Scientific Achievement:
A solar thermal receiver capable of heating sCO\(_2\) was constructed and tested on-sun (Fig. 1). Preliminary tests using air show that the novel bladed receiver design absorbs more sunlight than conventional flat-panel receivers. The tests were validated using coupled modeling (optical/thermal/fluid).

Significance and Impact:
A solar receiver capable of delivering sCO\(_2\) at high pressures (~20 MPa) and temperatures (~700°C) must be developed to enable a high-efficiency (~50%) sCO\(_2\) Brayton cycle. This work will make CSP technologies more cost competitive.

Research Details:
- A novel bladed receiver configuration intended to trap more incident sunlight was tested using banks of compressed bottles to prolong the test duration (Fig. 2, left)
- A unique flow pattern (Fig. 2, right) was employed to increase heat transfer to the fluid, reduce thermal emissivity, and avoid hotspots.
- The experiment and computation results showed satisfactory agreement for air, and the design can be used with sCO\(_2\) to yield high receiver thermal efficiency.

Publications:

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