Development and benchmarking of solar irradiance nowcasting systems

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Ground-based All Sky Imagers (ASI) as well as Shadow Cameras (SC) can be used to derive both current and future direct and global irradiance values in high spatial and temporal resolution for solar plants. Such so-called nowcasts support the optimization of plant operations. For industrial applications, the abilities of such systems must be known and the optimal accuracy to cost ratio has to be found. Within this PhD project, various nowcasting systems are developed and benchmarked. Furthermore, a general benchmarking framework for nowcasting systems is developed.

Benchmarking and determination of optimal nowcasting configurations

Currently, three major groups of nowcasting systems are developed and optimized: (1) The WobaS nowcasting system ([1], [2], [3]), consisting of four ASIs, with three systems currently operational at two solar technology test sites and at a 50 MW parabolic trough plant. (2) The SC system [4], which is based on downwards facing cameras and directly detects the shadows. Given certain geographies, such systems look very promising. (3) A modular system with one ASI and another sensor in a large variety of system configurations, adaptable to local data availability (e.g. regarding cloud height measurements derived from existing ceilometers or cloud speed sensors). In many cases, this system is less expensive than the WobaS system.

To benchmark nowcasting systems, twenty-six pyranometers, four pyrheliometers, the SC system and camera data of several years are used. With all these data available, the accuracies of nowcasting systems can be scrutinized and studied in detail ([5], [6], [7]). This way, constant improvements can be obtained.

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