

J. Michael Timmons

New Mexico Bureau of Geology and Mineral Resources

New Mexico Tech

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Personal Information: Born December 16, 1969, U.S. citizen

Education:

Ph.D., 2004, Geology, University of New Mexico, "Mesoproterozoic Tectonic evolution of southwestern North America: protracted intracratonic deformation, sedimentation, and differential exhumation in Grand Canyon and the Rocky Mountain Region"

M.S., 1999, Geology, University of New Mexico, "Proterozoic multistage (~1.1 and ~0.8 Ga) extension in the Grand Canyon Supergroup and establishment of northwest and north-south tectonic grains in the southwestern United States"

B.S., 1995, Geology, University of Nebraska at Omaha, "Geology of the Monte Largo Hills area, New Mexico: structural and metamorphic study of the eastern aureole of the Sandia pluton"

Employment History:

2004-present **Manager of New Mexico Geologic Mapping Program, New Mexico Bureau of Geology and Mineral Resources.** Principal Duties: Supervise mapping and mapping related activities at the New Mexico Bureau of Geology. Duties include: 1) Project management and administration. Establish mapping responsibilities for Bureau personnel and contract mappers. Manage and track the annual mapping budget. Timely completion and distribution of contract deliverables and open-file map products. 2) Proposal preparation. Set up contracts, construct budgets, and negotiate fees with mapping contractors. Set mapping priorities by coordinating with state and federal agencies, define scope of work, oversee mapping personnel, and coordinate land access issues. 3) Field Management and technical oversight. Coordinate efforts of individual mappers in multi-author

- quadrangles. Review final map products. Coordinate production of digital geologic maps with GIS and cartography sections.
- 2004-present **Field Geologist, New Mexico Bureau of Geology and Mineral Resources.** Principal Duties: Field Geology. Using geologic mapping techniques and field observations to resolve the distribution, deformation and depositional history of bedrock units. Specific emphasis on structural geology and research in Precambrian geology.
- 1996-2004 **University of New Mexico, Teaching Assistant:** Structure Geology (EPS 307) Advanced Field Geology (EPS 420) Physical Geology (EPS 105L) New Mexico Field Geology (EPS 310) **Research Assistant,** Neoproterozoic of the Grand Canyon, Mesoproterozoic structural evolution of the continental interior, and persistence of structural weaknesses through geologic time.
- 1995 **New Mexico Bureau of Mines and Mineral Resources: Contract Mapper:** Sandia Park quadrangle
- 1989 to 2004 **Grand Canyon River Guide/Interpreter** This experience is included to demonstrate diverse instructional background and ability to communicate with a large variety of people with an equally large variety of scientific backgrounds.

Teaching Experience:

- Spring Semester 1996, 1998, 2000:** Structural Geology teaching assistant: Duties include: design and prepare laboratory exercises, instruction of laboratory projects, 3 hours per week office hours, participate in field exercises, grade lab exercises and assign final grades.
- Fall Semester 1997, 2002 Spring Semester 2002:** Physical Geology Laboratory Instructor: Introduction to Geology reaches out to two different students: career-track geologists and non-geology degree seeking students. In this light, Introduction to Geology, when taught with enthusiasm, can be used successfully as a platform to attract undecided majors towards geology. Duties include: preparation of laboratory exercises, instruction of laboratory projects, 3 hours per week office hours, participate in field exercises, grade lab exercises and assign final grades.
- Summer Session 1997, 1998, 1999, 2000, 2001, 2002:** Advanced Field Geology Instructor (graduate level field course): Duties include: Reconnoiter and help design field exercises, plan and implement logistical support for field projects (including: lodging/camping, food, transportation, etc.), instruct students on field based techniques for geologic mapping (this includes: compilation of existing mapping, using remote sensing data in the field to compliment field observations, and making geologic maps). Field based

projects are multidisciplinary, from Precambrian metamorphic rocks to Quaternary deposits.

Spring and Fall Semesters 2003: New Mexico Field Geology teaching assistant:

The course involves weekly fieldtrips to nearby scenic areas such as the Sandia Mountains, central Rio Grande rift, Albuquerque volcanoes, Colorado Plateau, Albuquerque Basin, and Jemez Mountains.

Observations, rock identification, note taking, and other field methods (introductions to compass use, section description, and mapping) are taught in the field. This course offers an important opportunity to expose introductory students to basic field methods at classic localities in New Mexico and further broadened my experience in New Mexico geology.

Professional Interests:

Field geology

Structural geology

Grand Canyon Geology

Mid-Late Proterozoic Geology of western North America

Basement cooling histories determined from $40\text{Ar}/39\text{Ar}$ thermochronologic studies

Proterozoic ancestry of Phanerozoic deformational structures in the Southwest

Brittle structural history of the southern Sangre de Cristo Mountains, New Mexico

Ancestral Rocky Mountain deformation in New Mexico and Colorado

Proterozoic geology of New Mexico, with emphasis on structure and tectonics

Applied sedimentology to structural problems in sedimentary rocks

Publications:

Refereed Journals:

Timmons, J. M., Karlstrom, K. E., Heizler, M. T., Bowring, S. A., Gehrels, G. E., and Crossey, L. J., 2005, Tectonic inferences from the ca. 1254 -1100 Ma Unkar Group and Nankoweap Formation, Grand Canyon: Intracratonic deformation and basin formation during protracted Grenville orogenesis, Geological Society of America Bulletin, v.117, no.11/12, p. 1573-1595.

Dehler, C. M., Elrick, M., Karlstrom, K. E., Smith, G. A., Crossey, L. J., and **Timmons**, J. M., 2001, Neoproterozoic Chuar Group (~800-742 Ma), Grand Canyon: a Record of Cyclic Marine Deposition During Global Cooling and Supercontinent Rifting, Sedimentary Geology 141-142, p. 465-499.

Timmons, J.M., Karlstrom, K.E., Dehler, C.M., Geissman, J.W., and Heizler, M.T., 2001, Proterozoic multistage (~1.1 and ~0.8 Ga) extension in the Grand Canyon Supergroup and establishment of northwest and north-south tectonic grains in the southwestern United States, Geological Society of America Bulletin, v. 113, no. 2, p163-180.

Marshak, S., Karlstrom, K. E., **Timmons**, J. M., 2000, Inversion of Proterozoic extensional faults; an explanation for the pattern of Laramide and ancestral Rockies intracratonic deformation, United States, Geology, v. 28, no. 8, p. 735-738.

Karlstrom, K. E., Bowring, S. A., Dehler, C. M., Knoll, A. H., Porter, S. M., Sharp, Z. D., Des Marais, D. J., Weil, A. B., Geissman, J. W., Elrick, M. B., **Timmons**, J. M., Keefe, K., Crossey, L. J., in press, The Chuar Group of the Grand Canyon: record of break up of Rodinia, associated change in the global carbon cycle, and ecosystem expansion by 740 Ma, Geology, v. 28, no. 7, p. 619-622.

Andronicos, C.L., Karlstrom, K.E., Nyman, M.W., Kirby, E., and **Timmons**, J.M., 1999, Interactions of metamorphism, deformation, and plutonism in low-pressure, high-temperature metamorphic belts: an example from the Mesoproterozoic Sandia Pluton, New Mexico, U.S.A.: Journal of Metamorphic Geology, in press.

- **Journal articles in Progress:**

Timmons, J. M., Heizler, M. T., and Karlstrom, K. E., Proterozoic ancestry of regional Laramide fault networks: using $^{40}\text{Ar}/^{39}\text{Ar}$ K-feldspar thermochronology to evaluate early cooling/exhumation histories across discrete fault zones.

John D. Bloch, J. Michael **Timmons**, Laura J. Crossey, George E. Gehrels, and Karl E. Karlstrom, in review, The Shale petrology and detrital zircon geochronology of the Mesoproterozoic Unkar Group, Grand Canyon: far traveled Grenville-age Detritus deposited in intracratonic Rodinia

S. M. Cather, K. E. Karlstrom, V. J. S. Grauch, J. M. **Timmons**, and M. T. Heizler, in review, A Palinspastic Reconstruction of Proterozoic basement-related aeromagnetic features in north-central New Mexico: Implications for Mesoproterozoic to Late Cenozoic tectonism, Geosphere.

Books and Edited Volumes:

Cather, S. M., **Timmons**, J. M., and Karlstrom, K. E., 2005, Regional Tectonic Inferences for the 1.4 Ga-Holocene lateral slip history of the Picuris-Pecos and related faults, Northern New Mexico: New Mexico Geological Society Guidebook, 56th Annual Field Conference, Geology of the Chama Basin, p. 93-104.

Timmons, J.M., Karlstrom, K.E., and Sears, J., 2003, Geologic structure of the Grand Canyon Supergroup, in Beus, S. S., and Morales, M., eds., Grand Canyon Geology, second edition, Oxford Univ. Press, New York, NY | Museum of North. Arizona Press, p. 71-82.

Timmons, J.M., Karlstrom, K.E., Kirby, E., 1995, Geology of the Monte Largo Hills area, New Mexico: Structural and metamorphic study of the eastern aureole of the Sandia Pluton: New Mexico Geological Society Guidebook, 46th Annual Field Conference, Santa Fe region, p. 227-232.

- **Books and Edited Volumes in progress**

Timmons, J. M. and Karlstrom K. E. *eds.*, anticipated 2006, Advances in Understanding the Geology of Eastern Grand Canyon: results from recent 1:24,000 mapping in Grand Canyon, Grand Canyon Association.

Geologic Maps:

Aby, S., and **Timmons**, J.M., 2005, Geology of the El Valle 7.5-minute quadrangle, Rio Arriba, Taos, and Santa Fe Counties, New Mexico: *New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OF-GM 105*, scale 1:24,000.

Smith, G.A., **Timmons**, M., and Gaud, M., 2004, Preliminary geologic map of the Truchas 7.5-minute quadrangle, Rio Arriba and Santa Fe Counties, New Mexico: *New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map OF-GM 84*, scale 1:24,000.

Ferguson, C.A., **Timmons**, J.M., Pazzaglia, F.J., Karlstrom, K.E., and Bauer, P.W., 1996 (*last revised: 31 August 1999*), Geology of the Sandia Park 7.5-minute quadrangle, Bernalillo and Sandoval Counties, New Mexico: *New Mexico Bureau of Mines and Mineral Resources, Open-file Geologic Map OF-GM 1*, scale 1:24,000.

- **Geologic Maps in progress:**

Aby, S., and **Timmons**, J.M., Geology of the Tres Ritos 7.5-minute quadrangle, Taos County, New Mexico: *New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map*, scale 1:24,000.

Horn, M., and **Timmons**, J.M., Geology of the Ojitos Frios 7.5-minute quadrangle, San Miguel County, New Mexico: *New Mexico Bureau of Geology and Mineral Resources, Open-file Geologic Map*, scale 1:24,000.

Abstracts:

Timmons, J. M., Fletcher, K. E., Bloch, J. D., Karlstrom, K. E., Heizler, M. T., Gehrels, G., Bowring, S. A., and Crossey, L. J., The Mesoproterozoic Grand Canyon Unkar Group: a detailed record of intracratonic basin formation and deformation during Grenville-age orogenesis: Geological Society of America Abstracts with Programs, Vol. 37, No. 7, p. 494.

Fletcher, K. E., **Timmons**, J. M., Karlstrom, K. E., Heizler, M. T., Gehrels, G., Crossey, L. J., and Bloch, J. D., Detrital zircon and muscovite geochronology from southwest USA Mesoproterozoic rocks: Geological Society of America Abstracts with Programs, Vol. 37, No. 7, p. 387.

Osburn, G. R., Kelly, S. A., Kempter, K. A., Bauer, P. W., **Timmons**, J. M., and Linden, M. A., 2005, Geologic research in the Santa Fe National Forest, Jemez Mountains, New Mexico: Geological Society of America Abstracts with Programs, Vol. 37, No. 7, p. 176.

Heizler, M.T., Karlstrom K.E., **Timmons** J.M., and Sanders R.E., 2005, Reactivation of Precambrian fault networks: A K-feldspar $^{40}\text{Ar}/^{39}\text{Ar}$ study: 15th annual Goldschmidt Conference, Moscow, Idaho, p. A293.

Timmons, J. M., Karlstrom, K. E., Pederson, J., and Anders, M., 2005, Geologic Map of Eastern Grand Canyon, Arizona: documenting multi-phase Late Proterozoic deformation and Laramide reactivation in the southwestern United States: New Mexico Geological Society 2005 Annual Spring Meeting Proceedings Volume, p. 57.

McCraw, D. J., **Timmons**, J. M., and Read, A. S., 2005, NMBG&MR's Preliminary Map Series: Expediting Dissemination of STATEMAP Geologic Map Data to the Public, Digital Mapping Techniques 2005, Baton Rouge, La.

Heizler, M. T., Karlstrom, K. E., Shaw, C. A., **Timmons**, J. M., and Sanders, R. E., 2004, The evolution of Laurentia as documented by $^{40}\text{Ar}/^{39}\text{Ar}$ thermochronology studies, Geological Society of America Abstracts with Programs, Vol. 36, No. 5, p. 405.

Fletcher, K.E., Heizler, M.T., Karlstrom, K. E., **Timmons**, J.M., Crossey, L.J., and Bloch, J.D., 2004, Provenance and Geochronology of Mesoproterozoic sedimentary rocks from across the southwest United States revealed by $^{40}\text{Ar}/^{39}\text{Ar}$ dating of detrital muscovites, Geological Society of America Abstracts with Programs, Vol. 36, No. 5, p. 405.

- Timmons**, J. Michael, Heizler, Matt, and Karlstrom, Karl E., 2002, Proterozoic and Paleozoic ancestry of regional Laramide fault networks: using $^{40}\text{Ar}/^{39}\text{Ar}$ K-feldspar thermochronology to evaluate early cooling/exhumation histories across discrete fault zones, Geological Society of America Abstracts with Programs, v. 34, no. 6, p. 181.
- Crossey, L. J., **Timmons**, J. M., Karlstrom, K.E., Ashby, J. Rampe, J., Tyson, A., Johnson, S., Marshall, K., Dehler, C. M., Prave, T., 2001 Petrologic approaches to correlate Late Mesoproterozoic to Neoproterozoic stratigraphic successions in Western North America, Geological Society of America Abstracts with Programs, v. 33, n. 5.
- Timmons**, J. M., Karlstrom, K. E., Heizler, M., Bowring, S., 2001, A synthesis from the Unkar Group of Grand Canyon, and inferences on late Mesoproterozoic intracratonic sedimentation and deformation in the Western U.S., Geological Society of America Abstracts with Programs Vol. 33, No. 5, p. 20.
- Heizler, M. T., **Timmons**, J. M., Karlstrom, K. E., 2000, Ancestry of the Ancestral Rocky Mountains, Geological Society of America Abstracts with Programs, v. 32, no. 7.
- Timmons**, J.M. and Karlstrom, K.E., 1999, Multistage Proterozoic extension and establishment of the N-S and NW tectonic grains in the southwestern United States: Evidence from 1:12,000 mapping of the Grand Canyon Supergroup, Geological Society of America Abstracts with Programs, v. 31, n. 7, p. 177.
- Heizler, M.T., Karlstrom, K.E., and **Timmons**, J.M., 1999, Where have all the old micas gone?, New Mexico Geological Society, Proceedings Volume, 1999 Annual Meeting, p. 43.
- Timmons**, J.M., Karlstrom, K.E., and Dehler, C.M., 1998, Structure and sedimentary tectonics of the Chuar basin and Butte fault, Grand Canyon: evidence for a Neoproterozoic 'growth' fault; Geological Society of America Abstracts with Programs, v. 30, n. 6. p. 38.
- Timmons**, J.M., 1996, Evidence for 1.4 Ga metamorphism and deformation in the aureole of the Sandia Pluton, Monte Largo Hills Area, New Mexico, New Mexico Geological Society 1996 Annual Spring Meeting Proceedings Volume, p. 44.
- Timmons**, J.M., Shuster, R.D., Karlstrom, K.E., 1995, Geology of the Monte Largo Hills area, New Mexico: Structural and Metamorphic study of the eastern aureole of the Sandia Pluton: GSA Abstracts with Programs, v.27, n. 3, p.90.

Thesis:

Timmons, J. M., 1999, Proterozoic multistage (~1.1 and ~0.8 Ga) extension in the Grand Canyon Supergroup and establishment of northwest and north-south tectonic grains in the southwestern United States, Masters Thesis, University of New Mexico.

Dissertation:

Timmons, J. M., 2004, Mesoproterozoic Tectonic evolution of southwestern North America: protracted intracratonic deformation, sedimentation, and differential exhumation in Grand Canyon and the Rocky Mountain Region, [Dissertation], University of New Mexico.

Public Outreach:

Ilg, B.R., Bennett, J., **Timmons**, M., Pederson, J., 1998, From the birth of a continent to Glen Canyon Dam: A Grand Canyon Voyage: Geological Society of America GeoVenture, GSA Today, v.7, p. 8-9.

Timmons, J.M., Karlstrom, K.E., Dehler, C.M., 2000, Grand Canyon Supergroup: six unconformities make one 'Great Unconformity' - a record of supercontinent assembly and disassembly; Boatman's Quarterly Review, Grand Canyon River Guides.

Grand Canyon River Guides training trip 1999, invited speaker on Grand Canyon Geology.

Current Contracts and Grants:

2005-2006 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (STATEMAP), Geology of 7.5-minute quadrangles in New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$287,856 awarded.**

Proposals submitted and pending:

2006-2007 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (STATEMAP), Geology of 7.5-minute quadrangles of New Mexico; P.I. **J. Michael Timmons**, U.S. Geological Survey: **\$300,000 requested.**

2006-2008 Valles Caldera National Preserve Trust, Digital map compilations of the Jemez Mountains and printed map of the Valles Caldera Preserve, P.I. **J. Michael Timmons**: **\$188,734 requested**

Previously funded Contracts:

- 2004-2005 National Cooperative Geologic Mapping Program, State Geologic Mapping Component (**STATEMAP**), Geology of 7.5-minute quadrangles in critical watersheds of New Mexico; P.I. P.W. Bauer and **J. Michael Timmons**, U.S. Geological Survey: **\$275,275 awarded.**
- 2005 U.S. Forest Service, Phase II: Digitize five geologic quadrangle maps in the Santa Fe National Forest, Jemez Mountains, P.I. P.W. Bauer and **J. Michael Timmons**, **\$15,120 awarded.**
- 2004 U.S. Forest Service, Phase I: Digitize five geologic quadrangle maps in the Santa Fe National Forest, Jemez Mountains, P.I. P.W. Bauer and **J. Michael Timmons**, **\$19,400 awarded.**

Organization Affiliations:

Geological Society of America
New Mexico Geological Society
National Center for Science Education
Grand Canyon River Guides

Invited Meetings, Talks and Research:

- 2005 -Invited talk at Utah State University Geology Department Technical Seminar on the Grand Canyon Supergroup and Late Proterozoic deformation in the Southwest.
-Invited talk at New Mexico State University Geology Department Technical Seminar on the Grand Canyon Supergroup and Late Proterozoic deformation in the Southwest.
-Invited guest lecturer at New Mexico Tech Geology Department Structure class.
-Invited to present a briefing on NMBGMR Mapping Program in the Espanola Basin to the Espanola Basin Technical Advisory Group, March.
Participated as a judge in the 'Awesome Aquifers' competition at New Mexico Science Fair
- 2004 Invited talk at New Mexico Tech Geology Department Technical Seminar on the Grand Canyon Supergroup and Late Proterozoic deformation in the Southwest.

Staff Supervision at NMBGMR:

David McCraw, Senior Geological Lab Associate, May 2004 to present

Service on NMBGMR Search Committees:

2005 Bureau search for graphics specialist – Aquifer Mapping Program –
 hired Brigitte Felix