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Future change in renewable energy availability in West Africa: a time of emergence approach

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Independence in energy production is a key aspect of development in West African countries, which are facing fast population growth and climate change. Sustainable development is based on the availability of renewable energy sources, which are tightly tied to climate variability and change. In the context of current and projected climate change, development plans need reliable assessment of future availability of renewable resources.

In this study, the change in the availability of photovoltaic (PV) and wind energy in West Africa in the next decades is assessed. Specifically, the time of emergence (TOE) of climate change in PV and wind potential is estimated in 29 CMIP5 climate projections.

The ensemble robustly simulates a shift into a warmer climate in West Africa, which already occurred, and projects a decrease in solar radiation at the surface to occur by the 70s. The reduction in solar radiation is associated with a projected increase in the monsoonal precipitation in the 21st century. It results a likely change into climate conditions less favourable for PV energy production by the 40s. On the other hand, the projected change in the monsoonal dynamics will drive the increase in low level winds over the coast, which in turn will result in a robustly simulated shift into climate conditions favourable to wind power production by mid-century. Results show that climate model projections are skilful at providing usable information for adaptation measures to be taken in the energy sector.