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Paper No. 75-11

Presentation Time: 10:55 AM

**LINKING TETON AND EAST GALLATIN FAULT MOTION ACROSS THE
YELLOWSTONE HOTSPOT TRACK, WYOMING, USA: IMPLICATIONS FOR
ONGOING EXTENSION BENEATH YELLOWSTONE AND THE NORTHERN
CONTINUATION OF THE ACTIVE TETON FAULT**

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Previously, it has been proposed that the active Teton fault system, which marks the eastern edge of the Teton Range, originally extended across the Yellowstone hotspot track prior to migration of the supercaldera system into its present position at ~2 Ma. This hypothesis, based largely on fault length-displacement scaling relationships, assumes the Teton Range extended at least 65-85 km north of the present-day range, but collapsed following supercaldera eruptions from ~2 Ma to the present. A potential linkage was also proposed between the Teton fault and a similar down-to-the-east normal fault, the East Gallatin fault, north of the Yellowstone caldera. If correct, this impacts our understanding of contrasting topography between the low-relief in the Snake River Plain hotspot track and the bordering high-relief mountain ranges. Additionally, an active fault beneath Yellowstone would have implications for regional seismic hazards. Detailed structural mapping of a 2020 LiDAR dataset of Yellowstone National Park (YNP) acquired by the National Park Service (NPS) provides a timely opportunity to test this hypothesis. Integration of surface ruptures apparent in the LiDAR dataset with existing structural mapping indicates a distributed zone of ~N-S trending normal faulting with mostly down-to-the-east offsets that extend from the northernmost parts of Grand Teton National Park to the southern extent of the Gallatin Range in YNP. Surficial displacements of 71-164 m were measured across multiple volcanic flows with ages ranging from ~200 ka to ~80 ka yielding consistent along-strike displacement rates of 730 – 1,096 m/Ma. These rates are also consistent with longer-term estimates of Teton fault slip derived from low-temperature thermochronology and shorter-term estimates derived from fault trenching studies. Thus, we interpret these new data to indicate that Basin and Range extension has continued beneath Yellowstone despite multiple supercaldera eruptions, is linked between the Teton and East Gallatin faults, and is manifested as a distributed N-S striking fault zone linking through relatively young Yellowstone volcanic flows. Importantly, these findings provide compelling new evidence consistent with the predictions of the northern paleo-Teton fault extension hypothesis.

Session No. 75

[T13. The Legacy of Kenneth L. Pierce: Interdisciplinary Studies along the Track of the Yellowstone Hotspot and Beyond I](#)
Monday, 10 October 2022: 8:00 AM-12:00 PM

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