

PACIFIC SECTION SEPM FALL FIELD TRIP  
November 8-9, 2014

CONTINENTAL EXTENSION  
OLD AND NEW AT THE EDGE OF THE MOJAVE



**Field Trip Leaders:**

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## FIELD TRIP OVERVIEW

This year's Pacific Section SEPM Fall Field trip will look at an excellently exposed section of the Meso-Neoproterozoic Pahump Group (pre-Cryogenian Crystal Spring, Horse Thief Springs and Beck Spring Formation, Cryogenian Kingston Peak Formation and Ediacaran Noonday and Ibex Formations) in the Silurian Hills, as well as newly-described Miocene rock avalanche megabreccias in the northern Salt Spring Hills, with the goal of understanding the challenges of how to fit the deposits into a broader basin analysis context. Detailed correlations with regions outside the Mojave are challenged by complex faulting, magmatic overprinting, and a poor understanding of original basin geometry.

The Silurian Hills and Salt Spring Hills are found at the northern border of the Mojave Desert, at the eastern terminus of the Garlock Fault and south of Death Valley. During the Meso-Neoproterozoic, this region shifted from one of intracratonic platform to the leading edge of a new passive continental margin (Laurentia, formed from rifting of the older Rodinian supercontinent).

North and northeast of the Silurian and Salt Spring Hills, Neogene extension has exposed large swaths of time-correlative Proterozoic strata in such well-studied locales as the Panamint Range, Saddle Peak Hills, Kingston Range, and Alexander Hills. To the east lies the Shadow Valley, the location of spectacular Neogene extensional basins with thick sedimentary deposits, including enormous megabreccia sheets representing far-traveled rock avalanches. South and southeast, significant exposures of Mesoproterozoic (and rare Paleoproterozoic) basement complexes of the Mojave Province are found in low relief hills. Recent crustal thinning in the area enabled extensive basaltic volcanism and young cinder cones and flows found throughout the area. Directly south and west of the area, late Permian through Cretaceous granitoids formed during the arc magmatism which obliterated the older rock record, although greenschist-grade windows of metasediments are preserved.

In contrast to the extensive normal-faulting within the Basin and Range province, the Mojave Desert is dominated by strike-slip faults and lateral translations which make direct correlations difficult. Similarly, understanding the geologic setting during major Miocene unroofing and extension is challenged by lateral translation, magmatism and uplift, and lack of appreciation for long run-out rock avalanches. The Salt Spring Hills are the westernmost expression of the megabreccia deposits well-described from the nearby Shadow Valley area and Valjean Hills.

**This PS-SEPM Fall Field Trip will focus on the following questions:**

**Question 1:** What is the nature of the major unconformity between the Crystal Spring and Horse Thief Springs formations?

**Question 2:** Is the Beck Spring Formation recognizable in the Silurian Hills?

**Question 3:** How does the Cryogenian Kingston Peak Formation in the Silurian Hills correlate to the Death Valley and Kingston Range sections? What are the facies variations?

**Question 4:** Are there post-glacial "cap carbonates" in the Silurian Hills and, if so, how many and can they be correlated to adjacent areas?

**Question 5:** Are the textures in the Neogene megabreccia deposits in the northern Salt Spring Hills consistent with a rock avalanche interpretation? If so, are there any indicators of provenance of the deposit to gauge run-out distances?

*We hope the PS-SEPM field trip will stimulate lively debate and new questions!*

## ITINERARY

This field trip is a walking field trip. The field trip will officially begin on Saturday morning at 7:30 a.m. in the Silurian Hills at **Gypsy Sally's**, a remnant structure from a bygone era. Participants can either show up Friday night at Gypsy Sally's to camp (*no dinner provided that night*), or stay nearby in Baker, Shoshone, or other campgrounds. Breakfast will be provided for all participants at 7:30 a.m. at Gypsy Sally's on Saturday morning, as well as sack lunches for the day's hike. The remainder of the day on Saturday will be spent in the Silurian Hills looking at the Proterozoic section. The total round trip mileage on Saturday is approximately 12 kilometers, comprising 10 stops with flat to moderate (and optional steep) hiking conditions. Dinner will be provided back at Gypsy Sally's as well as discussions and campfire chats.

On Sunday morning, participants will have breakfast and box lunches provided at Gypsy Sally's before we leave camp and drive 13 miles to the northern Salt Spring Hills to investigate Miocene rock avalanche deposits. Here, we will hike approximately five kilometers roundtrip with five stops. The majority of hiking at both localities is moderate with optional sections on steeper slopes. After returning from the hike, the trip will be over at approximately 1 p.m.

## TRANSPORTATION & LODGING

Participants are responsible for travel to the two field areas. Two-wheel drive vehicles with normal clearance will be acceptable. *There are dirt roads that may become impassable in inclement weather and participants will be updated.*

There are plenty of flat camping spots available for Friday and Saturday nights. We will be in the same area both nights. Open camping on BLM land is available at the field trip site for Friday and Saturday nights. *Amenities are primitive with dry pit toilets and no potable water.* Lodging is available in Baker, California (approximately 40 kilometers to the south) and Shoshone (approximately 56 kilometers to the north). Musical instruments are encouraged. Participants not camping are responsible for their own reservations AND for being promptly on time for field trip activities on Saturday and Sunday morning.

## WEATHER

The southern Death Valley region is generally sunny, dry, and clear throughout the year. The winters, November through March, are mild *with occasional winter storms.* *Average DAILY highs in November are 75-62°F (24-17°C) and nighttime lows are 44-35°F (7-2°C).* Most importantly, wind can be quite strong, especially at night. In short, prepare for sun, cold, rain, and wind.

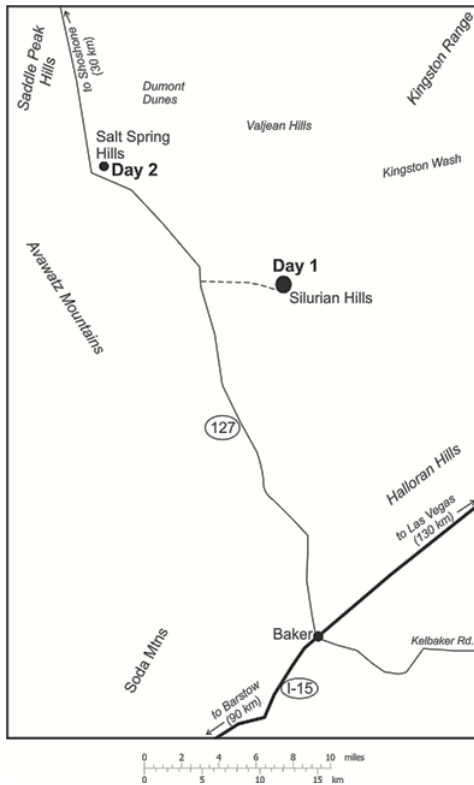
## MEALS & GAS

Meals for Saturday morning, lunch, and dinner, and Sunday breakfast and lunch will be provided. *Please bring plenty of water for hiking and personal use.* Participants are responsible for their own meals on Friday night, and Sunday night after the trip. *Food, gas, and supplies are available in Baker (south of the field area) and Shoshone (north of the field area).*

## RECOMMENDED FIELD GEAR

- Bring clothes that you don't mind getting dirty/ripped. Be prepared for a range of temperatures/conditions;
- Sturdy hiking boots (with ankle support and good traction) (sandals and lightweight shoes NOT recommended) and 2nd pair of shoes in case 1st pair gets wet;
- Pants to protect against sharp rocks and plants;
- Layers and warm clothes for cool evenings;
- Layers and lightweight clothes for warm days;
- Sunscreen;
- Sunhat and sunglasses;
- Rain gear;
- Windbreaker jacket;
- Water bottles or camelback (at least 2 liter capacity, 4 liters recommended);
- Rock hammer (optional);
- Day pack (big enough to carry field gear, lunch, camera, water, and extra clothing);
- Hand lens;
- small magnet;
- HCl 10% solution acid bottle (optional)

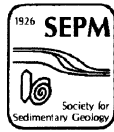
## DIRECTIONS & MAP



The Silurian Hills section is located 40 kilometers north of Baker. It is accessed by driving approximately 34 kilometers north on State Route 127, then turning east across a (hopefully) dry playa. A dirt road will bring participants directly to Gypsy Sally's, 7 kilometers from the highway.

On Sunday, participants will drive the 7 kilometers west out of the playa, and drive 14 kilometers north along Highway 127 to a rest stop next to the northern Salt Spring Hills. We will then hike to various field spots and back to the cars for approximately five kilometers round trip. The field trip will be officially over by 1 p.m. on Sunday.

Specific details will be provided to registered participants.



PACIFIC SECTION

**REGISTRATION FORM**  
**PS-SEPM Fall Field Trip: November 8-9, 2014**

**CONTINENTAL EXTENSION OLD AND NEW AT THE EDGE OF THE MOJAVE**

**Field Trip Leaders:**  
**Russell Shapiro, Todd Greene (California State University-Chico)**  
**rsshapiro@csuchico.edu, tjgreene@csuchico.edu**

**Carol Dehler (Utah State University)**  
**carol.dehler@usu.edu**

**REGISTRATION DEADLINE: OCTOBER 20, 2014**

**FIELD TRIP LIMIT: 70 Participants**  
**PLEASE NOTE that student registration is limited to 5 students per college/university**

Each field trip participant is required to complete this Registration Form *and* accept the Release and Indemnity Agreement (on next page) by signing it.

Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

Telephone #: \_\_\_\_\_ E-mail address: \_\_\_\_\_

**Please note any DIETARY RESTRICTIONS (allergies, vegetarian, etc.)** \_\_\_\_\_

**REQUIRED REGISTRATION FEE** (which pays for field trip guidebook, BLM camping fee, Saturday & Sunday meals and soft beverages). Write the number of registrations of each type included in your payment.

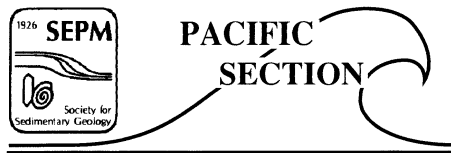
- PS-SEPM Member / non-student \$150 \_\_\_\_\_
- Non-Member/non-student \$170 \_\_\_\_\_  
(3-year membership included)
- Student Member (Institution \_\_\_\_\_) \$25 \_\_\_\_\_
- Student Non-Member (Institution \_\_\_\_\_) \$30 \_\_\_\_\_  
(3-year membership included)

**Total: No cash or credit card. Check only; made payable to PS-SEPM**      **Total \$** \_\_\_\_\_

Mail Registration Form and signed Release & Indemnity Agreement with payment **NO LATER THAN**  
**October 20, 2014** to:

**Wayne Henderson, Department of Geological Sciences, California State University, Fullerton,  
800 North State College Blvd., Fullerton, CA 92834-6850**

**---KEEP A COPY OF THIS FORM FOR YOUR RECORDS---**





PACIFIC SECTION

Pacific Section SEPM (Society for Sedimentary Geology) Fall Field Trip 2014

RELEASE AND INDEMNITY AGREEMENT

In consideration of the receipt by registrant ("Registrant") of permission from the Pacific Section, Society for Sedimentary Geology (PS-SEPM) to register for and participate in the PS-SEPM 2014 Fall Field Trip to be conducted November 8 - 9, 2014 and entitled "Continental Extension Old and New At The Edge of the Mojave", registrant hereby releases and will indemnify, defend, and hold harmless Pacific Section SEPM and Global SEPM, the agents, officers, servants, and employees of each, and those persons in charge of and/or conducting any of the Adjunct Activities, including without limitation the leader or leaders of the Field Trip (hereafter referred to as "Indemnitee" or "Indemnitees") of and from any and all liabilities, claims, demands, actions, and causes of action whatsoever arising out of or relating to any loss, damage, or injury, including death, as may be sustained by Registrant, and to any loss, damage, or injury to any property of Registrant's, while involved in any way with the Field Trip, including without limitation any exhibition component thereof or any of the Adjunct Activities.

Registrant is fully aware that the Field Trip may involve hazardous and/or dangerous activities and/or being in or around hazardous conditions and recognizes and accepts the risks, known and unknown, involved on the Field Trip, including without limitation those involved in traveling to and from the site or sites of the Field Trip (whether by air, water, or land transportation) and at and during all stops and layovers during the Field Trip. The provisions of this paragraph shall in no way serve to limit or restrict Registrant's release and indemnity of PS-SEPM and those persons in charge of and/or conducting any of the Adjunct Activities.

This release and indemnity includes without limitation liabilities, claims, demands, actions, and causes of action to or by third parties as well as to or by Registrant. This release and indemnity includes without limitation liabilities, claims, demands, actions and causes of action arising out of or relating to any loss, damage, or injury caused in any way by the concurrent or contributory negligence of any Indemnitee. This release and indemnity includes without limitation liabilities, claims, demands, actions and causes of action arising out of or relating to any loss, damage, or injury caused in any way by the sole negligence of any Indemnitee. Having made all inquiries deemed by Registrant to be appropriate, Registrant hereby voluntarily assumes all risks of loss, damage, or injury, including death, as may be sustained by Registrant or any property of Registrant while involved in any way with this field excursion.

In the event the release by Registrant of any Indemnitee of any liability, claim, demand, action, or cause of action described herein is determined to be invalid or unenforceable, Registrant agrees that Registrant's total recovery of damages from the Indemnitees, or any of them, both actual and punitive, shall be limited to the cost of the registration for the field trip and the costs of tuition or other charges paid by Registrant for Registrant's participation in any of the Adjunct Activities.

In the event any provision of this Release and Indemnity Agreement is determined to be invalid or unenforceable, all other provisions hereof shall continue to be enforceable and shall be interpreted as though said invalid provision had never been contained herein. The provisions of this Release and Indemnity Agreement shall be binding upon Registrant's heirs, next of kin, executors, administrators, and personal representatives.

This Release and Indemnity Agreement shall be governed by and construed and enforced in accordance with the laws of the State of California, United States of America (without regard to any conflict of laws and principles). All actions, suits and proceedings arising out of or in connection with this Release and Indemnity Agreement shall be brought to the District Court of California, United States of America, which shall be the exclusive forum therefore. Registrant hereby irrevocably submits, in person, to the jurisdiction and process of the District Court of California, United States of America.

By consenting to the terms of this Release and Indemnity Agreement with a signature, Registrant acknowledges that:

- 1. He or she has read and understands the above terms of this Release and Indemnity Agreement, and agrees to them voluntarily.
2. He or she is allowed to register for and participate in the field trip and any adjunct activities.
3. Consenting to the terms of this document is essential to allowing Registrant to register for and participate in this field trip and any adjunct activities.

Print Name \_\_\_\_\_

Signed \_\_\_\_\_ Dated: \_\_\_\_\_