Université de Lille 1 SCIENCES ET TECHNOLOGIES — UFR de Physique

Master Physique
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International Master 2 Atmospheric Environment: Research Training 2017-2018

Laboratory: LOA

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CaPPA Work Package: WP-5 Interactions Aerosols/Clouds/Climate

A detail analysis of the surface solar resource for an optimization of its exploitation

The solar resource is the most important renewable energy available on Earth. Its right exploitation is determinant for actual and future challenges linked to energy, in the context of a global increase of energetic demand, of the rarefaction of fossil energies, and of climate change that recommands a control of greenhouse gas production. A detailed knowledge and measurement of the characteristics of solar radiation incident at the surface (spectral variation, direct and scattered parts, three dimensional effects) is important for the evaluation and optimization of photovoltaic materials, particularly when cloud cover is present. In addition, the detailed analysis of the downwelling radiation at the surface permits the characterization of cloud covers and its interaction with shortwave radiation field, and their radiative effects.

This research training aims to analyze the characteristics of the downwelling solar radiation as measured daily since 2010 with the in situ radiometers (pyranometer, pyrheliometer) of the Laboratoire d'Optique Atmosphérique, and to simulate the spectral variation of the radiation field at medium resolution thanks to radiative codes available at LOA. A synergy with other in situ measurements (photometer, lidar) will be be investigated.

Key words: solar resource, cloud, pyranometer, radiative code