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Design of a solar chimney dryer

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Abstract. Drying is a common method for food preservation. A solar dryer which is in a similar shape to the chimney is proposed in this study. A numerical model using ANSYS-FLUENT was developed and validated with a result taken from the literature. The dryers which have a circular and a square cross-section were investigated and compared. An area ratio (AR) of the chimney outlet and chimney inlet, i.e. the dryer outlet and inlet, is used as a test parameter. It was found that the air velocity and temperature increase with the increase of AR. However, it was noted that higher ARs deteriorate the smoothness of the airflow by generating the recirculation zones near the chimney outlet. This reduces the rate of mass flow increase. The results show that the circular chimney with AR20 provides the highest mass flow rate.

Keywords: Solar dryer; Drying; Solar chimney; Computational Fluid Dynamics; Divergent chimney