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Statistical representation of mountain shading

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Abstract. Shadows cast by the mountains themselves have a strong influence on the surface energy balance of mountainous regions. If the influence of shadows is to be included on sub-grid scales in a surface energy balance model, a statistical representation has to be used. Slope components calculated from digital elevation models of areas in North Wales and the French Alps are found to have double-exponential distributions. From this result, expressions are developed for the fractions of the areas that will be either self-shaded or shaded by remote topography as functions of solar elevation and time of day. These expressions are in good agreement with results from a terrain shading model.

Keywords: solar radiation, topography, surface energy balance, statistical parameterisation

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