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.

May Newletter

All are welcome to come to attend our May meeting:

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

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

Thursday, May 11, 2023, 7:00 p.m.
Calvary Church, 1320 Arapahoe St., Golden

All are always welcome – no admission charge

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

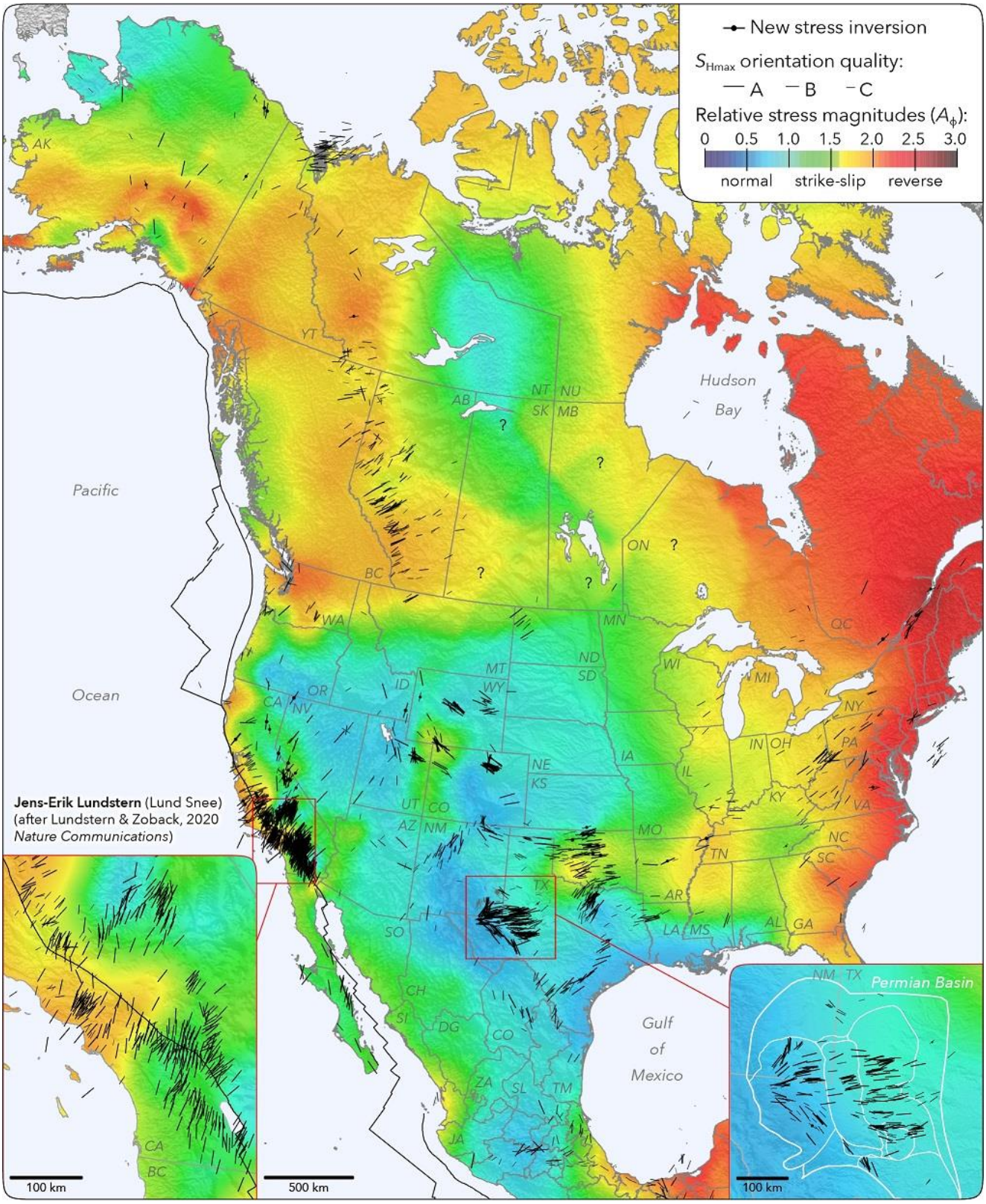
In-person Meeting at Calvary Church Golden

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.**

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.



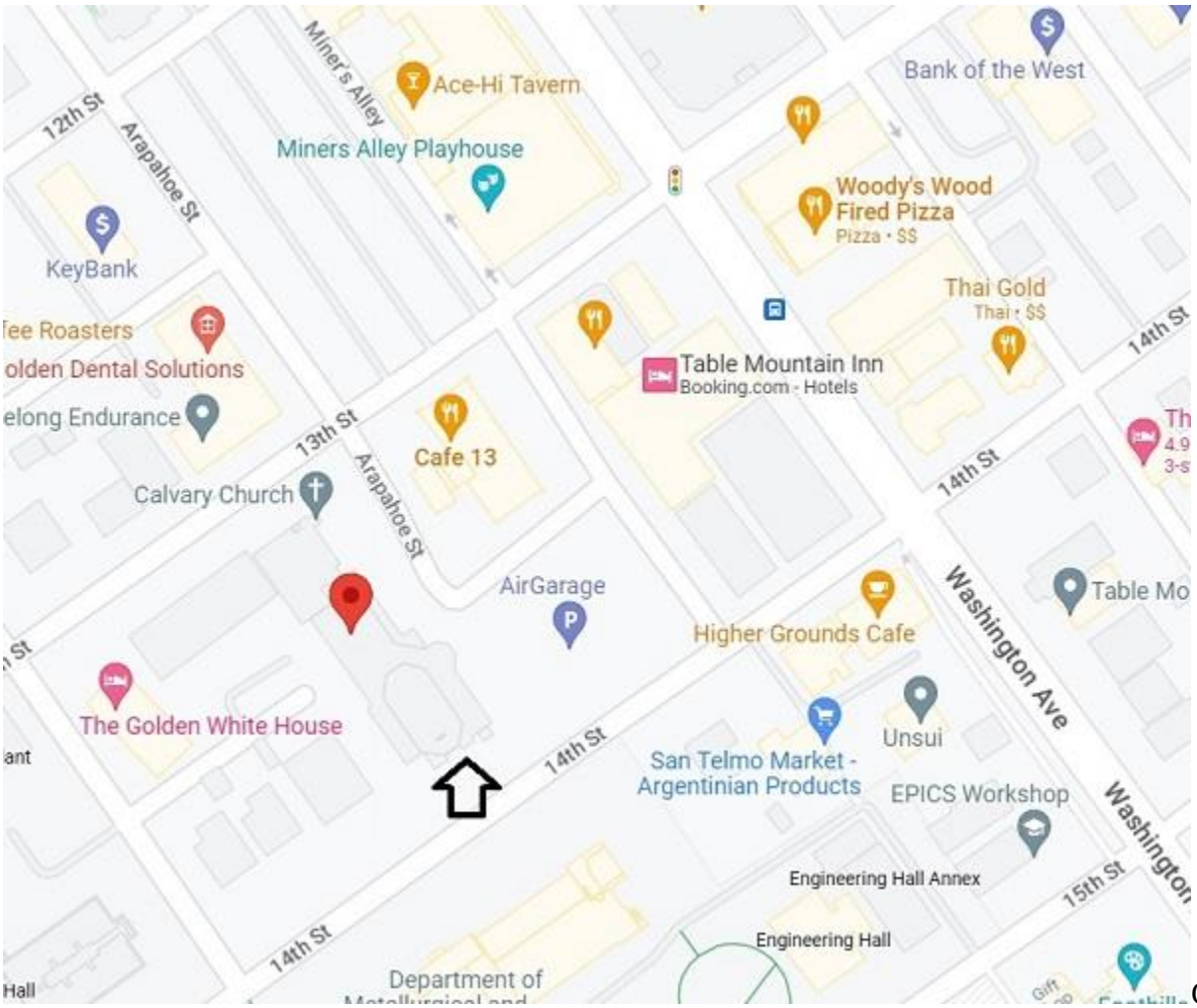
Jens-Erik Lundstern (Lund Snee)
(after Lundstern & Zoback, 2020
Nature Communications)

Link to Join CSS May Meeting on Next-Generation Stress Maps of North America via Zoom:

Thursday, May 11, 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.

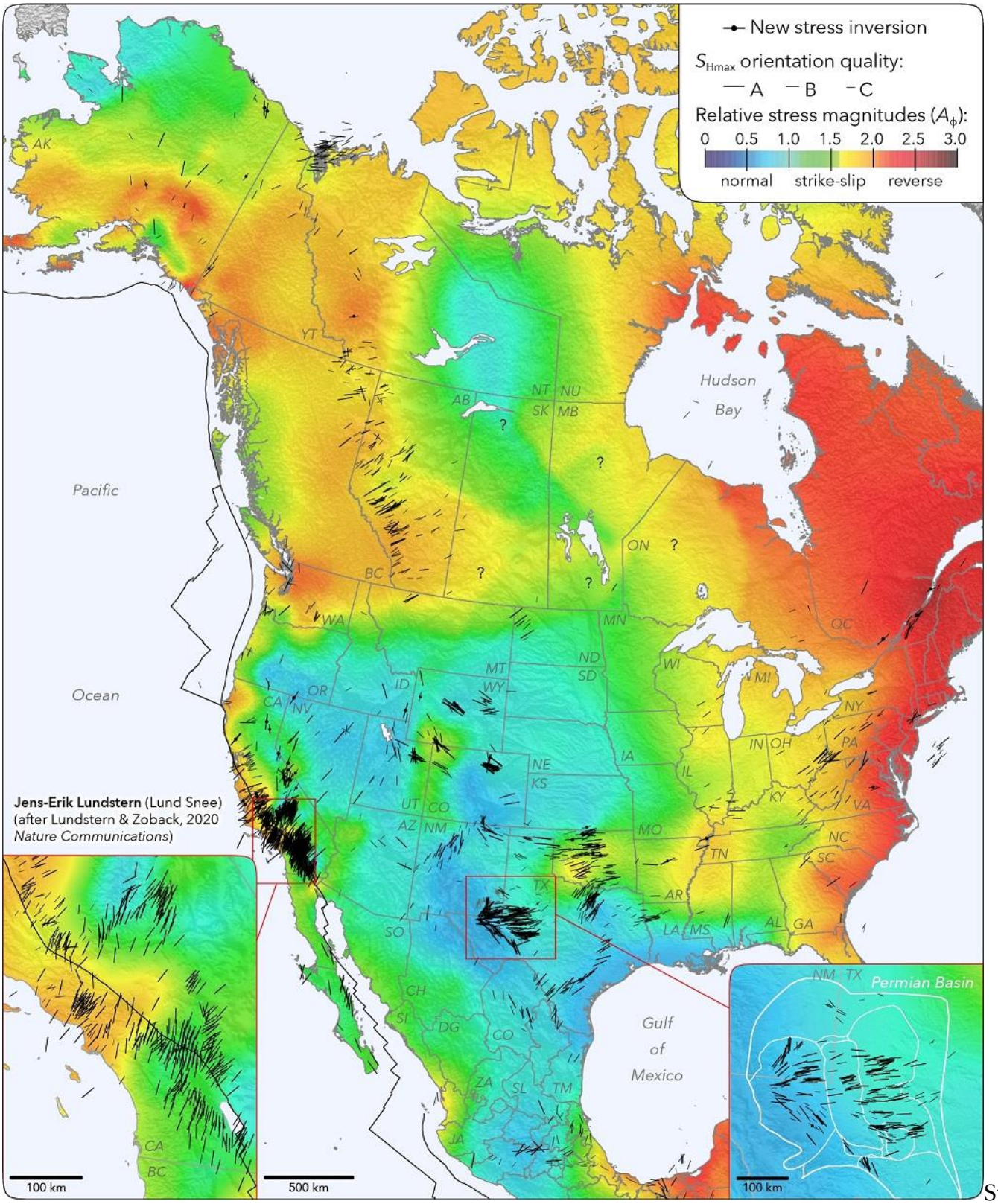
Do **not** enter via the old church above 13th St.

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 at our meeting, for $20. These were donated to CSS by the family of Raymond Bridge, recently deceased.



Stress map of North America

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