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**Enhancement of convective cooling in solar photovoltaics** MARC CALAF, BROOKE STANISLAWSKI, TODD HARMAN, University of Utah, RAUL B. CAL, Portland State University — At present, most research on solar photovoltaics (PV) is focused on improving cell efficiency at $25^oC$, where most world-record efficiencies have been measured, and which neglects the fact that in outdoor conditions the air temperature grows significantly higher. Reduction of undesirable thermal effects can be achieved by either decreasing heat generation at the cell level or by increasing heat dissipation. Here, heat dissipation is exploited through enhanced convection, which has remained fairly unexplored. It is now well-accepted that solar module temperature increases lead to undesired power losses. The rate of efficiency decrease per degree of temperature rise is quantified by the "temperature coefficient." For a silicon cell, the efficiency of the cell drops by about 0.4% with the increase of every one degree Celsius above $25^oC$, and solar modules in real atmospheric conditions can typically operate at upwards of $25^oC$ above the ambient temperature. While ongoing efforts continue to reduce the thermal losses at the source, manipulation the operating temperatures of solar PV modules is sought out within large-scale solar farms by developing new solar farm arrangements that boost the convective heat transfer between the modules and the atmospheric flow. For this purpose, large-eddy simulations of realistic solar PV farms are conducted, where results will illustrate whether there exists any preferential solar farm arrangement for enhanced cooling and hence increased solar PV efficiency.

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