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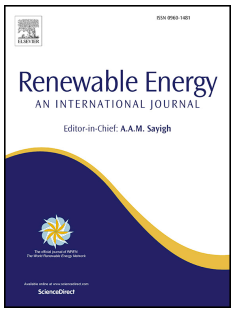

A novel solar concentrating system based on a fixed cylindrical reflector and tracking receiver

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A novel solar concentrating system based on a fixed cylindrical reflector and tracking receiver

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Abstract:

The performance of a novel solar energy concentrating system consisting of a cylindrical mirror placed in a stationary position and a receiver tracking system is investigated. Via a computational tool based on the ray-tracing method, the sensitivity of the geometric concentration ratio, rim angle, shadow angle, incidence angle and hourly insolation level to the optical performance of the concentrator are evaluated. The simulation includes a model of solar concentrating system based on the approximation of the optical behavior of a cylindrical reflector. In fact, the optical efficiency of the solar concentrator system is examined. The results prove that the maximum of the optical efficiency is achieved for 20×geometric concentration ratio and 80°-rim angle. Moreover, the concentrated solar density and the Local Concentration Ratio (LCR) distribution along the tracked receiver tube are analyzed and compared to those obtained by the classical one-axis tracked parabolic trough concentrator system.

Keywords: solar energy concentrating system; a fixed cylindrical reflector; receiver tracking system; RT 3D-4R method; optical efficiency