



Using GIS data and satellite derived irradiance to optimize siting of PV installations in Switzerland

Annelen Kahl (1), Viet-Anh Nguyen (2), Stuart Bartlett (1), Fabrizio Sossan (3), and Michael Lehning (1)

(1) ENAC, EPFL, Lausanne, Switzerland, (2) CDM, EPFL, Lausanne, Switzerland, (3) STI, EPFL, Lausanne, Switzerland

For a successful distribution strategy of PV installations, it does not suffice to choose the locations with highest annual total irradiance. Attention needs to be given to spatial correlation patterns of insolation to avoid large system-wide variations, which can cause extended deficits in supply or might even damage the electrical network. One alternative goal instead is to seek configurations that provide the smoothest energy production, with the most reliable and predictable supply.

Our work investigates several scenarios, each pursuing a different strategy for a future renewable Switzerland without nuclear power. Based on an estimate for necessary installed capacity for solar power [Bartlett, 2015] we first use heuristics to pre-select realistic placements for PV installations. Then we apply optimization methods to find a subset of locations that provides the best possible combined electricity production.

For the first part of the selection process, we use a DEM to exclude high elevation zones which would be difficult to access and which are prone to natural hazards. Then we use land surface cover information to find all zones with potential roof area, deemed suitable for installation of solar panels.

The optimization employs Principal Component Analysis of satellite derived irradiance data (Surface Incoming Shortwave Radiation (SIS), based on Meteosat Second Generation sensors) to incorporate a spatial aspect into the selection process that does not simply maximize annual total production but rather provides the most robust supply, by combining regions with anti-correlated cloud cover patterns.

Depending on the initial assumptions and constraints, the resulting distribution schemes for PV installations vary with respect to required surface area, annual total and lowest short-term production, and illustrate how important it is to clearly define priorities and policies for a future renewable Switzerland.