OVERVIEW OF THE ATMOSPHERIC IONIZING RADIATION ENVIRONMENT MONITORING BY BULGARIAN BUILD INSTRUMENTS

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Humans are exposed to ionizing radiation all the time, and it is known that it can induce a variety of harmful biological effects. Consequently, it is necessary to quantitatively assess the level of exposure to this radiation as the basis for estimating risks for their health. Spacecraft and aircraft crews are exposed to elevated levels of cosmic radiation of galactic and solar origin and to secondary radiation produced in the atmosphere, the vehicle structure and its contents. The aircraft crew monitoring is required by the following recommendations of the International Commission on Radiological Protection (ICRP) (ICRP 1990), the European Union (EU) introduced a revised Basic Safety Standards Directive (EC 1997) which, inter alia, included the exposure to cosmic radiation. This approach has been also adopted in other official documents (NCRP 2002). In this overview we present the results of aircraft, balloon and mountain peaks radiation environment monitoring by means of a Si-diode energy deposition spectrometer Liulin type developed first in Bulgarian Academy of Sciences (BAS) for the purposes of the space radiation monitoring at MIR and International Space Station (ISS). These spectrometers-dosemeters are further developed, calibrated and used by scientific groups in different countries for the monitoring of the aircraft, balloon and mountain peaks radiation fields. Calibration procedures of them are performed at different accelerators including runs in the CERN high-energy reference field, simulating the radiation field at 10 km altitude in the atmosphere and with heavy ions in Chiba, Japan HIMAC accelerator were performed also. The long term aircraft data base were accumulated using specially developed battery operated instrument in 2001-2009 years onboard of A310-300 aircrafts of Czech Air Lines, during 24 about 2 months runs with more than 2000 flights and 13500 flight hours on routes over the Atlantic Ocean mainly. The obtained experimental data are compared with computational models like CARI and EPCARD. The mountain peak measurements are performed with Liulin-6I, Liulin-6MB, and Liulin-6R and Liulin-6M internet based instruments. They use internet module to generate WEB page, which is posted online. The obtained deposited energy spectra, dose and flux data are transmitted via LAN interface by HTTP and FTP protocols. They work online for different periods between 2005 and 2011 at Jungfrau (3453 meters Above Mean Sea Level (AMSL) http://130.92.231.184/); at Lomnicky stit (2633 meters AMSL http://147.213.218.13/) and Moussala (2925 meters AMSL http://beo-db.inrne.bas.bg/moussala/) peaks in Switzerland, Slovakia and Bulgaria. 3 small size battery operated instruments were flown on NASA balloon over New Mexico, USA on 11th of June 2005. Rocketborne space radiation spectrometer-dosimeter Liulin-R instrument take part in Transnational Access to Research Infrastructure under the EU's 6th FP during the flight of HotPay-2 rocket experiment up to 380 km on January 31st 2008 at Andoya Rocket Range in Norway.