This is consistent with the geological history and the geochemical significance of these rocks. Also it has been clearly established that, there is no leakage of any type of radioactive materials from Copper mines at Ingladhal and BBH mines near Hosadurga in the Chitradurga district based on the study of soil, minerals and granites and water samples.
3. The activities of $^{226}$Ra, $^{210}$Po and $^{210}$Pb in soils measured in the Granite and Sand quarries in and around Malnad region show that, the observed ratios of $^{210}$Po to $^{226}$Ra and $^{210}$Po to $^{210}$Pb show that both $^{210}$Po and $^{210}$Pb are not in equilibrium with $^{226}$Ra. Further, the topographic and hydraulic gradients would strongly influence the systematics of $^{210}$Po to $^{226}$Ra ratio.

4. Some rocks especially granites and minerals showed higher radioactivity levels. The radioactivity is due to the presence of in them either of minerals containing radioactive elements (Uranium, thorium, radium), or of radioactive isotopes of potassium, calcium, rubidium, zirconium, tin, tellurium, tungsten, rhenium, or bismuth. In addition, a number of minerals have the capacity to adsorb radioactive elements and isotopes from the surrounding medium. As a consequence, their presence also raises the radioactivity of rocks. Thus it has been found that, the clays and argillaceous shales have increased radioactivity as a result of the sorption of elements in the earth's crust. The radioactivity of rock is given as a percentage amount of uranium.

\[ \Gamma_{scr} = \frac{n \, G_a}{n \, G_r} \]  

\[ \cdots 6.1 \]
Where, $n_r$ and $n_s$ are the number of particles emitted every minute respectively from the rock sample and the standard. $Gr$ and $Gs$ are the weights of the rock and the standard respectively in grams and $a$ is the weight of the uranium in the standard substance.

5. The study of radioactivity in rocks is useful in the measurement of rock density in a mass, as absorption of gamma rays depends on the density of the material. Electrical strength of rocks changes by the effect of gamma rays and still other properties like microhardness, specific gravity and a number of physiochemical properties of rocks change by the presence of gamma rays. The data provided in the present study provides valuable information for geophysicists in the characterization of various types of rocks.

6. The activity of $^{222}\text{Rn}$ in water samples measured show that, concentration of $^{222}\text{Rn}$ in the bore well waters of Chandravalli are quite high compared to those dug in other locations in the town except a well near Government Hospital which showed higher concentration for radon in the water.

7. The electric properties of soils, minerals and granites and their correlation with distribution of radionuclides in them requires lot of attention. It is found that, increase of $\text{SiO}_2$ in soil and Granite is an
indication of Thorium content in the soil. The effect of radiation emitted by Thorium on electric property of Silicon is also need to be studied.

8. In the present study, the chemical characterization of soil was not undertaken during the measurement of specific activities of $^{210}$Po and radioactive $^{210}$Pb in soil samples. The effect of various chemical parameters, such as, particle size, pH of the soil, calcium carbonate in soil, cation exchange capacity of the soil, carbon content and organic matter content in soil on distribution coefficient of $^{210}$Po and radioactive $^{210}$Pb, lead mobility, etc., requires lot of attention and will be taken up for the future studies.
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