Exploring the space-time distribution of potential solar radiation in Greece, introducing radiation indices.

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Solar radiation is a key factor for a lot of natural processes and human activities. The influence of local geographical characteristics of a specific surface (such as slope, aspect, altitude and shading) on the amount of incoming potential solar radiation is very important. In this paper two indices are introduced in order to quantify this effect and facilitate the mapping of the space-time distribution of potential incoming solar radiation (useful for the analysis of a wide range of hydrological processes). The Relative Potential Radiation Index (RPRI) is calculated as the fraction of the estimated potential incoming solar radiation to the theoretical one (for a flat and unshadowed surface of certain latitude during a specific time period of the year). The Absolute Potential Radiation Index (APRI) is calculated as the fraction of the estimated extraterrestrial incoming solar radiation to the theoretical one (for a flat and unshadowed surface of latitude 0o during a specific time period of the year). The indices were summed in daily, monthly and annual basis, for the exploration of the solar radiation potential of the Greek territory. The hourly indices were calculated in each cell of the Digital Elevation Model (DEM) of Greece (using GIS techniques) and were integrated spacewise (e.g. water basins) and timewise (e.g. daily, monthly and annually). From the performed analysis the following conclusions were drawn: (a) 1 % of the Greek territory receives less than 80% of the theoretical amount of incoming potential solar radiation and another 1 % receives 15 % more than the theoretical value, (b) the influence of topographic factors on the amount of potential incoming solar radiation is prominent during winter (as the sun is lower in the sky) and is reduced significantly during summer, (c) each area maximizes its receiving amount of potential incoming solar radiation during a specific period of the year which depends on the relation between the orientation of the surface and the position of the sun (maximum when they are perpendicular), (d) areas with significantly different monthly potential incoming solar radiation indices can be often located very close (i.e. in the same basin) and finally, (e) the names of a great number of Greek villages are related to their extreme or reduced exposure to the sun.