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A new solar radiation model for research and applications in Austria

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The operational model STRAHLGRID calculates 10 minute values of direct and diffuse solar radiation as well as sunshine duration on a 1x1km grid for the national territory of Austria in near realtime. The model accounts for atmospheric turbidity, cloudiness, terrain shading, multiple and terrain reflections and ground albedo feedbacks. To reproduce temporal changes of atmospheric turbidity at best, we use precipitable water (water vapour transmittance) and visibility fields (aerosol transmittance) from the ZAMG operational nowcasting model INCA at same spatial resolution as well as a cloud raster. The latter combines measured sunshine fraction at 249 automatic weather stations (TAWES) with cloud type from MSG-2 satellite data and is therefore directly relevant for solar radiation. It is updated every 15 minutes. To account for multiple reflections, the ground albedo is taken from daily available MODIS imagery. Terrain data (elevation, aspect, slope, ground and sky view factor) is taken from a 100x100m DEM extracted at every 10th grid cell. To validate the model, quality controlled global solar radiation and sunshine duration data from 232 automatic weather stations in Austria as well as direct and diffuse solar radiation data of 5 operational suntracking systems are used. At ZAMG, the model is operationally used to assist the legal task of a national climate monitoring in Austria, to perform data quality control, to provide input and verification data for modeling tasks on different temporal and spatial scales (e.g. energy balance, regional climate modeling, weather forecasting) and to derive products related to solar energy applications (longterm means and forecasts). In future, the model will be used as an important part of a planned national operational snow cover model. The model data is freely available for academic and research use.