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The mirror symmetry principle for radiation fields in a vertically non-uniform atmospheric slab

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The fundamental problem of mirror spatial-angular symmetry of extended radiation fields in a vertically non-uniform plane-parallel atmosphere is considered. New approach to the mentioned problem generalizes an appropriate analytical consideration in the case of vertically uniform atmospheric slab is also studied [1]. Exact conditions of adequate mapping for the own mirror symmetry properties of a vertically non-uniform slab into multiple light scattering have been established. The mirror symmetry principle for scalar and polarized radiation fields of a vertically non-uniform plane-parallel atmosphere is performed. Mentioned principle generalizes the analogous symmetry principle in the case of a vertically uniform atmospheric slab [2]. The principle of mirror images (symmetry) and appropriate invariant relations take into account arbitrary vertical non-uniformities and any energetic sources′ distribution. Basic content of given principle is as follows: the sum of initial and mirror radiation fields is an spatial-angular invariant value which is relatively mutual for mirror transfer of optical levels, vision directions and primary energetic sources. Application of previously performed general concept to the spatial-angular radiation fields as well as in uniform case produces a new notation of the radiative transfer theory known as photometrical invariants. However, in contradistinction to the uniform slab [3], the mirror radiation field in the non-uniform case cannot be calculated, making direct use of initial radiation field. In present paper the new algorithm of numerical determination of initial radiation field in arbitrary non-uniform atmospheric slab based on the mentioned above mirror symmetry principle is performed.

References

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