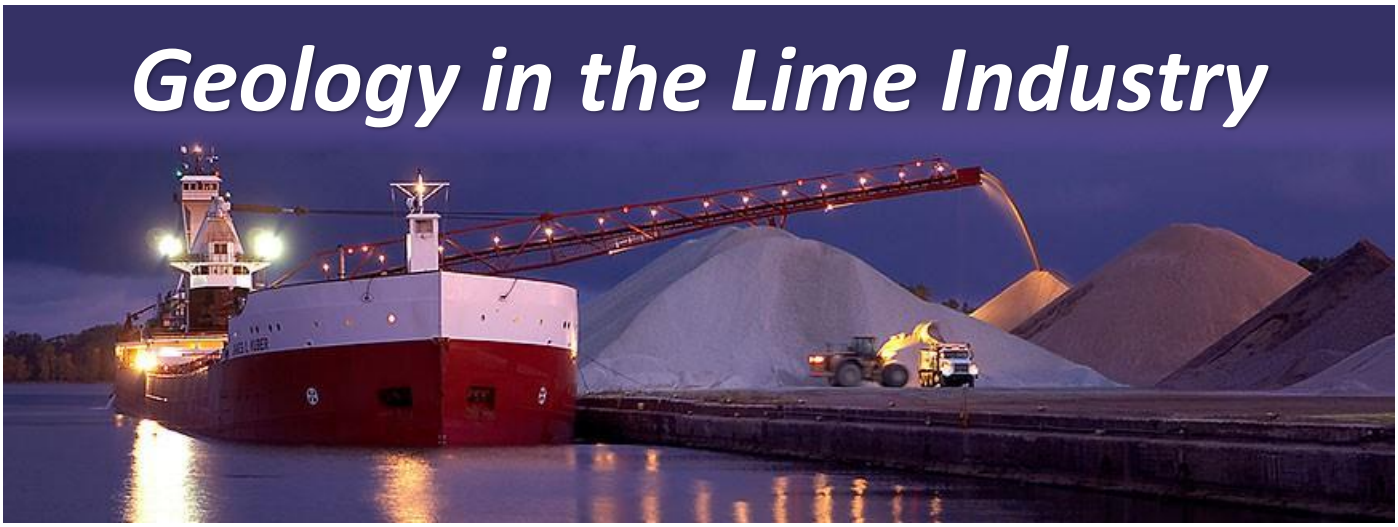
PGS Newsletter

http://www.pittsburghgeologicalsociety.org/

Vol. LXVIII, No. 6 | Karen Rose Cercone, Editor | February, 2016

Wednesday, February 17, 2016

The Pittsburgh Geological Society presents



Dr. John Groves

Manager of Geology, Carmeuse Lime and Stone

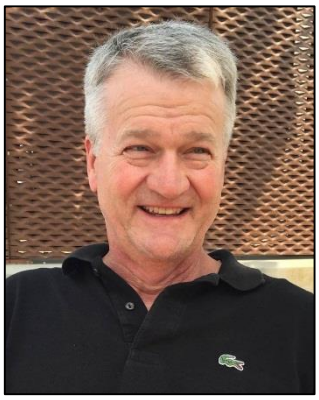
Quicklime (or just “lime”) is CaO obtained by the calcination of limestone. Lime is used in a number of industrial and environmental applications, with steel manufacturing and flue gas desulfurization being the biggest markets. Commercially acceptable lime must contain < 6% impurities. Because impurities are concentrated by a factor of nearly two during the calcination process, the precursor limestone must be exceptionally pure. Geologists in the lime industry prospect for chemically pure limestone, they evaluate calcination behavior, perform resource and reserve estimates, and develop 3-dimensional models to determine the geometry and chemical variability of ore deposits. All of these activities depend on the synthesis of information gleaned from extensive testing, both chemical and physical.

Social hour - 6:00 p.m. **Dinner - 7:00 p.m.** **Program - 8:00 p.m.**

Dinner costs $30.00/person, students $10.00; checks preferred. For reservations, please email pgsreservations@gmail.com with your name and number of attendees in your party. You can also reserve and pay for dinners via PayPal on our website http://pittsburghgeologicalsociety.org. Please include your name and number of attendees in your party. Deadline for reservations is noon Monday, February 15..

Meeting will be held at Foster’s Restaurant, Foster Plaza Building 10, Green Tree.

SPEAKER BIOGRAPHY



Our February speaker is Dr. John Groves, Manager of Geology for Carmeuse Lime and Stone in Pittsburgh. John joined Carmeuse in 2012 after having spent the previous 12 years as Professor of Geology at the University of Northern Iowa. Prior to his academic career he worked 15 years with Amoco Production Company in Denver and Houston. John earned B.S. and M.S. degrees in Geology at the University of Oklahoma, and a Ph.D. in Geology at the University of Iowa. He specializes in micropaleontology and carbonate depositional environments, having authored more than 60 peer-reviewed articles dealing mostly with Paleozoic foraminifera.

PRESIDENT'S STATEMENT

In review, thus far, of this program year's meeting attendance from September 2015 through January 2016, I'm pleased that we have averaged nearly 70 members per meeting. Our attendance reflects the hard work of our Program Committee to bring in relevant and dynamic speakers (kudos Dr. Schiappa – Program Chair) that interest our professional and student members alike. The attendance of our professional members currently outnumbers that of the student members, giving the students plenty of opportunities to network with working geologists. Our professional members have the added benefit of earning PDH credits. The benefits of attendance for all! Speaking of PDH credits - the Society continues to communicate PDH opportunities to our membership as they present themselves in the region. An important upcoming opportunity will be the AAPG Pittsburgh Playmaker Forum, co-sponsored by the PGS and PAPG, on April 13, 2016. Details will be made available in the future emails and newsletters. If you know of any other upcoming PDH opportunities in the Pittsburgh area, please share them with us so we can get the word out.

I would like to ask our membership to consider participating in the outreach efforts of the Society. Our Outreach Committee, chaired by Ken LaSota, has been very active on many fronts, participating in local educational conferences for K-12 educators through the Allegheny Intermediate Unit, visiting local schools for science and career fairs, or just responding to general requests that appear via our website. From time to time we get small requests from schools, youth and scouting organizations, etc. that could easily be covered by a PGS member that may live in the community of the request. In such a case we will send out an email to our membership to increase our pool of participants and reduce the burden and travel time for a willing member that may live a county away. Please consider participating and helping in our efforts to educate the public. You can contact me or any Board member if you want to get involved.

I would like to acknowledge the following corporate sponsors that have committed their support to our 2016 initiatives since last month's newsletter; ACA Engineering, Inc., American Geosciences, Inc., American Geotechnical & Environmental Services, Inc., Billman Geologic Consultants, Inc., DC Energy Consultants, DiGioia, Gray & Associates, LLC, DORSO LP, Geo-Environmental Drilling Company, Inc., Groundwater & Environmental Services, Inc., Hayward Natural Resources, Inc., Howard Concrete Pumping Company, Inc., Huntley & Huntley Energy Exploration, LLC, Moody & Associates, Inc., Oil & Gas Management, Inc., Pennsylvania Drilling Company, and Seneca Resources Corporation. Thank you all for your continued support.

In closing, please join us at the February meeting. Our guest speaker this month is Dr. John Groves of Carmeuse Lime and Stone. His presentation will encompass how geologists in the lime industry prospect for and develop high quality limestone reserves for commercial use. I hope that you will join us.

Ray Follador

CALENDAR OF EVENTS

PITTSBURGH ASSOCIATION OF PETROLEUM GEOLOGISTS

February 18, 2016
Petrophysical Interpretation of Electromagnetic Measurements in Clay- and Pyrite-Bearing Formations: Toward Improved Water Saturation Estimates by Siddharth Misra, University of Oklahoma
Cefalo's Event Center, Carnegie PA

PENNSYLVANIA COUNCIL OF PROFESSIONAL GEOLOGISTS

February 4-5, 2016
PG Review Course for the Practicing Geologist and ASBOG Exams
Pittsburgh Marriott - North
Cranberry Township, PA

HARRISBURG GEOLOGICAL SOCIETY

February 11, 2016
Mapping the Source: The Challenges of Protecting Pennsylvania's Unconventional Springs by Alfred Guiseppe, SSM Group
GTS Technologies, Harrisburg PA

OHIO GEOLOGICAL SOCIETY

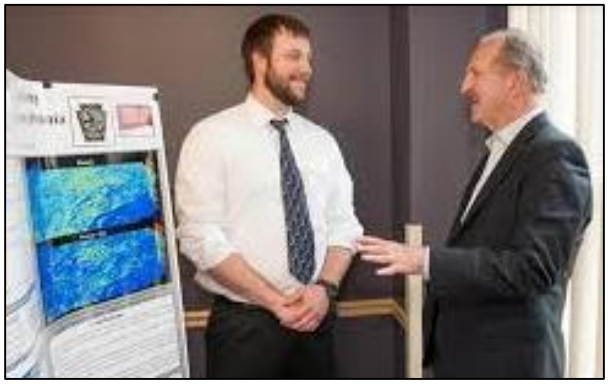
February 18, 2016
Full Tensor Gravity Gradiometry: How it is being used to advance exploration by Colm Murphy, Bell GeoSpace Inc.
Holiday Inn Columbus, Worthington OH

March 16, 2016
Determination of Wellbore Orientation in the Utica Shale of Southeast Ohio by Joseph P. Smith, PDC Energy, Inc.
Hilton Easton, Columbus OH

14th ANNUAL PGS / AEG / ASCE

STUDENT NIGHT

Wednesday April 20, 2016



If you have been conducting undergraduate or graduate research in any geological or geotechnical field, here is an opportunity to show off your work to members of three local professional societies. Students who present their research improve their public speaking skills, plus they get to network with professionals and experts in their fields, list a presentation on their resume and possibly even win a cash award!

Each of the three sponsoring societies will select one student paper (graduate or undergraduate) for oral presentation. Additional abstracts will be accepted for poster presentations. All presenters will receive certificates of recognition and appreciation, as well as complimentary dinner. The three oral presenters will each receive awards of $100, while the three top poster presenters will each receive $50.

Professors: please pass this information on to your students who are doing research.

Abstracts of 300 words or less should be emailed to Dr. Tamra Schiappa at by Monday, March 4, 2016 for consideration.

PGS SPRING 2016 12th ANNUAL STUDENT FIELD WORKSHOP

Saturday, April 2, 2016

The Pittsburgh Geological Society invites students across our region to attend a field workshop at California University of Pennsylvania. Students will work alongside an experienced drilling contractor and field professionals to take samples of soil and water, install a monitoring well and learn the basics of field geology for environmental and engineering applications. This workshop will be held rain or shine! To reserve your space, contact Frank Benacquista, PG at fbenaquista@kuresources.com.

The Pittsburgh Geological Society is pleased to welcome a new student member, James A. Bader from California University of Pennsylvania.

Recent Publications on Pennsylvania Geology

Pressley, Katie. "Anisotropic groundwater modeling in the Cumberland Valley, southcentral Pennsylvania." (2015). Shippensburg University of Pennsylvania Master's Thesis.

Lu, Jun, et al. "Transitional geology and its effects on development and longwall mining in Pittsburgh Seam." International Journal of Mining Science and Technology 26.1 (2016): 31-37.

Phan, Thai T., et al. "Factors controlling Li concentration and isotopic composition in formation waters and host rocks of Marcellus Shale, Appalachian Basin." Chemical Geology 420 (2016): 162-179.

Lee, Jin-Yong, Matthew Weingarten, and Shemin Ge. "Induced seismicity: the potential hazard from shale gas development and CO_2 geologic storage." Geosciences Journal 20.1 (2016): 137-148.

COMMUNITY FOUNDATION
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220 South Jefferson Street, Suite B, Kittanning, PA

THE ORIGIN OF WESTERN PENNSYLVANIA PLACE NAMES

Raccoon Presbyterian Church in Candor, Washington County

In 1774, Col. Samuel Beelor settled on some land in northwestern Washington County, and he was soon joined by others who erected a church there, Raccoon Presbyterian Church, one of the oldest churches in western Pennsylvania. The settlement was small until after 1817 when Rev. Moses Allen became pastor of the church. He is credited with founding the village of Candor at that location. As the story goes, his son Watson, a store keeper, traveled to Philadelphia for supplies. When asked for an address where they could be delivered, he thought for a few moments before replying, “Candor”, a word meaning “frankness” or “the quality of being open”. That became the official name of the village. A post office was opened there, but since there was already a Candor Post Office elsewhere in Pennsylvania, it was affiliated with the post office in the nearby village of Bulger. Candor was the site of bituminous coal mines for many years. It also gives its name to an anomalous geologic structure in the area called the Candor dome.

DID YOU KNOW . . . ?

The USGS announced in September, 2015 that Denali, previously known as Mount McKinley, has a new official elevation – 20,310 feet, 10 feet less than the previous estimated elevation. But Denali hasn’t shrunk. The USGS used GPS technology to determine the new elevation, technology that wasn’t available in 1950 when the mountain was measured.

Kyanite is a mineral found mainly in metamorphic rocks. It most often forms from the high pressure alteration of clay minerals during the metamorphism of sedimentary rocks. It is found in the schists and gneisses of regionally metamorphosed areas and less often in quartzite or eclogite.

Kyanite's typical habit is a bladed crystal although it sometimes occurs as radiating masses of crystals. It is often associated with other metamorphic minerals such as garnet, staurolite and corundum.

Kyanite is used to manufacture a wide range of products, such as refractory bricks, mortars and kiln furniture used in high temperature furnaces. For foundries, the molds that are used for casting high temperature metals are often made with kyanite. It is also in products used in the automotive and railroad industries where heat resistance is important. Mullite, a form of calcined kyanite, is used to make brake shoes and clutch facings.

***Arsinotherium*, an Eocene relative of elephants and manatees**

***Archaeotherium*, an Eocene relative of hippopotami and whales**

While hordes of children and adult visitors pack the dinosaur halls in our nation's museum, the fossil mammal halls are basically empty. People want to see the astonishingly huge dinosaurs, not the much less impressive mammals. This despite the fact that, after the dinosaurs went extinct and the mammals rose to dominance on the planet, many became as bizarre and spectacular as any dinosaur. There are even some museum visitors who, assuming that any skeleton in a museum must be from the Age of Dinosaurs, mistakenly think giant sloths, multi-toed horses, and enormous elephants must be dinosaurs.

The mammals of the past 65 million years, as well as many that lived alongside the dinosaurs, were some of the most fantastic animals to ever live on this planet. Yet, before the word "dinosaur" was coined, mammals were the stars of the fossil record. Thomas Jefferson cited the existence of the American mastodon to demonstrate that the New World was just as able to produce vibrant and interesting life as the Old World. And during the "Bone Wars" of the late 1800s, Edward Drinker Cope and Othniel Charles Marsh were as famous for discovering rhinoceras-like brontotheres, early horses, and other mammals as they were for all the dinosaurs they discovered.

Dino-mania only began to take hold in the early 1900s when the American Museum of Natural History in New York City, the Field Museum in Chicago, and the Carnegie Museum in Pittsburgh competed to establish themselves as the best dinosaur museum. Yet, through all the years of dino-mania, the professional vertebrate paleontologists still preferred fossil mammals. Although Brontosaurus, Stegosaurus, and Tyrannosaurus sold the tickets, the experts were more concerned with what came after the Cretaceous mass extinction. There were far more fossil mammals than dinosaurs, and their history could be traced through the

constantly changing arrangements of their teeth, making them ideal for drawing big-picture conclusions of how life evolves through time. Dinosaurs were considered something of a prehistoric sideshow to the point where some paleontologists proposed that they became extinct because they got too big and weird to function anymore.

So, why are we so gaga over dinosaurs? Well, for one thing, they have been so well marketed by the media – books, movies, social media, and newspaper and TV coverage of every new discovery, no matter how mundane. One pundit even went so far as to say we've gone beyond dino-mania and are now in full-blown dino-psychosis.

Yet museum cabinets are full of fossil mammals that are just as strange as any dinosaur. For example, because of fossils, we know that whales started off as hoofed mammals, like *Pakicetus*, that walked on land. The age of mammals is still young compared with the 180-million-year-long reign of the dinosaurs, which are, admittedly, strange and deserving of wonder, but they are popular simply because they are so popular.

We, a species of mammals with our own wonderful evolutionary history, have turned dinosaurs into unbearable exhibitionists with large numbers of popular science headlines. It's time we learned to appreciate our relatives. Anyone for mammal-mania?

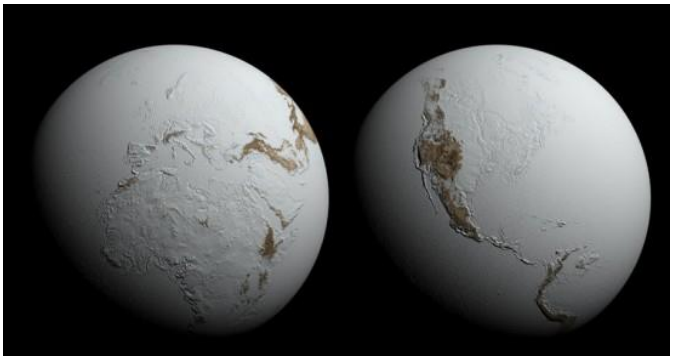
***Pakicetus*, an Eocene mammal and the oldest member of the whale family**

***Moeritherium*, an Eocene relative of elephants and manatees**

While we are on the topic of dinosaurs, a new study suggests that our perennially popular reptile friends probably evolved more rapidly than scientists had previously thought. According to the study, dinosaurs emerged less than 5 million years after the so-called "pre-dinosaurs", shaving about 10 million years off the previously accepted evolutionary timeline.

Scientists have shed new light on the earthquake that devastated Nepal in April 2015, killing more than 8,000 people. They used the latest satellite technology to measure land height changes across the entire eastern half of Nepal. The highest Himalayan peaks in that dropped by up to 24 inches in the first seconds of the earthquake. Mt. Everest was too far away to be affected.

At the end of the Precambrian, around 720 to 640 ma, large areas of the Earth's surface were covered in ice during a glacial period that lasted tens of millions of years, a time often referred to as “Snowball Earth”. Although the evidence for this is well established, some aspects of the extreme glaciation remain uncertain.



Artist’s conception of “Snowball Earth” near the end of the Precambrian

It is a common conception that the breakup of the supercontinent Rodinia at that time caused increased river discharge into the ocean, which changed ocean chemistry and reduced atmospheric CO_2. This had the effect of increasing global ice coverage and Earth lapsed into severe icehouse conditions. As the land surface became covered in ice, continental weathering basically stopped, locking the planet into the “Snowball Earth” state until CO_2 increased enough to warm the atmosphere so that the ice could melt.

But where did the increase in CO_2 come from? From volcanic activity. Apparently, this was also a period of explosive underwater volcanoes. Many geological and geochemical phenomena associated with “Snowball Earth” are consistent with extensive submarine volcanism along shallow mid-ocean ridges.

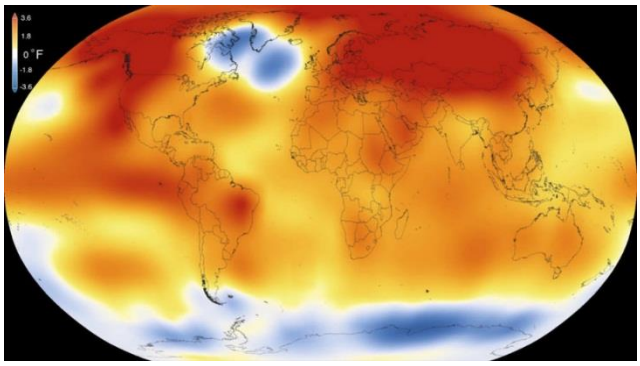
Another aspect of “Snowball Earth” is the existence of hundreds-of-feet-thick deposits of “cap carbonates”, continuous layers of limestone and/or dolostone that sharply overlie Precambrian glacial deposits and sub-glacial erosion surfaces where the glacial deposits are absent. According to researchers at the University of Southampton in England, while Rodinia was breaking up, thousands of miles of mid-ocean ridge formed over tens of millions of years. The lava erupted explosively in shallow waters producing large volumes of hyaloclastite, a glassy pyroclastic rock.

When volcanic material is deposited in the oceans, it is rapidly altered chemically, which impacts the biogeochemistry of the oceans. As hyaloclastite piled up on the sea floor, rapid chemical changes released massive amounts of calcium, magnesium, and phosphorus into the ocean. Over time, the calcium and magnesium deposits became limestones and dolostones, while the phosphorus may have acted as a catalyst for the origin of complex animal life on Earth.

Photo of a dolomite “cap carbonate” overlying a glacial deposit in Namibia

According to independent analyses issued by both the National Oceanic and Atmospheric Administration (NOAA) and NASA's Goddard Institute for Space Studies in New York (GISTEMP), Earth's 2015 surface temperatures were the warmest since modern record keeping began in 1880.

Globally-averaged temperatures increased over 2014 by 0.23ºF (0.13ºC), continuing a long-term warming trend. It should be pointed out that, because weather station locations and measurements change over time, there is some uncertainty in the individual values in the GISTEMP index. Because of this uncertainty, NASA's estimates indicate that there is a 94% certainty that 2015 was the warmest year on record.



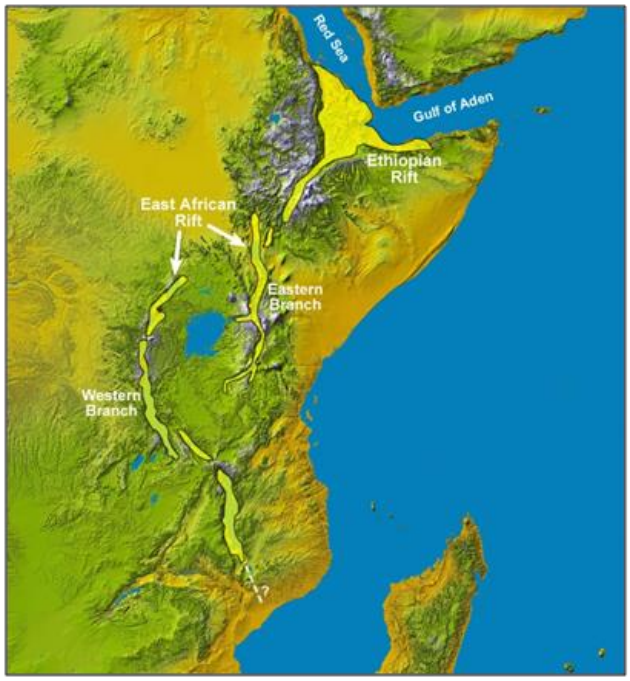
According to NASA and NOAA, 2015 was the warmest year on record since 1880

NASA's analyses incorporate surface temperature measurements from 6,300 weather stations, ship- and buoy-based observations of sea surface temperatures, and temperature measurements from Antarctic research stations. Then the climatologists use an algorithm to analyze the raw measurements that considers the varied spacing of temperature stations around the globe and urban heating effects that could skew the conclusions if left unaccounted for. The result of these calculations is an estimate of the global average temperature difference from a baseline period of 1951 to 1980.

NOAA's scientists used much of the same raw temperature data, but a different baseline period and different methods to analyze Earth's polar regions and global temperatures. Earth's average surface temperature has risen about 1.8ºF (1.0ºC) since the late-1800s. Most of the warming occurred in the last 35 years, with 15 of the 16 warmest years on record occurring since 2001. 2015 was the first time the global average temperatures were 1.8ºF or more above the 1880-1899 average. It was also a year in which a warming El Niño was in effect for most of the year.

Scientists think that CO_2 from Earth's interior is released into the atmosphere through degassing from active volcanoes, but it can also escape along faults away from active volcanic centers. Tectonic degassing such as this is poorly constrained, and until recently had been largely unmeasured. Most people believe that natural carbon emissions come mostly from active volcanoes.

Now, scientists at the University of New Mexico, in an attempt to quantify magmatic CO_2 from non-volcanic and continental rift regions, conducted research to study carbon emissions through fault systems in the East African Rift (EAR) by measuring diffuse CO_2 flux from the Magadi-Natron basin between Kenya and Tanzania. The EAR is the world's largest active continental rift system. Large volumes of CO_2 are emitted by active volcanoes and significant amounts are stored in large anoxic lakes in this region.



The East African Rift System

Gas samples collected along fault zones in the Magadi-Natron basin indicated an elevated CO_2 flux, providing evidence that faults act as permeable pathways for at least 10% of all the escaping deep-sourced CO_2 in the entire Natron-Magadi region. When the scientists compared gas data from all samples with data from a local active volcano, they found the carbon isotope compositions indicate a strong magmatic contribution to the fault-related CO_2. They also found that: (1) about 4.5 megatons of mantle-derived CO_2 is released in the basin annually; and (2) seismicity detected 10 to 20 miles deep during the research suggests that extensional faults in the basin might penetrate the lower crust. The ultimate source of the CO_2, therefore, is the lower crust or the mantle, consistent with carbon isotopes in the gas.

Extrapolating the measurements to the entire Eastern branch of the rift system implies a CO_2 flux of almost 80 megatons per year, which is comparable to CO_2 emissions from the entire global mid-ocean ridge system, <60 to >105 megatons per year. The implications are interesting. For example, widespread continental rifting and super-continent breakup could produce massive, long-term CO_2 emissions like those at the end of the Precambrian, and contribute to prolonged greenhouse conditions like those at the end of the Cretaceous. But, by comparison, these numbers are dwarfed by emissions from fossil fuel use – as much as 36 gigatons in 2013.

Primeval diamonds from Witwatersrand, South Africa, suggest that the early Earth may have had a recycling mechanism similar to modern-style plate tectonics. Geologists from the University of the Witwatersrand in South Africa analyzed nitrogen isotopes in diamonds from some of the oldest rocks on Earth (3.1 billion years). The researchers found that up to 3 percent of the nitrogen in the diamonds was nitrogen-15 rather than the more common isotope, nitrogen-14.

That ratio is much higher than the typical nitrogen isotopic composition of the mantle, and instead resembles the nitrogen isotopic ratio of both ancient and modern crust. This suggests that sometime prior to 3.5 billion years ago, crust from the surface had somehow made its way down deep into the mantle, where the diamonds formed.

While the results clearly show that crust was being recycled during the Earth's early years, plate tectonics aren't the only possible explanation. Dripping or sagging of the Earth’s weak early crust could also have been responsible for recycling the nitrogen that ended up in these ancient diamonds.

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PGS Website of the Month

https://www.nasa.gov/multimedia/imagegallery/iotd.html

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Memberships: For information about memberships, please write PGS Membership Chair, PO Box 58172, Pittsburgh PA 15209, or e-mail jharper.pgs@gmail.com. Membership information may also be found at our website: www.pittsburghgeologicalsociety.org.

Programs: If you would like to make a presentation at a PGS meeting or have a suggestion for a future speaker, contact Tamra Schiappa, Program Chair at tamra.schiappa@sru.edu.

PGS Website: To contact the Webmaster, Mary McGuire, with questions or suggestions, please either email marykmcguire@comcast.net or use the site's "Contact Us" link at www.pittsburghgeologicalsociety.org.

Facebook: Follow the PGS at https://www.facebook.com/PittsburghGeologicalSociety for breaking news, announcements and interesting geological facts.

News items: If you have news items you would like to have included in the PGS newsletter, please send them to Karen Rose Cercone at kcercone@iup.edu.

Fun Fact Having Nothing to Do with Geology

The first item to be scanned by a bar code reader was a 10-pack of Wrigley's Juicy Fruit chewing gum in 1974. The 67-cent pack of gum is displayed today at the Smithsonian Institute's National Museum of American History.