Earthquakes are nothing new to Virginia and VTSO tracks them all.

The Virginia Tech Seismological Observatory

Most students who have taken geoscience classes at Virginia Tech know that when the team scores a touchdown at Lane Stadium, the excitement of the crowd triggers the local seismometer (and if you haven't seen this, be sure to check it out here during the next game). But this seismometer is just the tip of the iceberg as far as research at the Virginia Tech Seismological Observatory (VTSO) goes.

Earthquakes in the eastern United States may not occur as often as those in California, but they happen more regularly than most people realize, and they can get big. Think magnitude 7 or even 7.5 big. The crust in the eastern U.S. is different than that found in CA, which means that when the earthquakes occur, the waves — and any potential damage — can travel much farther away from the center of the shaking. You might have experienced this if you were on the east coast during the Virginia earthquake in 2011. That earthquake was a magnitude 5.8, and it was felt as far south as Atlanta, Georgia and up north into Canada.

If an earthquake has occurred in the eastern United States, there's a good chance researchers at VTSO have looked into it, though most of the research conducted here focuses on the southeastern U.S. and associated seismic hazards. More specifically, current VTSO researchers look at earthquakes and seismic hazards pertaining to Virginia (of course); earthquakes and seismic hazards in Charleston, SC; earthquakes in the Eastern Tennessee Seismic Zone; wave propagation in the central U.S.; and induced seismicity (earthquakes triggered by human activity) around the country.

Continued on page 3...
Geosciences in the News

From **VT News**: “Geophysicists challenge traditional theory underlying the origin of mid-plate volcanoes”

VT News highlighted Dr. Scott King's research about the role the athenosphere plays in plate tectonics. Dr. King's work was published *Science magazine* in early December.

From **VT News**: “Geologist Esteban Gazel earns top 40 under 40 accolade”

Dr. Esteban Gazel was also featured in VT News as one of Coasta Rica's 40 people under 40 who have positively influenced the region. Dr. Gazel is the first geoscientist to receive this honor.

From **VT News**: “Virginia Tech researchers help set agenda on ‘Big Data’ challenges at Virginia Academy Summit”

Dr. Patricia Dove made news this past month with her role as a member of the steering committee for the Virginia Summit on Science, Engineering and Medicine, which discussed Big Data and its impact on all scientific fields. The summit was co-hosted by Senator Mark Warner. Said Dr. Dove, “Many of the Virginia Tech science and engineering faculty participated, including new VT President Tim Sands, because VT is the leader for much of the state's science and technology development.”

Geosciences Events and Activities

This month, the Geosciences Museum hosted a special talk and field trip about local Appalachian geology by Dr. Phil Prince. The trip focused on explaining the New River’s famous “across the mountains” course in the context of the structural architecture and erosional history of our area. While the New River does indeed flow across the structural grain of the Valley and Ridge, its present course minimizes the amount of resistant rock (Mississippian and Silurian sandstone) exposed in the riverbed, meaning the river has localized on a course which minimizes ridge crossings. The New thus follows the “best” course, energetically speaking, from the Appalachian high country towards the continental interior, and this course has developed over time during the progressive un-burying of Valley and Ridge folds. The tour stopped at a number of sites which helped participants visualize the structure of our area as a series of kilometer-scale folds out of which our ridge-and-valley topography has been etched by erosion. Most of the trip participants had attended the pre-trip lecture on Thursday night, which attracted a group of nearly 40 people (the trip was capped at 12 participants).

The Geosciences Museum also hosted a class on wire-wrapping this month, giving hokies (and the general public) a chance to stretch their creative muscles.

Keep up with other events at the Geosciences Museum by checking in with the calendar and liking them on Facebook.
Virginia Tech Sesimological Observatory continued...

To make this information more accessible to other scientists and to the general public, VTSO recently launched a new website. Though the site is still a work in progress, it’s already a great resource for understanding where and why eastern earthquakes occur. The site also provides extensive information about induced seismicity.

In 2013, VTSO partnered with the National Energy Technology Laboratory to assess which parts of the country are more susceptible to induced seismicity and why. Induced earthquakes have long been associated with reservoirs and injection wells, however, the recent uptick in wastewater disposal wells associated with hydrofracking, as well as enhanced oil recovery wells, have led to significant increases in induced earthquakes occurring across the U.S. Oklahoma has seen the largest increase in earthquake activity, with central Oklahoma now experiencing more earthquakes than the same sized region around San Francisco, CA. The VTSO induced seismicity page provides more detail about why induced seismicity occurs and which regions around the country are more strongly affected.

Dr. Martin Chapman heads VTSO, and Dr. Arthur Snoke is an emeritus professor involved with the effort. Current researchers include Jake Beale, Ariel Conn, Qimin Wu, and Anna Hardy (who successfully defended her Masters thesis in December, 2014).

Life of a VT Geosciences Alumnus

Hello VT Geology Dept!

Just wanted to share the completion of my solo thru-hike of the entire Appalachian Trail, 03Jun-03Nov2014, 2186.3 miles. I chose to journey as a “MeGa SoBo” Maine to Georgia Southbound, for several reasons;

1. Start hard, finish easy, relatively...Maine and New Hampshire are wicked tough!
2. Far fewer people attempt a SoBo thru-hike, I hiked entirely alone on the trail for all but two days...alone but never, ever lonely.
3. Lastly, the “green tunnel” turned into an unending exquisite kaleidoscope of changing Fall colors.

I also met up with another VT Geology graduate ‘91Mike Jones, whom I’ve not seen since field camp Saltville, Va.’90, at the Antietam shelter on the trail in Pa. Gosh, where does the time go?! Anyway, I just wanted to share this tidbit and perhaps encourage other geologist to consider challenging themselves to one of the most magnificent hidden wonders of this world, The A.T.! No better way to come to understand and appreciate the bigger picture of geology than trekking on foot over one of the most complex mountain ranges in the world, equivalent to climbing Mt Everest 18 times with over 515,000 feet of vertical ascent and descent from end to end. And yes, the feet do suffer! But every step, ache, agony, strain, sprain and pain is worth the journey :-)

“Stay the Blaze, Not the Path, because if you’re on a path, most likely you’re no longer on the AT!”

Over 250,000 white blazes painted on trees, rocks, posts, etc is the only way to follow this trail, “connect the dots, get lost often!” as there exists no footpath for over 1000 miles of this trail that journeys through 14 States. Website and pics at: www.hitchahiker.net though I’ve only posted in completion from Maine to Massachusetts.

-Ashley K. Goodrich
2014 Fall AGU Presentations:


Ph.D. candidate Neal Auchter presented poster EP13C-3533 titled “Multi-phase submarine channel history recorded by stratigraphic architectures in outcropping slope-channel deposits, Tres Pasos Formation, Chile”


Former SSR student Patrick Boyle had a poster (PP51E-1175) based on his completed master’s thesis titled “Cenozoic circulation history of the North Atlantic Ocean from seismic stratigraphy of the Newfoundland Drift Complex”. Brian Romans (2nd author) presented the poster.

Julie Fosdick (Indiana Univ) gave an invited talk (Brian Romans was a collaborator and co-author) in session EP11C-01 about detrital records of tectonics titled “Unraveling burial heating and sediment recycling in retroarc foreland basins: Detrital thermochronologic insights from the northern Magallanes Basin, Patagonian Andes”


Steve Hubbard (Univ of Calgary) gave an invited talk (Brian Romans was collaborator and co-author) in session EP53E-04 about comparison of fluvial and submarine channel processes and deposits titled “The stratigraphic expression of formative processes in channels”


Brian Romans gave an invited talk about propagation and preservation of signals in the sedimentary record titled “Sediment flux from stratigraphy: Insights from <1 Ma and >300 Ma sedimentary archives”


Esther Schwarzenbach, Aida Farough and Bob Lowell convened a session on: “Chemical, physical and biological interactions during serpentinization of ultramafic rocks”
Driving the Earth machine?
Don L. Anderson and Scott D. King
Science 5 December 2014: 346 (6214), 1184-1185. [DOI:10.1126/science.1261831]

The asthenosphere—derived from the Greek asthenēs, meaning weak—is the uppermost part of Earth's mantle, right below the tectonic plates that make up the solid lithosphere. First proposed by Barrell 100 years ago (1), the asthenosphere has traditionally been viewed as a passive region that decouples the moving tectonic plates from the mantle and provides magmas to the global spreading ridge system. Recent studies suggest that the asthenosphere may play a more active role as the source of the heat and magma responsible for intraplate volcanoes. Furthermore, it may have a major impact on plate tectonics and the pattern of mantle flow.


Upcoming Events

Geosciences Seminar Series
Every Friday at 4 PM in room 4069. Open to the public, refreshments provided.

January 23:
Hosted by Nancy Ross & Bob Bodnar
Lutz Nasdala
MSA Distinguished Lecturer
Ph.D., Institute of Theoretical Physics, Freiberg University of Mining and Technology

http://www.univie.ac.at/Mineralogie/nasdala_engl.htm

January 30:
Hosted by Michelle Stocker
Robert L. Anemone
Professor and Department Head
Biological Anthropology and Paleoanthropology
Ph.D., University of Washington

http://www.unCG.edu/ant/faculty-staff/anemone.html

Congratulations to the graduate students who successfully defended their Masters and PhDs!

Congratulations to Anna Hardy who successfully defended her master’s thesis on December 5, 2014. A description of her work -- which provides new information about the faults that ruptured during of the 1886 Charleston, SC earthquake -- can be found on the VTSO website.

Virginia Tech
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