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## Convective heat transfer of water flowing in intersected rock fractures for enhanced geothermal extraction

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Numerous intersected rock fractures constitute the fracture network in enhanced geothermal systems. The complicated convective heat transfer behavior in intersected fractures is critical to the heat recovery in fractured geothermal reservoirs. A series of three-dimensional intersected fracture models are constructed to perform the flow-through heat transfer simulations. The geometries effects of dead-end fractures on the heat transfer are evaluated in terms of intersected angles, apertures, lengths, and the connectivity. The results indicate that annular streamlines appear in the rough dead-end fracture and cause an ellipsoidal distribution of the cold front. Compared to the steady flow in plate dead-end fractures, the fluid flow formed in the rough dead-end fracture enhances the heat transfer. Both the outlet water temperature  $T_{out}$  and heat production  $Q$  present the largest when the intersected angle is  $90^\circ$ . A larger intersected angle and longer length extension of the intersected dead-end fracture, raising  $T_{out}$  and  $Q$ , are beneficial to the heat production, while increasing the aperture is ineffective. Solely increasing numbers of dead-end fractures poses a little increase on  $T_{out}$  and  $Q$ . More significant heat extraction is obtained through connecting these dead-end fractures with the main flow fracture forming the flow network.