Draft Minutes for the 1593rd meeting of the Geological Society of Washington
October 25th, 2023
Video conference via Zoom

President Kori Newman called the meeting to order at 20:00 EDT.

Attendance
There were 47 attendees online.

Minutes
The meeting began with the approval of the minutes from the previous meeting (1592nd). The minutes of the 1592nd meeting had been posted online and a Minute's Minute was read aloud at the 1593rd meeting. One correction was noted, and the minutes were accepted as amended.

Guests and New Members
Two new members were announced: Mara Cox and Robert Blandford

No guests were introduced:

Announcements
One announcement was made about the upcoming GSW fall field trip to Richmond area on Nov 4, 2023

Obituaries
No obituaries were read.

Informal Communication
No informal communications were read.

Formal Program

The formal program commenced at 20:20 EDT and consisted of three speakers: Geoffrey S. Ellis, USGS Denver; Jack Conrad, Nasa Marshall Space Flight Center; Kathryn Watts, USGS Spokane.

Geoff Ellis presented "Geologic hydrogen: an overlooked potential primary clean energy resource."

Although natural hydrogen in the subsurface of the Earth is well documented in a variety of geologic environments, economic accumulations of natural hydrogen have generally been assumed to be non-existent. Recent discoveries in Africa and elsewhere have challenged this notion, and there is a growing acknowledgement that geoscientists have not looked for natural hydrogen in the right places with the right tools. Model predictions based on the known behavior of hydrogen in the subsurface and geologic analogues indicate a global resource potential in the millions of megatonnes (Mt), a fraction of which could meet projected demand for hydrogen for hundreds of years. While much is known about the occurrence of subsurface hydrogen (e.g., generation mechanisms, consumptive processes, etc.), there is currently a lack of understanding of the processes and settings that are most conducive to the formation of significant accumulations of hydrogen. To develop effective strategies for exploration and assessment of geologic hydrogen resources, a comprehensive framework is required that could lead to the discovery of economic hydrogen accumulations.

The U.S. Geological Survey has developed a "hydrogen system" model for understanding the potential generation of economic accumulations of geologic hydrogen based on the "petroleum systems" concept. The essential components that make up the models (e.g., source, migration pathway, reservoir, seals, etc.)

are the same but the details of each of the components vary and may not be directly comparable. Given our nascent understanding of geologic hydrogen, many components of the hydrogen system are highly uncertain. However, the uncertainty associated with each of the essential components of the hydrogen system can be estimated and used to assign risk. This presentation discussed what is known about the potential for natural hydrogen resources, the geologic model for natural hydrogen accumulation that has been developed, and the major gaps in our current understanding. Additionally, details of ongoing efforts to map hydrogen prospectivity across the US and plans for further research to refine the hydrogen system model, improve geologic hydrogen prospectivity mapping capabilities, and reduce the associated uncertainty (i.e., risk) were presented.

Talk length: 20 minutes.
Questions were asked by: Maryann Malinconico, Lafayette College; John Christoph NAS, Bill Burton, USGS emeritus; Jamie Allen, NSF

Jack Conrad presented "Sampling geologic properties of Mars' crust with secondary crater clusters."

When a meteorite impacts into a planetary surface, most of the material thrown out through the force of the impact rains back down and generates many thousands to millions of other impact craters. Those secondary craters, while an annoyance for those who count craters to determine surface ages, present an opportunity to directly measure crustal property differences of bordering geologic units. Statistics of secondary crater clusters that cross geologic units allow us to collapse crater scaling equations to depend on just the differences in crustal properties like strength and porosity. We have applied this technique to a few areas on Mars, but the sharpest contrast we measured was at the boundary between a geologically young volcanic plain and the landslide deposits of Olympus Mons. A cluster of secondaries show an average diameter difference of ~1.5:1 with the smaller craters in the landslide deposit. This points towards comparatively higher porosity in the landslide with a minimum porosity of ~40% in the upper hundred meters. Finding more locations to apply this technique could help solve the missing middle problem of Mars and other inner solar system worlds.

Talk length: 20 minutes.
Questions were asked by: Bill Burton, USGS emeritus; Victor Zabielski, NVCC; Graham Lederer, USGS; Mark Tyra, NIST

Kathryn Watts, USGS Spokane presented "Mining the science of the Nation's rare earth element deposit at Mountain Pass, CA."

For over fifty years, the Mountain Pass rare earth element deposit has been at the forefront of technological revolutions. From color television sets to cell phones, to permanent magnets, rare earth elements (lanthanides) have filled essential applications that cannot be replicated by other parts of the periodic table. Given their importance to the Nation's economy and vulnerability to supply disruption, the rare earth elements constitute about a third of the USGS 2022 Final List of Critical Minerals (Federal Register notice 87 FR 10381). USGS science on the Mountain Pass deposit dates back to its discovery in the Mojave Desert in 1949. Economic rare earth element mineralization is hosted in a carbonatite stock associated with a belt of ~1.4 Ga alkaline silicate intrusions in southeastern California. Bastnäsite, a light rare earth element-bearing fluorocarbonate mineral, $LREE(CO_3)F$, is the dominant ore mineral. Integrated USGS research on the geology, geophysics, geochronology, petrology, and economic geology of the Mountain Pass deposit is yielding new insights into its formation and geologic context.

Talk length: 20 minutes.
Questions were asked by: Larry Meinert, USGS retired; Bill Burton, USGS; Jamie Allen, NSF; Dalton McCaffrey, USGS

President Newman adjourned the meeting at 22:02 EDT.

Respectfully submitted,

Graham Lederer