

The AGeS2 (Awards for Geochronology Student Research2) Program:

An update and seeking community input on its future

Becky Flowers (CU Boulder)

Ramon Arrowsmith (ASU)

Vicki McConnell (GSA)

*Jim Metcalf (CU Boulder), Tammy Rittenour (USU),
Blair Schoene (Princeton), Susan Eriksson*

Some AGeS Numbers

- 213 submitted student proposals
- 45 AGeS awards
- 36 more awards in next 2 yrs
- 53 AGeS labs
- 90 geochronologist mentors



*AGeS1
awardee
Victor
Guevara
(formerly
at VT)*



*AGeS2
awardee
Erin Peck
(Oregon
State)*

The AGeS2 (Awards for Geochronology Student Research2) Program:

An update and seeking community input on its future

Outline

- Motivation and goals
- Program structure
- Outcomes
- Looking forward: AGeS3 and sustainability



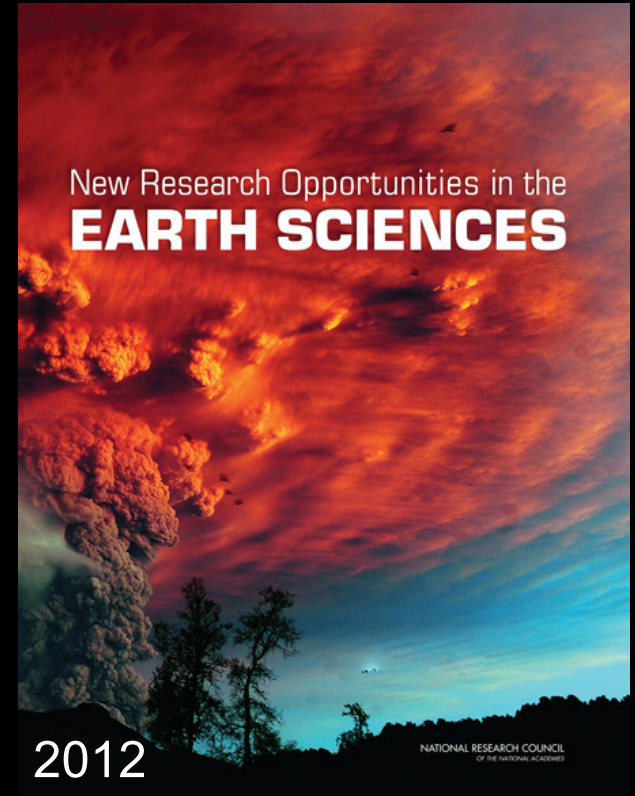
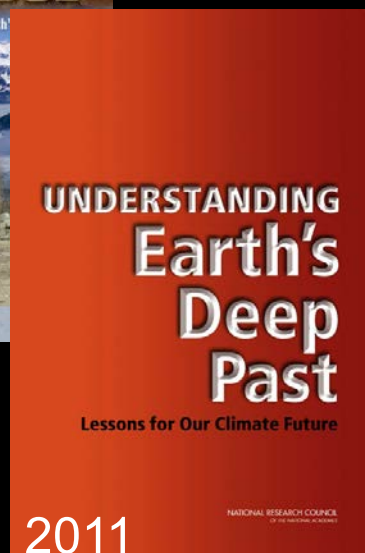
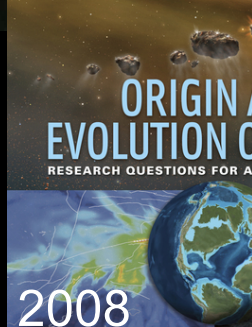
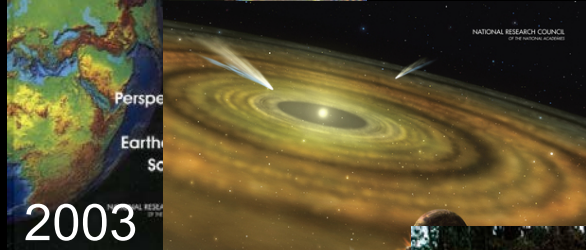
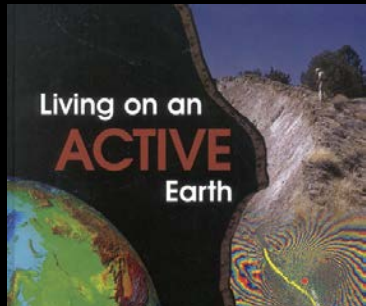
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Recent National Academy reports identify geochronology as key to addressing major unresolved questions in Earth science

- Climate change
 - Tempo of biologic and landscape change
- Earthquake cyclicity
 - 4D Earth evolution



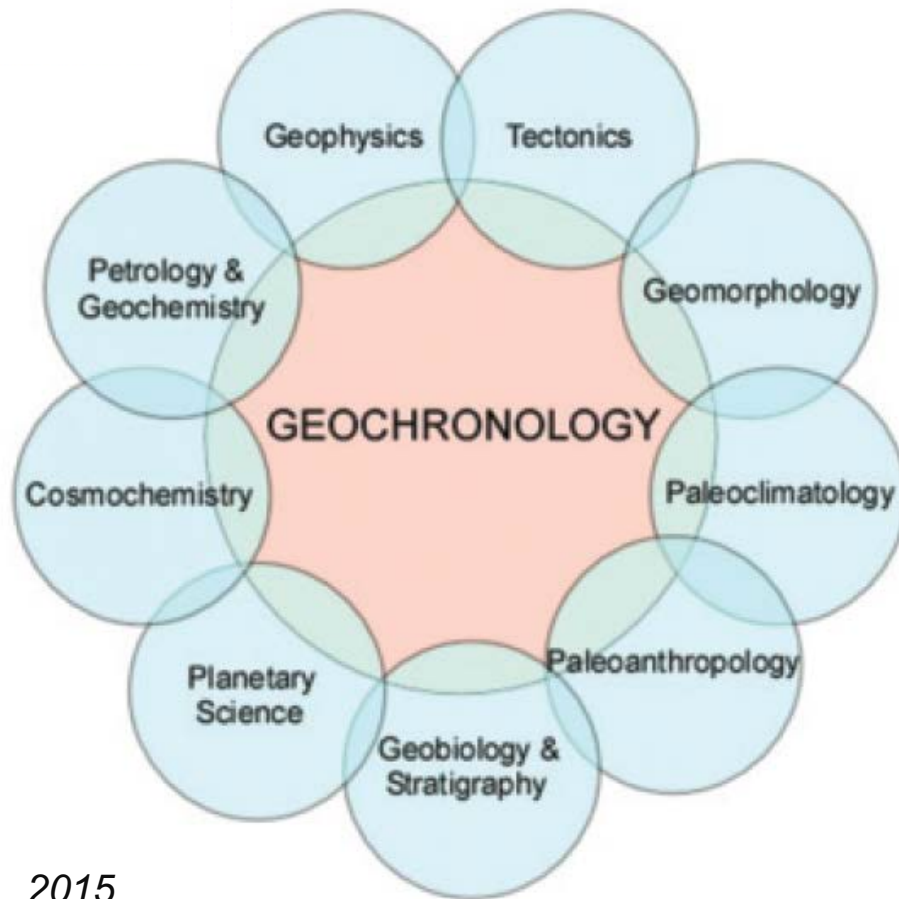
Inputs to numerical models to understand links between mantle dynamics, tectonics, surface processes and climate

Vital for testing causative relationships between events and processes

NSF report on: “Opportunities and Challenges for U.S. Geochronology”

Figure 1

Venn diagram illustrating the central role that geochronology aspects of the Earth sciences.



Harrison et al., 2015

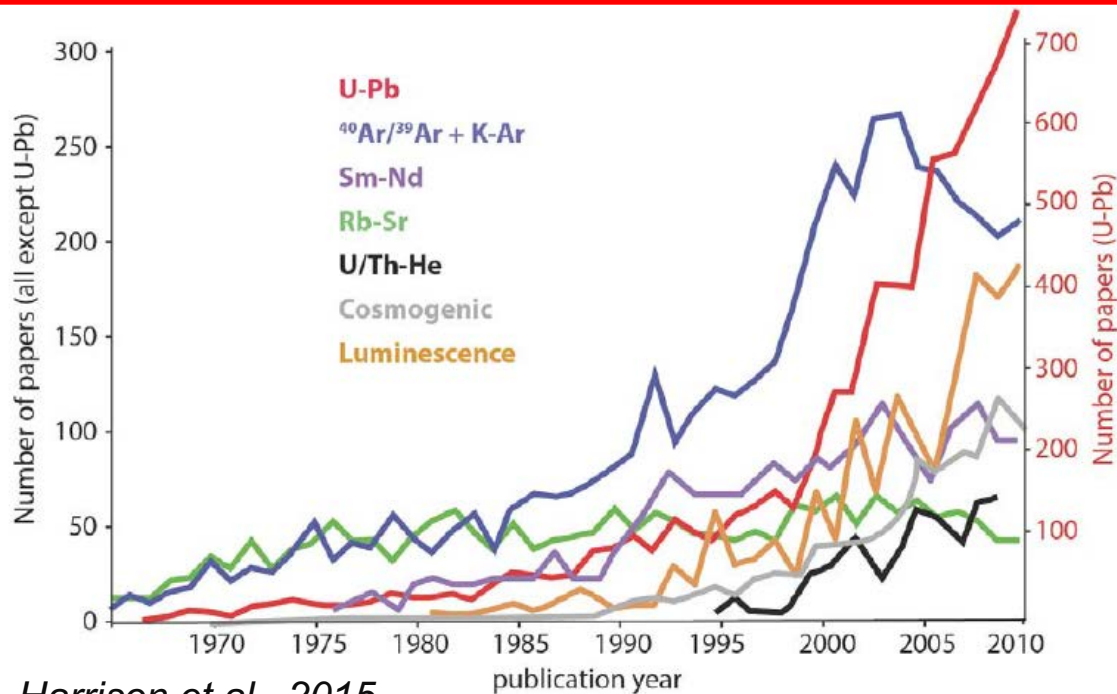
“Deep Time is what separates geology from all other sciences.”



It's About Time:
Opportunities & Challenges
for U.S. Geochronology

Harrison et al., 2015

NSF report on: “Opportunities and Challenges for U.S. Geochronology”



Harrison et al., 2015

Figure 1 - Plot of number of publications per year for various radioisotopic dating methods. Curves were constructed by counting all publications per year with the dating method listed in the title, as recorded on web of knowledge (www.webofknowledge.com). A similar analysis on Google Scholar (scholar.google.com) reveals similar trends with slightly different magnitudes. A compilation that searched for the method listed anywhere in the paper revealed roughly the same relative trends, but with much higher values.

“Deep Time is what separates geology from all other sciences.”



It's About Time:
Opportunities & Challenges
for U.S. Geochronology

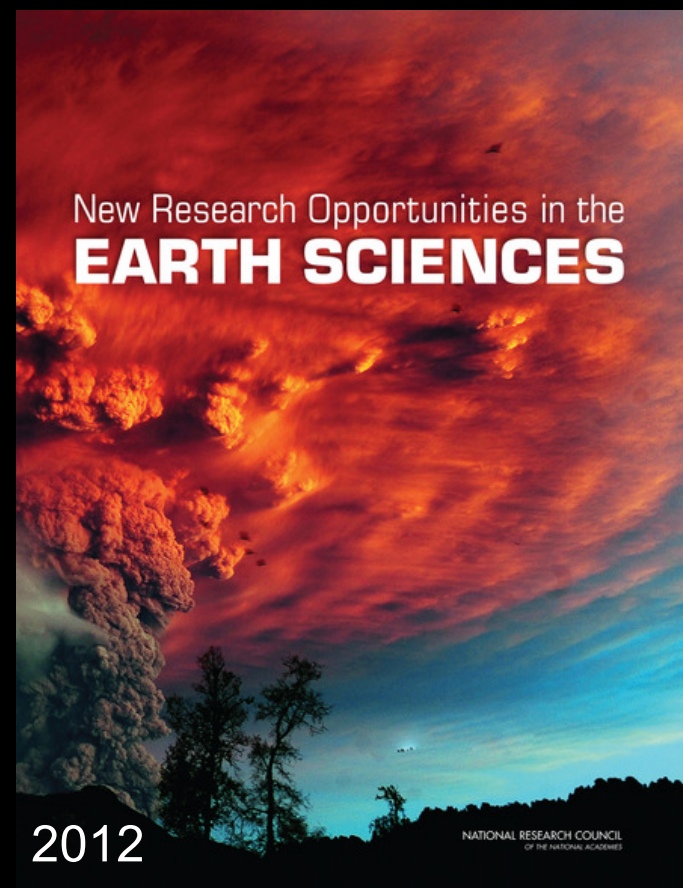
Harrison et al., 2015

“While there has never been a time when users have had greater access to geochronologic data, they remain, by and large, **dissatisfied with the available style/quantity/cost/efficiency.**”

2012 NROES Report Recommendations: Some motivations for AGeS

“EAR should explore new mechanisms for geochronology laboratories that will service the geochronology requirements of the broad suite of research opportunities while sustaining technical advances in methodologies.”

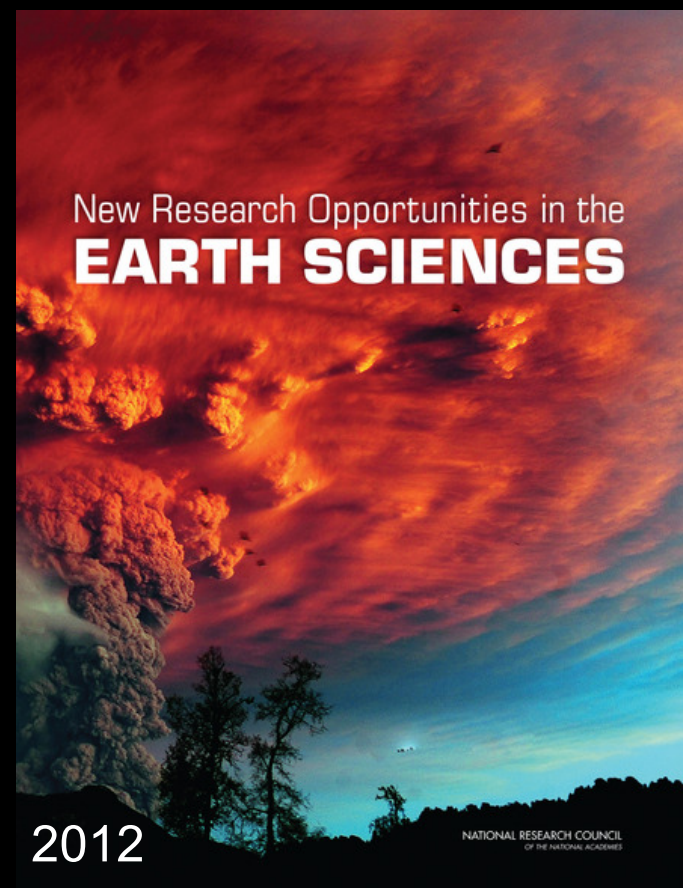
“The best science outcomes occur when strong intellectual engagement exists between the investigators who make the measurements and those who use them...A simple analysis-for-hire scheme is unlikely to yield results of consistent high quality.”



2012 NROES Report Recommendations: Some motivations for AGeS

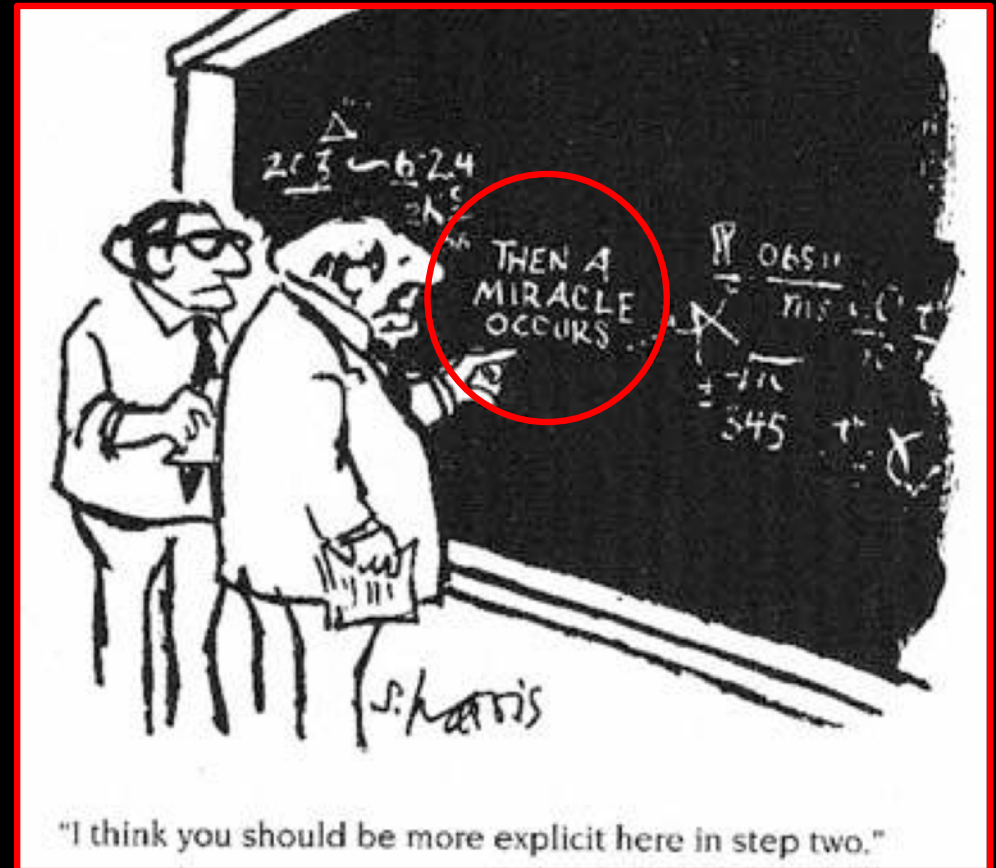
“It will be useful to identify mechanisms that will **encourage broad community access** to the facilities.”

“**The education of investigators, especially students and post-docs, is an essential goal of these facilities.** The education of geochronologists and that of users of geochronology are equally important. Intellectual isolation of measurements from applications is best avoided.”

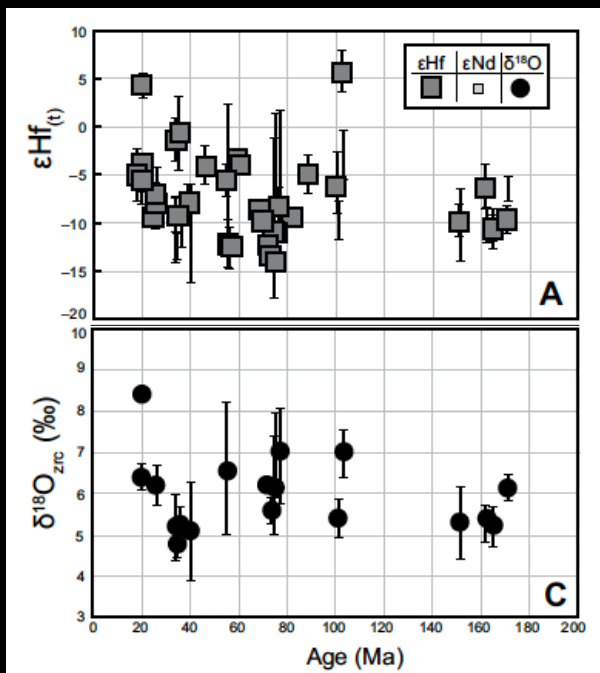


2012 NROES Report Recommendations: Some motivations for AGeS

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Chapman
et al.
(2018)

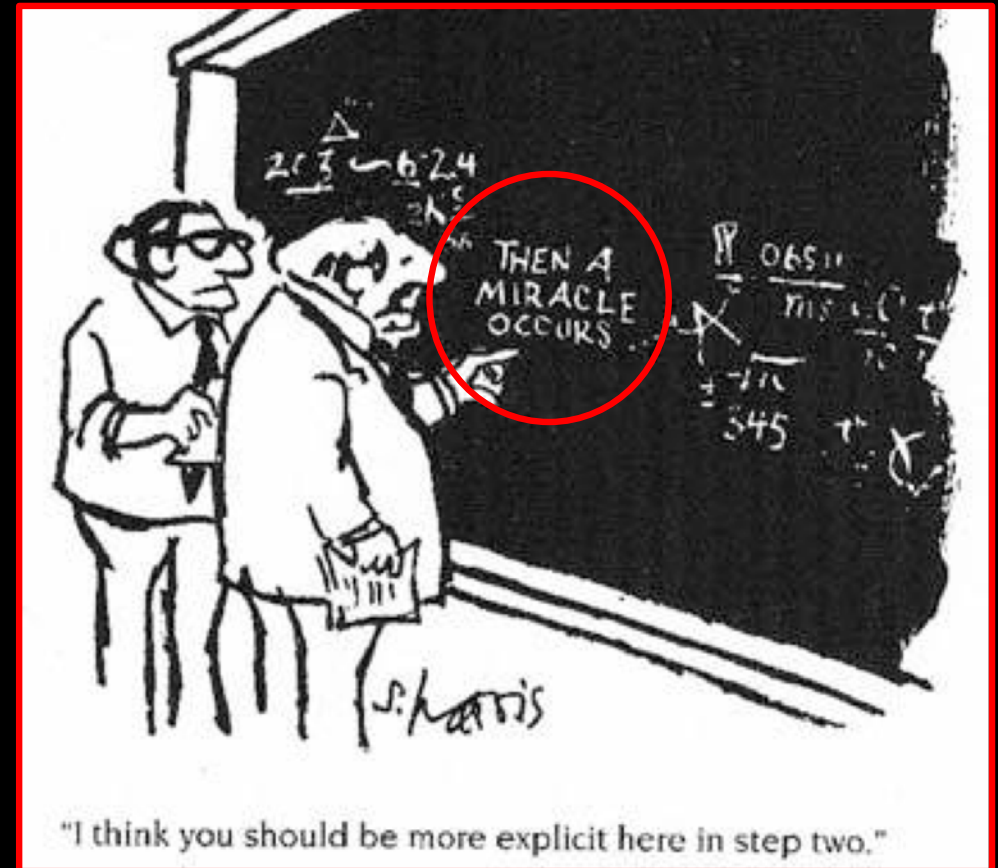


2012 NROES Report Recommendations: Some motivations for AGeS

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AGeS1
awardee
Jay
Chapman
(formerly
at UAZ)



The AGeS Program is a collaborative strategy for supporting geochronology needs

www.geosociety.org/ages

Goals

- Broaden access to geochronology
- Educate users of geochronology data
- Promote synergistic science by fostering new relationships between labs, students, and scientists in different disciplines
- Provide strategic, high-quality, scientifically-valuable geochronology data for projects in which both users and producers of the data are intellectually engaged

AGeS Program Structure

www.geosociety.org/ages

1) Grad students can apply for up to \$10k (typical award is ~\$8500)

- Visit a host lab for a week or more
- Acquire and interpret geochronology data
- Be mentored by geochronologists on a project of joint interest



Noble gas mass spectrometry lab at NM Tech/ NM Bureau of Mines



Clean lab at Princeton University U-Pb TIMS facility

AGeS Program Structure

www.geosociety.org/ages

2) Any lab can participate and become an AGeS lab

- Submit a 2 pg lab profile
- Posted on the AGeS Lab database page

AGeS Labs: $^{40}\text{Ar}/^{39}\text{Ar}$ (N=9)

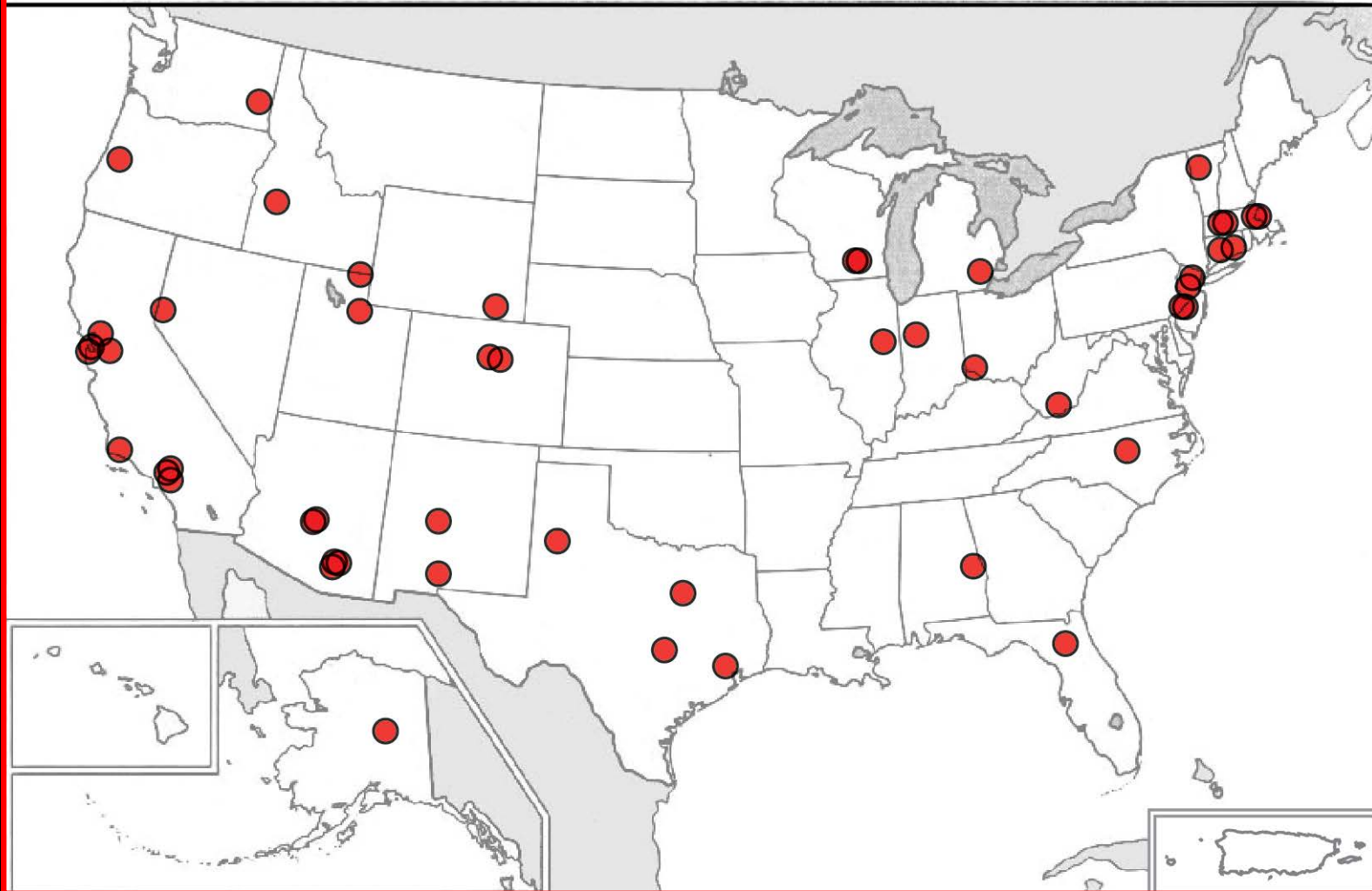
$^{40}\text{Ar}/^{39}\text{Ar}$

Lab PI	Institution	Technique	Primary Contact(s)	Lab Profile	Lab Website
Benowitz, Jeff	University of Alaska - Fairbanks	$^{40}\text{Ar}/^{39}\text{Ar}$	Jeff Benowitz	Lab Profile	UAF Geochronology Facility
Grove, Marty	Stanford University	$^{40}\text{Ar}/^{39}\text{Ar}$	Marty Grove ($^{40}\text{Ar}/^{39}\text{Ar}$ and (U-Th)/He: Matt Coble (U-Th-Pb SIMS) Trevor Dumitru (Fission Track)	Lab Profile	Stanford Geochronology
Hames, Bill	Auburn University	$^{40}\text{Ar}/^{39}\text{Ar}$	Bill Hames	Lab Profile	Auburn ANIMAL Facility
Heizler, Matt	New Mexico Tech	$^{40}\text{Ar}/^{39}\text{Ar}$	Matt Heizler Bill McIntosh Lisa Peters	Lab Profile	New Mexico Geochronology Research Laboratory
Hodges, Kip	Arizona State University	$^{40}\text{Ar}/^{39}\text{Ar}$	Michelle Aigner Matthijs van Soest	Lab Profile	ASU Group 18 Laboratories
Koppers, Anthony	Oregon State University	K/Ar & $^{40}\text{Ar}/^{39}\text{Ar}$	Anthony Koppers Daniel P. Miggins	Lab Profile	Lab Website
Turrin, Brent	Rutgers University	$^{40}\text{Ar}/^{39}\text{Ar}$	Brent Turrin	Lab Profile	Rutgers Noble Gas Laboratory
Singer, Brad	University of Wisconsin - Madison	$^{40}\text{Ar}/^{39}\text{Ar}$	Brad Singer Brian Jicha	Lab Profile	WiscAr
Webb, Laura	University of Vermont	$^{40}\text{Ar}/^{39}\text{Ar}$	Laura Webb	Lab Profile	UVM $^{40}\text{Ar}/^{39}\text{Ar}$ Lab

AGeS Program Structure: AGeS Labs

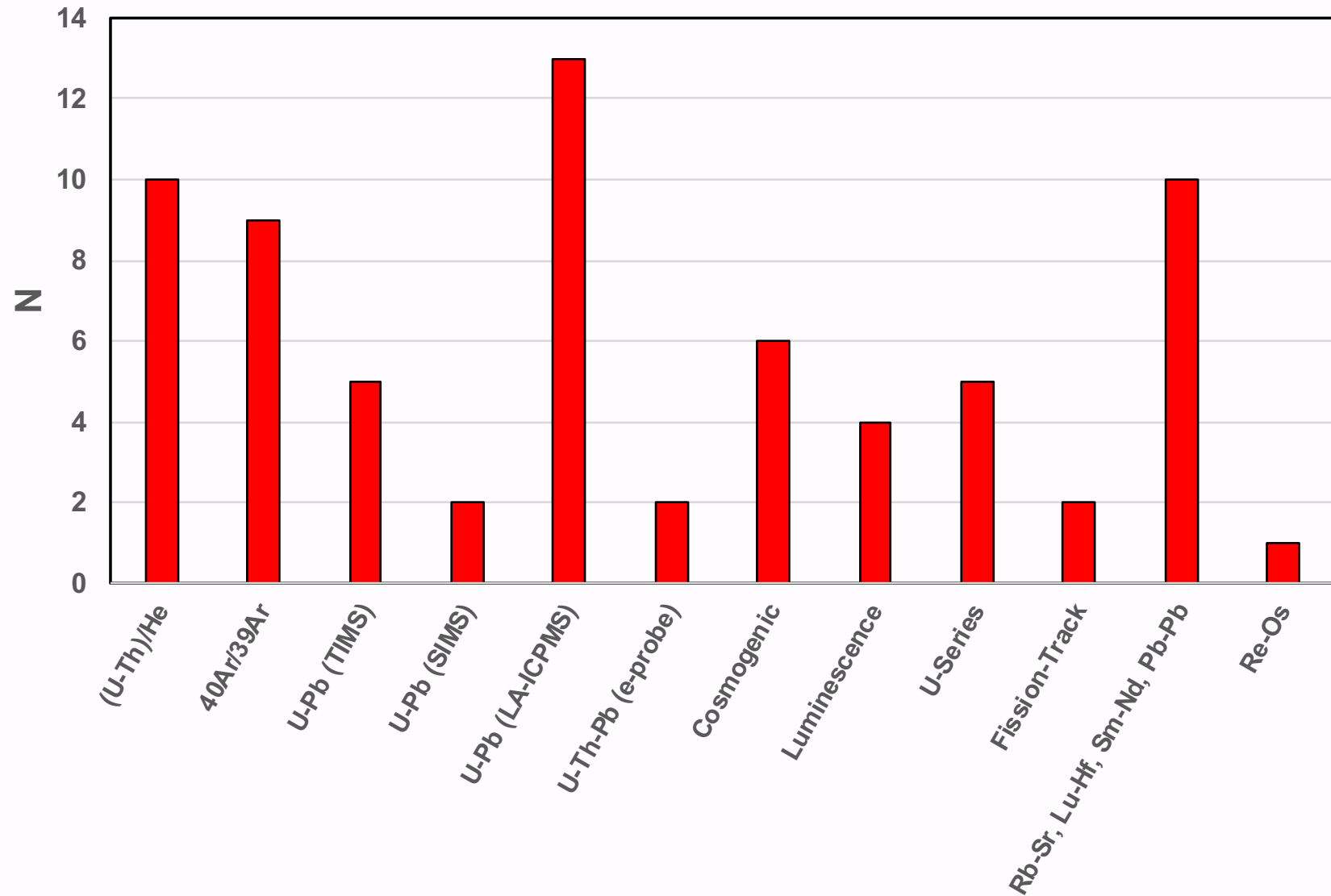
AGeS Labs, 2019

90 geochronologists, 53 labs



AGeS Program Structure: AGeS Labs

Techniques Available at AGeS Labs



AGeS Program Structure

www.geosociety.org/ages

3) Interested students initiate contact with a lab to discuss a potential project

4) Students apply by submitting a project description, detailed budget, letters of support from home institution and host AGeS Lab

Next deadline Feb 3, 2020!

5) Independent review panel reviews, ranks, and provides feedback on every submitted proposal

- 6-member review panel in AGeS1
- 10-member panel in AGeS2

We are grateful to our review panel!



earth
scope

AGeS1

In 2014 implemented within the
framework of the NSF EarthScope
Program

Award amount: \$350k + \$70k supplement

earth
scope

Co-directors:

Rebecca Flowers, lead-PI (CU-Boulder)

Ramon Arrowsmith, head of EarthScope National Office (ASU)

Co-PIs: *Tammy Rittenour (USU), Blair Schoene (Princeton), James Metcalf (CU)*

Assessment: Susan Eriksson

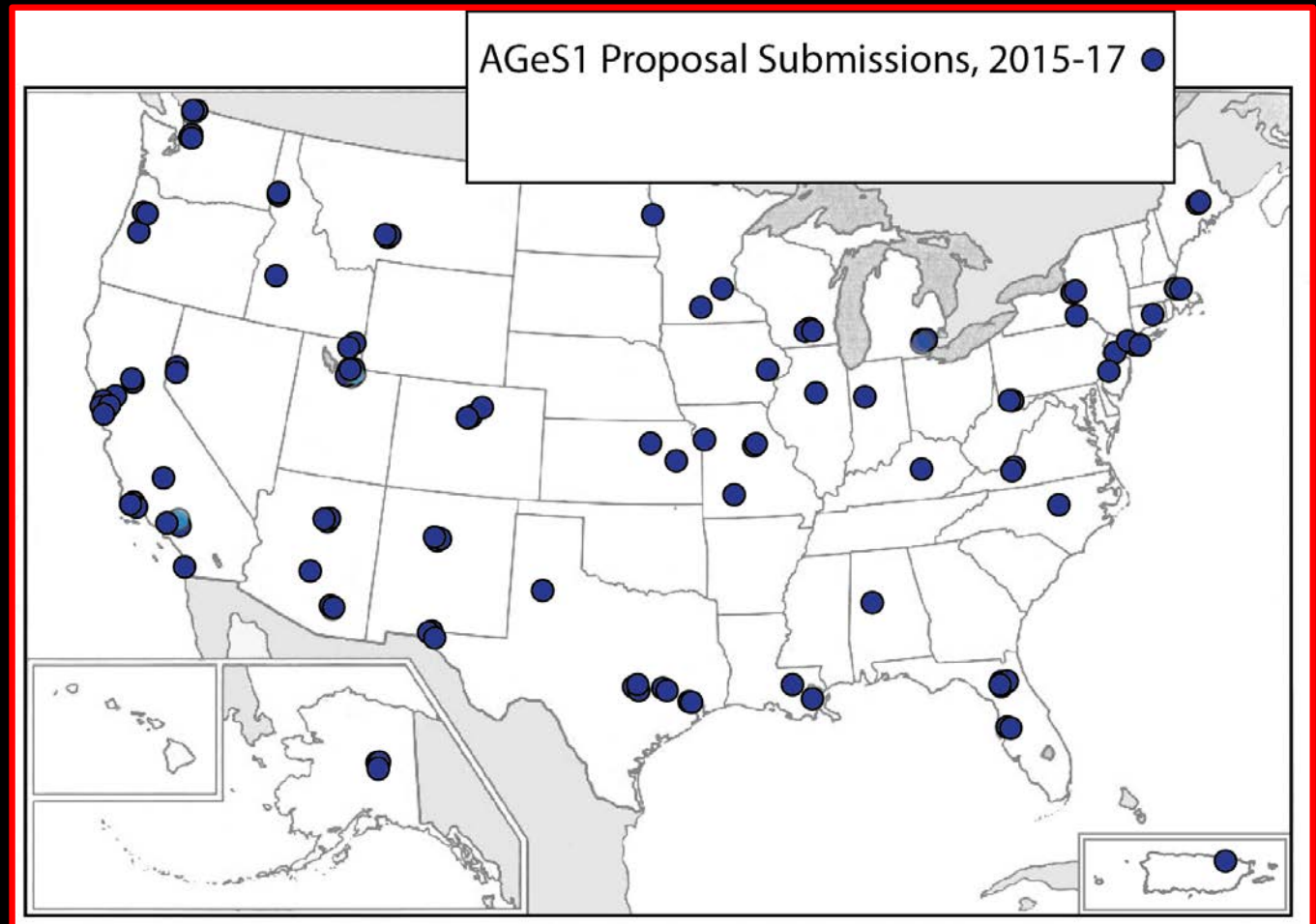
Award administration: EarthScope National Office at ASU

AGeS1 projects had a **primarily North American-based focus**



AGeS1

- 3 proposal cycles, 2015-2017
- 135 submitted proposals



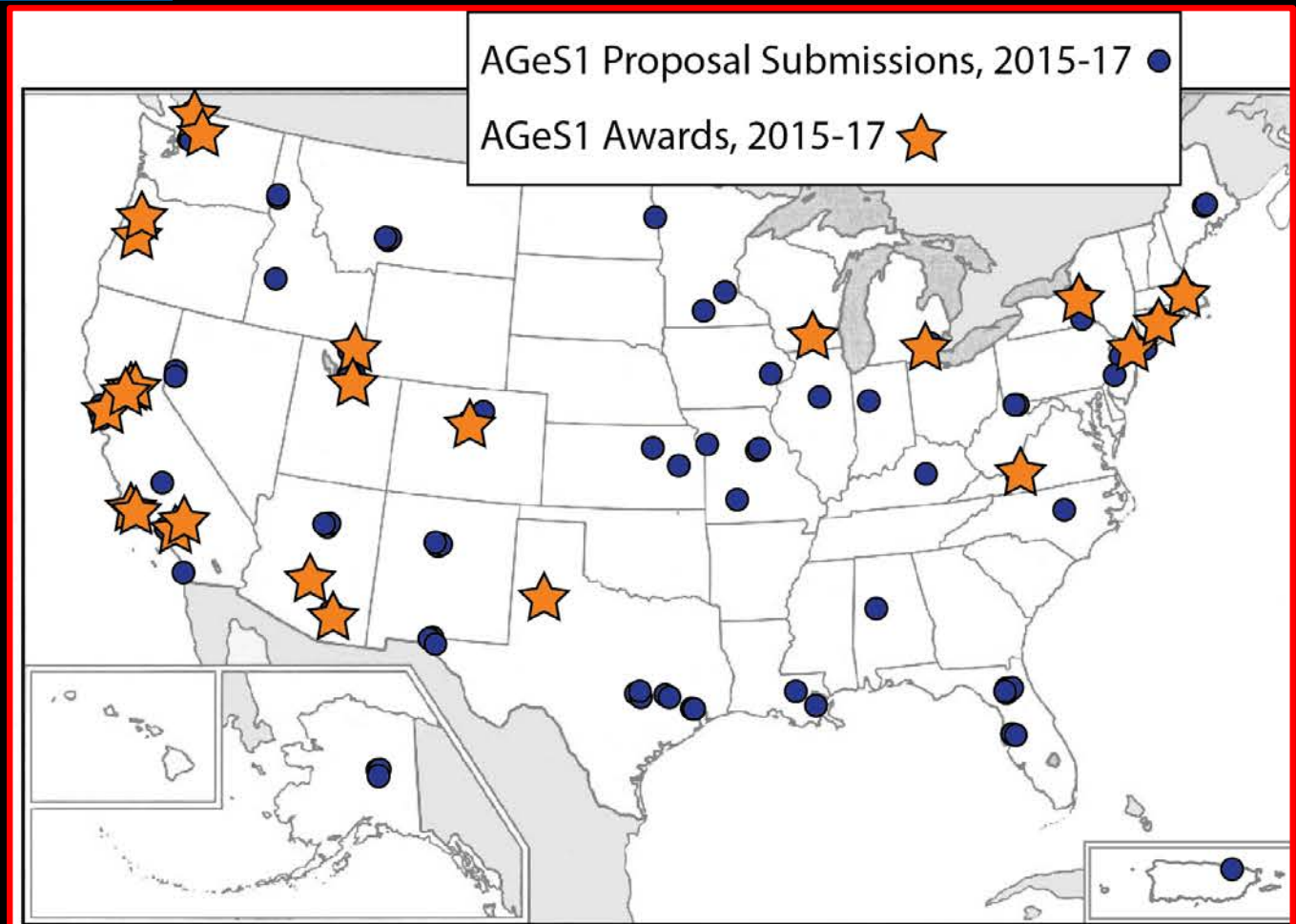
NSF EarthScope award and supplement: EAR-1358514, 1358554, 1358401, 1358443)



AGeS1

- 3 proposal cycles, 2015-2017
- 135 submitted proposals
- 25 awards: \$5,300-\$9,500

- >38 abstracts
- 9 published manuscripts
- 4 manuscripts in review
- More in prep



NSF EarthScope award and supplement: EAR-1358514, 1358554, 1358401, 1358443)

Outcomes: Funded project examples

Reading a 400,000-year record of earthquake frequency for an intraplate fault

Randolph T. Williams^{a,1}, Laurel B. Goodwin^a, Warren D. Sharp^b, and Peter S. Mozley^c

PNAS (2017) – Randy Williams (UWisc), U-series at BGC

Influence of the megathrust earthquake cycle on upper-plate deformation in the Cascadia forearc of Washington State, USA

Jaime E. Delano^{1*}, Colin B. Amos¹, John P. Loveless², Tammy M. Rittenour³, Brian L. Sherrod⁴, and Emerson M. Lynch²

Geology (2017) – Jaime Delano (Western Wash), OSL at USU

Lithospheric architecture and tectonic evolution of the southwestern U.S. Cordillera: Constraints from zircon Hf and O isotopic data

J.B. Chapman^{1,†}, M.N. Dafov¹, G. Gehrels¹, M.N. Ducea^{1,2}, J.W. Valley³, and A. Ishida^{3,4}

GSAB (2018) – Jay Chapman (UAZ), $\delta^{18}\text{O}$ at UW

Subduction initiation and early evolution of the Easton metamorphic suite, northwest Cascades, Washington

Jeremy L. Cordova¹, Sean R. Mulcahy¹, Elizabeth R. Schermer¹, and Laura E. Webb²

Lithosphere (2018) – Jeremy Cordova (WWU), $^{40}\text{Ar}/^{39}\text{Ar}$ at Univ Vermont



AGeS1 Feedback

AGeS awardees:

“The AGeS program was absolutely instrumental in getting my PhD project off the ground. After I collected the preliminary data with support from AGeS, we were able to assemble a successful NSF proposal to do a lot more thermochronology for my PhD.”

“It was a great way to accomplish an ambitious geochronology goal that would have been hard to do without a relatively large sum of money, such as from an NSF grant.”

“I also think it should be recognized how much information you pick up by ‘osmosis’ during these visits.”

Home advisors and AGeS Labs:

“The program is a terrific opportunity for students and I strongly encourage NSF continuing this. The benefit/cost ratio is extremely high...”

“[AGeS] is one of the best approaches I've seen to promoting interdisciplinary training and thinking for graduate students.”

AGeS2

Larger and more diversely focused program

Award amount: \$850k, cross-programmatic NSF support

- Expand beyond the primarily North American-based focus of AGeS1
- Double the annual award funding (18-20 awards/year in 2019, 2020, 2021)

New Partnership with GSA

Pls:

Rebecca Flowers, (CU-Boulder), Ramon Arrowsmith, (ASU), Vicki McConnell (GSA)

Executive committee:

James Metcalf (CU), Tammy Rittenour (USU), Blair Schoene (Princeton), Susan Eriksson

New GSA-hosted website, new GSA-hosted online submission and review system. www.geosociety.org/ages



THE GEOLOGICAL SOCIETY
OF AMERICA®

AGeS2

New cohort-activities

Goals:

- Promote interaction and peer-mentoring
- Reinforce expectations and timelines
- Encourage publication productivity
- Facilitate assessment

Plan:

Teleconferences for each year's cohort:

1 telecon in Year 1

2-3 telecons in Year 2

2020 and 2021 pre-GSA AGeS workshops

In-person interactions

Encourage GSA presentations

Cohort Lead: Jim Metcalf (CU)



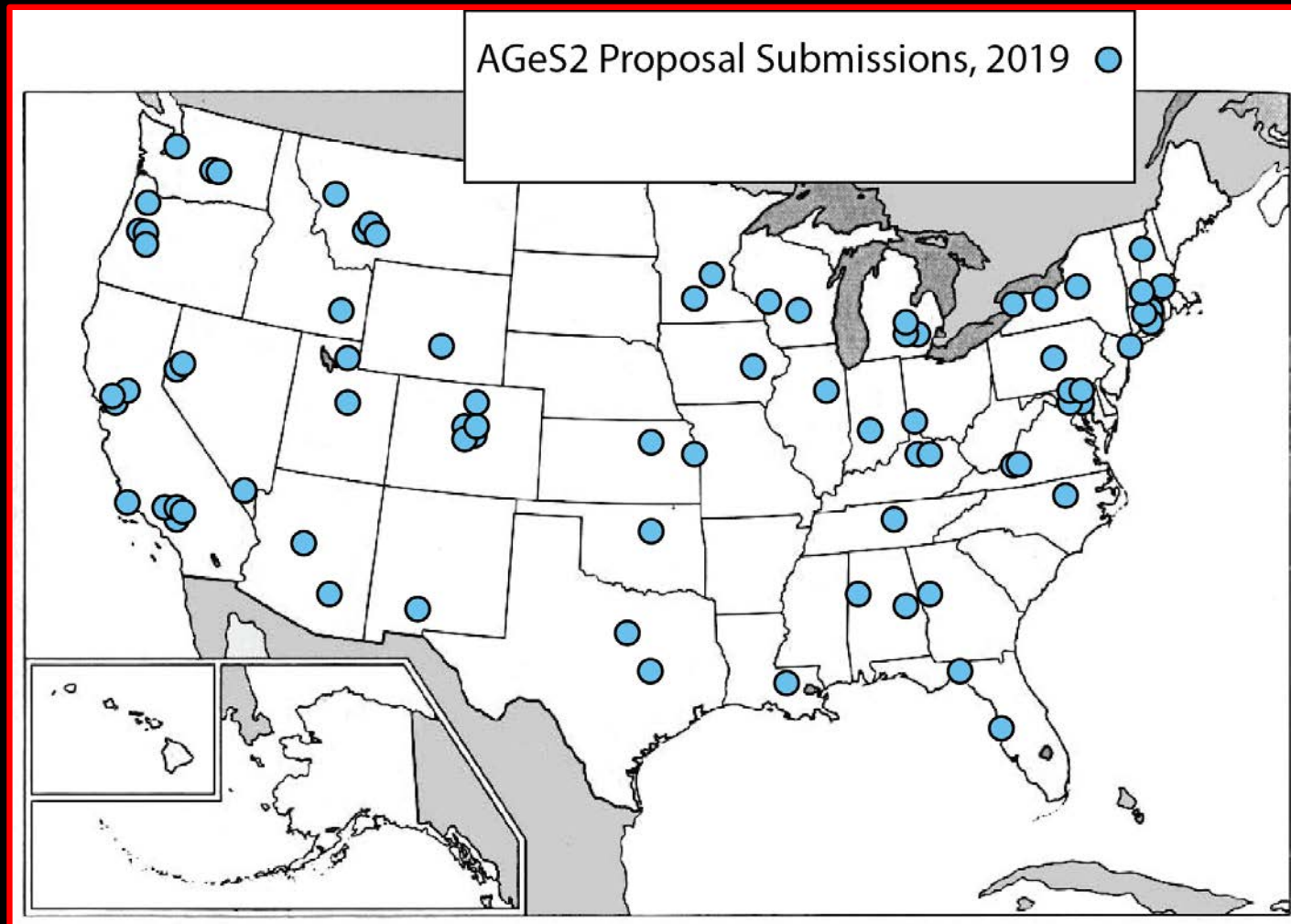
*AGeS1
awardee
James
Mauch
(formerly
at USU)*



*AGeS1
awardee
Stephen
Nguyen
(formerly
at Texas
Tech)*

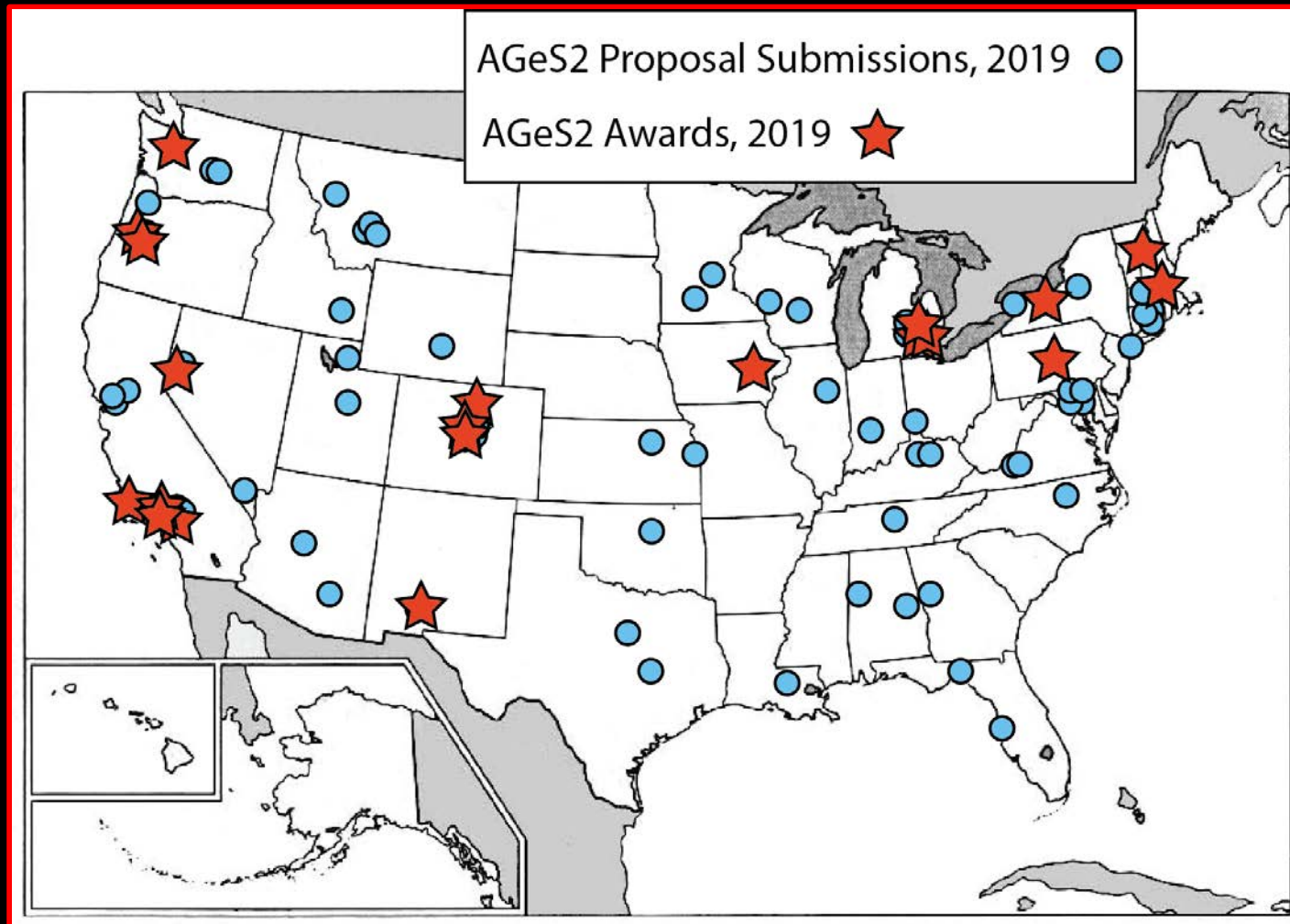
AGeS2: 2019 proposal cycle

- **78 submitted** AGeS2 proposals (Total AGeS proposals = 213)



AGeS2: 2019 proposal cycle

- **78 submitted** AGeS2 proposals (Total AGeS proposals = 213)
- **20 awards** (Total AGeS awards over 4 years = 45)



Examples of 2019 AGeS2 Funded Projects



“Investigating the structural controls and timing of mineralization at the Oro Cruz gold deposit, in the Cargo Muchacho Mountains of SE California”
Tarryn Cawood (USC), Re-Os at Yale

“Rate of accommodation space filling following the 1700 earthquake in an Oregon estuary” Erin Peck (Oregon State), cosmogenics at LLNL

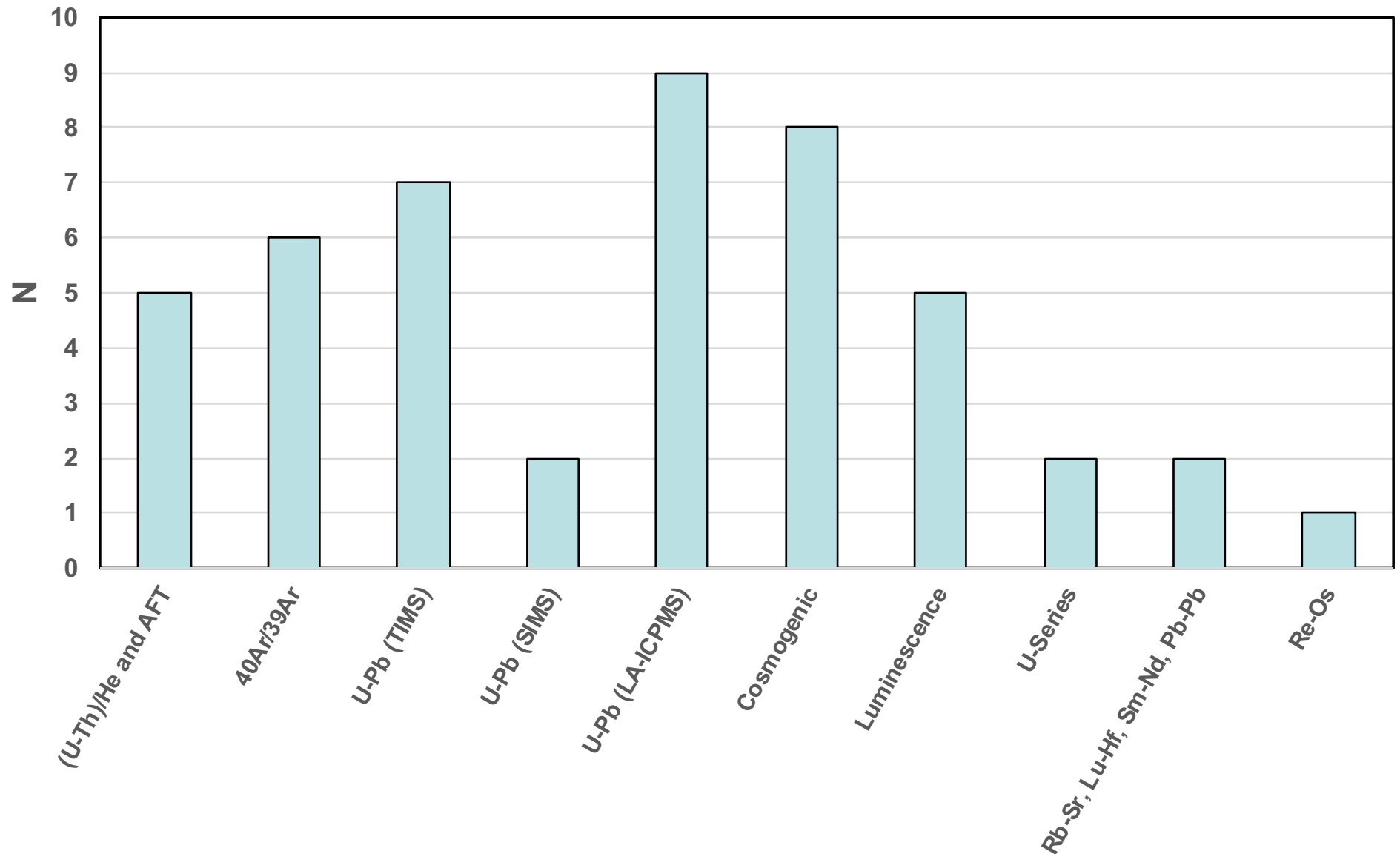


“Assessing the contribution of Jurassic crustal thickening to growth of the Cretaceous Nevadaplano”
Drew Levy (UNR), $^{40}\text{Ar}/^{39}\text{Ar}$ at NMT



AGeS: Techniques in Funded Projects

Techniques in Funded AGeS Projects (2015-2019)



AGeS: Assessment

- **Assessing the reach:** Diversity of home institutions, labs, students (applicants and awardees)
- **Analyzing the network:** Relationships being built short and long-term
- **Monitoring project implementation:** Review process, educational and research success of the projects
- **Evaluating the experiences of students, home advisors, and labs**

******Accomplished by surveys, interviews, quantitative data and network analysis******

AGeS1
awardee
Jaime
Delano
(formerly
at WWU)



Looking forward:

AGeS2

Two more proposal cycles: 2020 and 2021

Next deadline: Feb 3, 2020

Two pre-GSA AGeS cohort workshops

Additional AGeS2 awards: ~36

Total AGeS awards: ~80



Navajo volcanics field area, AGeS2 awardee David Uribe (CSM)

Looking forward:

What should AGeS3 look like?

How do we continue evolving AGeS to maximize its benefits to the community?

How do we develop a sustainable structure for AGeS?

\$162k/year required for 18-20 AGeS awards (\$8.5k each)

- *Oversight of review process by GSA Geochronology Division?*
- *Endowed fund through the GSA Geochronology Division?*
- *Instrument manufacturer and/or industry contributions?*
- *Other ideas???*