Join us for

# MGS Happy Hour

When? **Tuesday, Nov 15th 5:00PM – 8:00PM** (talk starts at 6:30PM)

Where? **CJ's Bar & Grill** in Billings (2455 Central Ave.)

What? Drinks, Presentation, Dinner

**RSVP to montanageologicalsociety@gmail.com by latest Monday November 14th**

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## SPEAKER: DR. YANN GAVILLOT

**ASSOC. PROF. – RESEARCH GEOLOGIST, MONTANA BUREAU OF MINES AND GEOLOGY,**
**MONTANA TECHNOLOGICAL UNIVERSITY, BUTTE, MONTANA**

Yann Gavillot recently joined the Montana Bureau of Mines and Geology leading the Geohazards Program working on various projects on active faults, earthquake geology, seismic hazards assessments, landslides, LiDAR, geological mapping, and Quaternary dating. He came in as a Postdoc from Oregon State University working on seismic hazards studies with the USGS in Northern California. He earned a Ph.D. in Geology from Oregon State University focusing on the neotectonics of the Kashmir Himalaya; a M.S. in Geology from the University of California Los Angeles focusing on the tectonics of the Zagros fold-thrust belt; and a B.S. in Geosciences from the University of Arizona with an emphasis on the structural geology. He worked as a geologist for the United Nations with UNESCO in Paris.

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### The Bitterroot Fault, Western Montana:
### Recent work and results on active faulting, geological mapping, Quaternary dating, Pleistocene glaciation, and paleo-earthquakes for the Bitterroot-Missoula valleys.

The Bitterroot fault is a 100-km-long active normal fault that bounds the eastern margin of the north-south trending Bitterroot Mountains and accommodates extension within the Intermountain Seismic Belt. New detailed mapping using LiDAR along the southern Bitterroot Range documents multiple generations of fault scarps in Holocene-Pleistocene deposits with vertical offsets that increase in magnitude with age. Fault mapping indicates a complex fault geometry characterized by an *en echelon* pattern of discontinuous segments of 45–70° east-dipping normal faults that appear to cut the older Eocene detachment fault, and locally 70–80° west-dipping antithetic normal faults. $^{10}$Be cosmogenic radionuclides surface exposure dating technique provides age control for >32 boulders sampled in glacial deposits. Near Como Dam, a dated 16–17 ka Pinedale moraine offset by the Bitterroot fault scarp with a vertical separation of 3.5 m, yields a fault slip

rate of 0.2–0.3 mm/yr. Glacial Lake Missoula shorelines inset into a dated ~15 ka Pinedale moraine and vertically offset 4.6 m by an antithetic strand of the Bitterroot fault, yield fault slip rates of 0.2–0.4 mm/yr. In the Ward Creek Fan located ~15 km to the north of Como Dam, two dated ~17 ka and 63–70 ka fan surfaces offset by the Bitterroot fault with vertical separations of 2.4 m and 4.5 m, yield fault slip rates of 0.1–0.2 mm/yr and 0.1 mm/yr, respectively. Our results indicate broadly consistent fault slip rates with an along-strike preferred average of 0.2–0.3 mm/yr for the southern Bitterroot fault. Fault scaling relations, structural model constraints and our slip rate results indicate both a seismogenic low angle and high angle fault geometry are possible at depth, which could generate a Mw ~7.2 earthquake or larger. We speculate the Bitterroot fault is likely characterized by millennia-timescale earthquake recurrence interval. Forthcoming paleoseismic trench results on the Bitterroot fault will aim to develop a Holocene-Pleistocene paleoearthquake chronology. Data from this study suggest seismic hazards from the Bitterroot fault potentially pose a significant risk to the rapidly growing Missoula metropolitan area, and major infrastructures across the Missoula-Bitterroot valleys.