Colorado Scientific Society

Founded in 1882, the objective of the Society is to promote the knowledge and understanding of Earth science, and its application to human needs. Samuel Franklin Emmons, 1841-1911, was "Geologist in Charge" of the Colorado Division of the U.S. Geological Survey when it was established in 1879 and was the first president of the Society.

April Newletter

All are welcome to come to our April meeting and annual S.F. Emmons Lecture:

The Paleo-Bell River, When the Colorado Ran North: Tracking Zircons from Arizona to the Labrador Sea

Dr. James W. Sears, University of Montana

Thursday, April 20, 2023, 7:00 p.m.
Calvary Church, 1320 Arapahoe St., Golden

All are always welcome – no admission charge

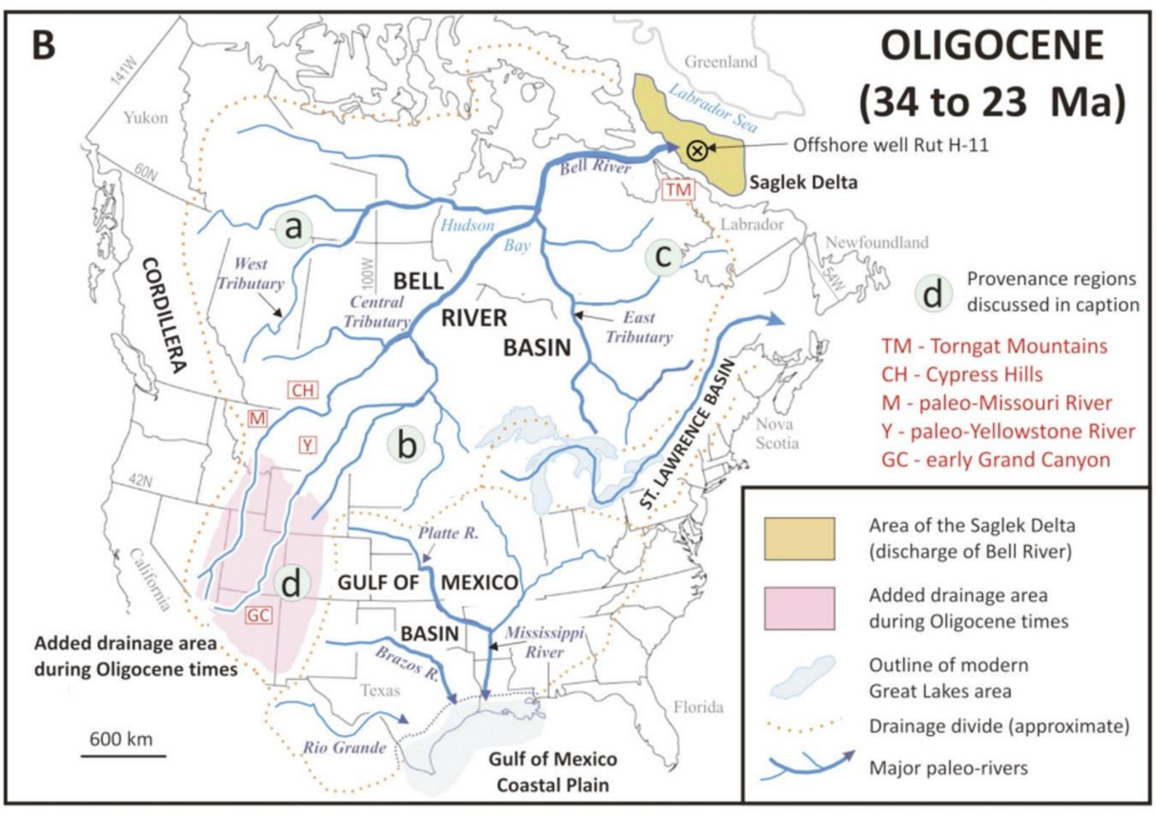


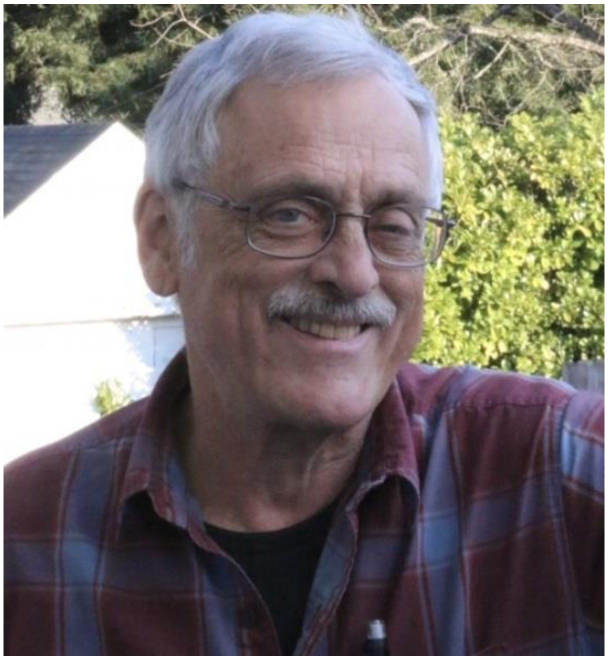
Figure above from Sears and Beranek's paper in the 2022 Canadian Geoscience issue (Vol 49, No 1).
Provenance regions discussed in presentation.
If you cannot access Canadian Geoscience Volume 49, No. 1, see the articles linked after Jim Sears' biography.

For more info on these and other coming CSS events, see (always!) our website, https://coloscisoc.org/!

Abstract: The origin of Grand Canyon is still debated. Where did the Colorado flow to the sea when it first started cutting the canyon? Where was its delta? New evidence shows erosion was deeply dissecting the canyon and Colorado Plateau for 20 million years before the first grain of sand reached its modern delta in the Gulf of California. The Gulf didn't even exist before the canyon's Inner Gorge was incised.

I propose that the missing delta is way up north in Canada's Labrador Sea. Luke Beranek of Memorial University and I sampled sand cuttings from a deep exploration well in a giant delta in the Labrador Sea. The sand was deposited when early Grand Canyon was eroding. We extracted zircon sand grains from the cuttings and U-Pb dated them at the University of Arizona Laserchron Lab. We found that, indeed, groups of the grains matched potential sources in the southern Colorado Plateau.

The river was the scale of the Amazon, and would have flowed south to north across the Colorado Plateau and through active grabens in Colorado's Brown's Park and Wyoming's Beaver Rim, to the Big Horn and Yellowstone Rivers. The grabens collected tell-tale detrital zircons linking the southern Colorado Plateau to the Labrador Sea delta. The Yellowstone joined the paleo-Bell River of Canada to reach the Labrador Sea. The gigantic river was destroyed by tectonics, volcanism, and continental glaciation. But evidence remains in tiny zircon sand grains.



Bio: Jim Sears recently retired from a long career as a Professor of Geology at the University of Montana. He has been intrigued about the origin of Grand Canyon ever since his undergrad days at Northern Arizona University, where, as a devoted member of the Hiking Club, he trekked hundreds of miles in the canyon. At the University of Wyoming he completed a master's degree on Grand Canyon Precambrian geology, then went on to complete a PhD in geology at Queen's University in Canada, with a project in the Canadian Cordillera. His geologic experiences in Grand Canyon, Canada, Wyoming, and Montana led him to the idea that the early canyon may have been carved by a large river that flowed from the canyon, north through Wyoming and Montana, to great delta in Canada's Labrador Sea. Sears recently returned to Canada to sample detrital zircons from the Labrador delta to test his hypothesis. With Luke Beranek of Memorial University, Sears dated the samples at the University of Arizona Laserchron Lab and indeed found direct links to the southern Colorado Plateau.

Jim Sears at an Arizona cross-road called "Gap". The gap on the skyline is an abandoned river channel near Grand Canyon that is part of the story about how the Colorado once drained north. Johnny MacLean took the photo when they were researching the story a few years ago.

Link to related article in Earth Magazine (2018) **The Paleo-Bell River: North America's vanished Amazon**

Link to article in GSA Today **Late Oligocene–early Miocene Grand Canyon: A Canadian connection?** by James W. Sears (2013).

In-person Meeting at Calvary Church Golden

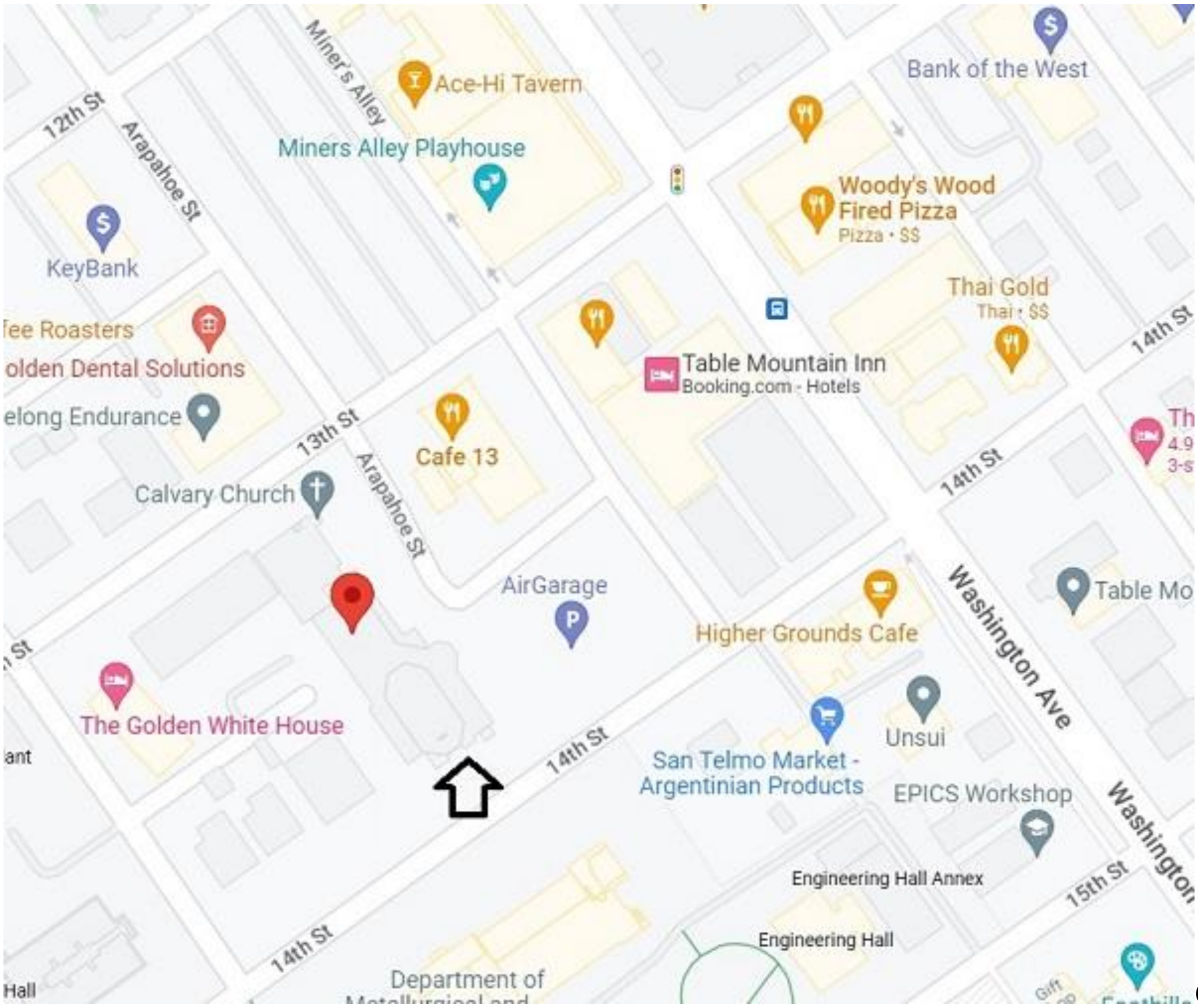
All are welcome – no admission charge
6:30 pm – Social time at in-person meetings
6:45 pm – Join Zoom meetings
7:00 pm – Meeting and Program begin. Please arrive early.
Church doors are locked, and **no one will be at the door to let you in after 7:00 pm.**

Link to Join CSS April Emmons Lecture on The Paleo-Bell River, When the Colorado Ran North via Zoom:

Thursday, April 20, 2023 at 7:00 pm Please Join the meeting about 6:45 pm.

Click to Join CSS Zoom Meeting
from PC, Mac, Linux, iOS or Android

For other Zoom options, click here.



Calvary Church in Golden. Enter at arrow on map.

Calvary Church Golden

Click on link to open a Google map.

Enter from 14th St., go in by the main glass doors at [906] 14th St.

Do **not** enter via the old church above 13th St.

From the 14th Street entrance go down the hallway following Colo Sci Soc signs to Community Rooms 1 and 2, where we meet.

The church doors must stay locked, and we will have a person to let you in at the doors off 14th st.

They want to see the presentation too, so **please arrive before 7:00 pm.**

There will be a phone number that you can text to be let in if you arrive late.

Parking

On street parking is available close by, along 14th St and west of Washington Ave in Golden.

The AirGarage parking structure, which can be entered from Arapahoe St., is $3.00 for three hours.

Copies of ***The Geology of Boulder County*** by Raymond Bridge (2004) will be available for $20.

CSS May Meeting, 7 p.m., Thursday, May 11

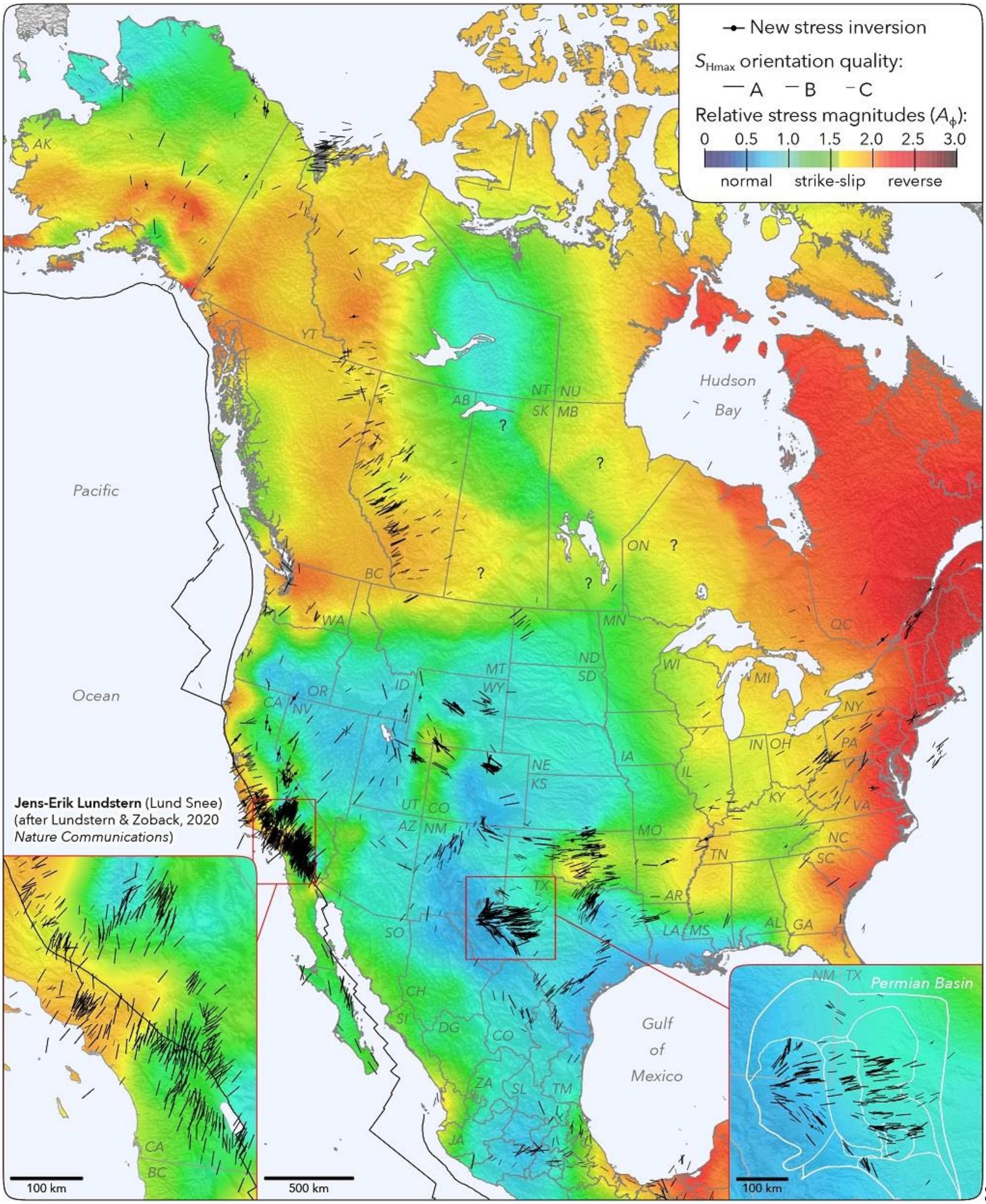
Calvary Church, 1320 Arapahoe St., Golden

Next-generation stress maps of North America: Utility for understanding active tectonics and managing induced seismicity

Jens-Erick Lundstern (Lund Snee), US Geological Survey

Abstract: The stress field controls active deformation of the Earth's crust and reflects the processes that drive plate tectonics. Although efforts to map the maximum horizontal stress (S_{Hmax}) began in the 1960s, large gaps have persisted in many areas. Here I present a next-generation stress map for North America (figure), which includes several hundred new S_{Hmax} orientations as well as the continent's first quantitative map of relative stress magnitudes (A_{φ}). In eastern parts of the continent, S_{Hmax} is generally oriented northeast–southwest and the style of faulting is compressive (reverse and/or strike-slip faulting). Moving westward into the center of the continent, S_{Hmax} rotates clockwise to a nearly east–west direction and the style of faulting becomes less compressive. Western parts of the U.S. are dominantly extensional, with normal and/or strike-slip faulting active. In these areas, S_{Hmax} rotates over much shorter distances, but these variations are coherent, especially when viewed at a fine scale. In this presentation, I present the new stress mapping and then discuss its utility for understanding sources of stress and active tectonics. I show how the stress maps contribute to understanding and managing induced seismicity, with particular focus on recent earthquakes in the Permian Basin of western Texas and southeastern New Mexico. By pairing these next-generation stress maps with maps of subsurface faults, it is possible to identify which faults may be the most sensitive to slip due to perturbations such as fluid pressure changes associated with wastewater disposal, hydraulic fracturing, or carbon storage.

Jens Lundstern (Lund Snee) is a research geologist at the U.S. Geological Survey who studies tectonics and geomechanics, focusing on induced seismicity, unconventional energy, and the geologic history of the western USA. He received his Ph.D. in Geophysics from Stanford University, where he developed a new-generation map of the state of stress in North America. Dr. Lundstern received his M.S. in Geological & Environmental Sciences also from Stanford, where he studied the tectonic and paleogeographic history of the Great Basin in the western U.S. He has previously studied the Alpine Fault plate boundary system in New Zealand on a Fulbright Fellowship, and his experience includes work for Statoil (now Equinor) as an exploration geologist in the Gulf of Mexico.



Stress map of North America

Click here to open a **full-size Stress map of North America** and enlarge to see details.