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Ground-based monitoring of solar radiation in Moldova

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Integrated measurements of solar radiation in Kishinev, Moldova have been started by Atmospheric Research Group (ARG) at the Institute of Applied Physics from 2003. Direct, diffuse and total components of solar and atmospheric long-wave radiation are measured by using of the radiometric complex at the ground-based solar radiation monitoring station. Measurements are fulfilled at the stationary and moving platforms equipped with the set of 9 broadband solar radiation sensors overlapping wavelength range from UV-B to IR. Detailed description of the station can be found at the site http://arg.phys.asm.md. Ground station is placed in an urban environment of Kishinev city (47.00N; 28.56E). Summary of observation data acquired at the station in the course of short-term period from 2004 to 2009 are presented below.

Solar radiation measurements were fulfilled by using CM11(280-3000 nm) and CH1 sensors (Kipp&Zonen). In the course of a year maximum and minimum of monthly sums of total radiation was ∼706.4 MJm-2 in June and ∼82.1MJm-2 in December, respectively. Monthly sums of direct solar radiation (on horizontal plane) show the maximum and minimum values of the order ∼456.9 MJm-2 in July and ∼25.5MJm-2 in December, respectively. In an average, within a year should be marked the predominance of direct radiation over the scattered radiation, 51% and 49%, respectively. In the course of a year, the percentage contribution of the direct radiation into the total radiation is ∼55-65% from May to September. In the remaining months, the percentage contribution decreases and takes the minimum value of ∼ 28% in December. In an average, annual sum of total solar radiation is ∼4679.9 MJm-2. For the period from April to September accounts for ∼76% of the annual amount of total radiation. Annual sum of sunshine duration accounts for ∼2149 hours, which is of ∼ 48% from the possible sunshine duration. In an average, within a year maximum and minimum of sunshine duration is ∼ 304 hours in July and ∼48 hours in December.

By carrying out radiation measurements with the set of broadband solar radiation sensor we are able to determine the percentage contribution of each of the broadband wavelength range from UV-B to IR relatively to yearly sum of total solar radiation (280-3000 nm). These contributions are the following: ∼ 0.2% for UV-B, ∼0.02% for UV erythema, ∼8% for UV-A, and ∼ 48% for PAR radiation.

Monthly mean values of integral transparency P2 at airmass m=2 were derived from measurements of direct solar radiation within the spectral range 280-3000 nm at the ground station. It was found that average of integral transparency <P2> was equal to 0.74 for February-October months. Minimum and maximum of transparency was observed in July-August with a value of P2∼0.71 and in February with value of P2∼ 0.79, respectively. Low transparency in July-August may be due to high loading of aerosols in atmosphere and high values of relative humidity with the presence of hygroscopic aerosols.