Hydrogen, a natural energy resource

Karrie A. Weber

Professor and Director of Microbiology

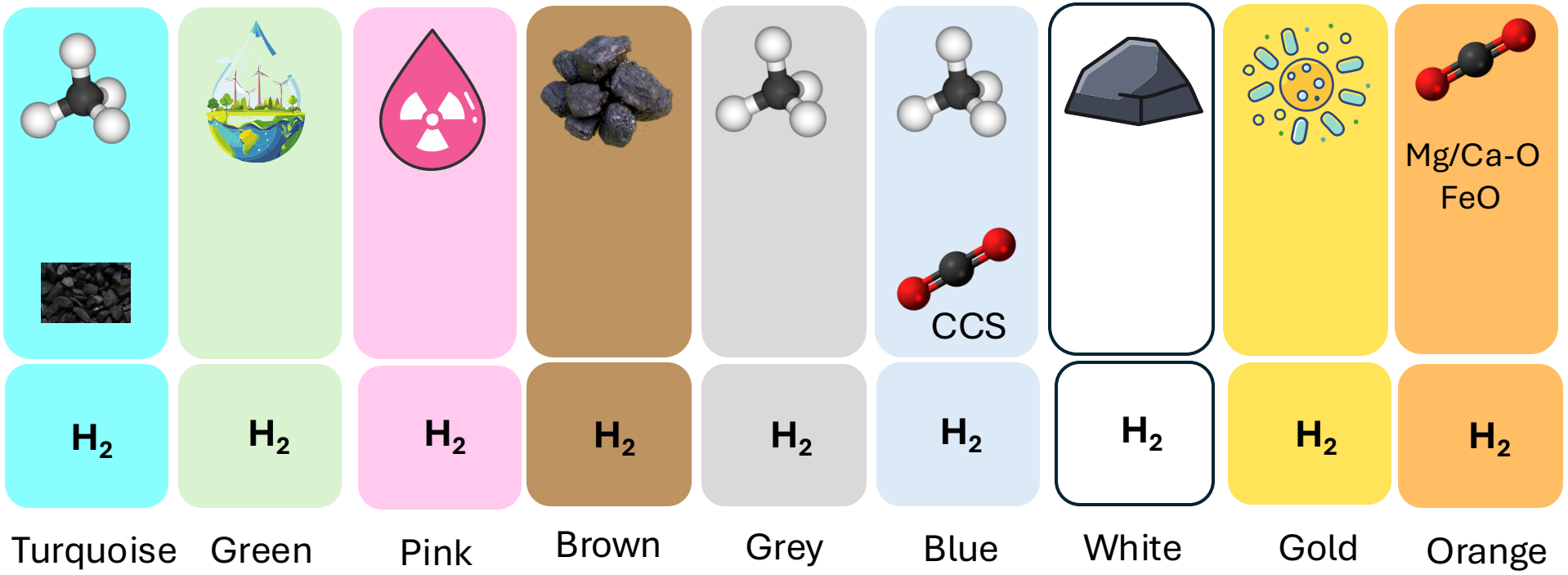
School of Biological Sciences and Department of Earth and Atmospheric Sciences

Fellow, National Strategic Research Institute and Fellow, Daugherty Water for Food Institute

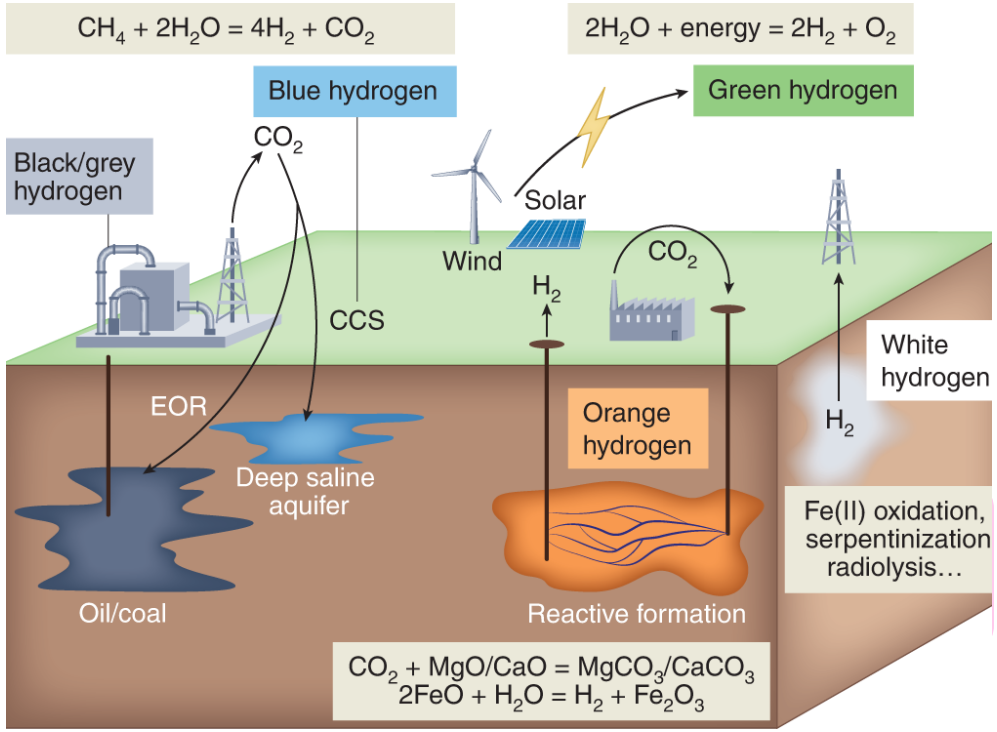
University of Nebraska-Lincoln

NASEO, February 6, 2025

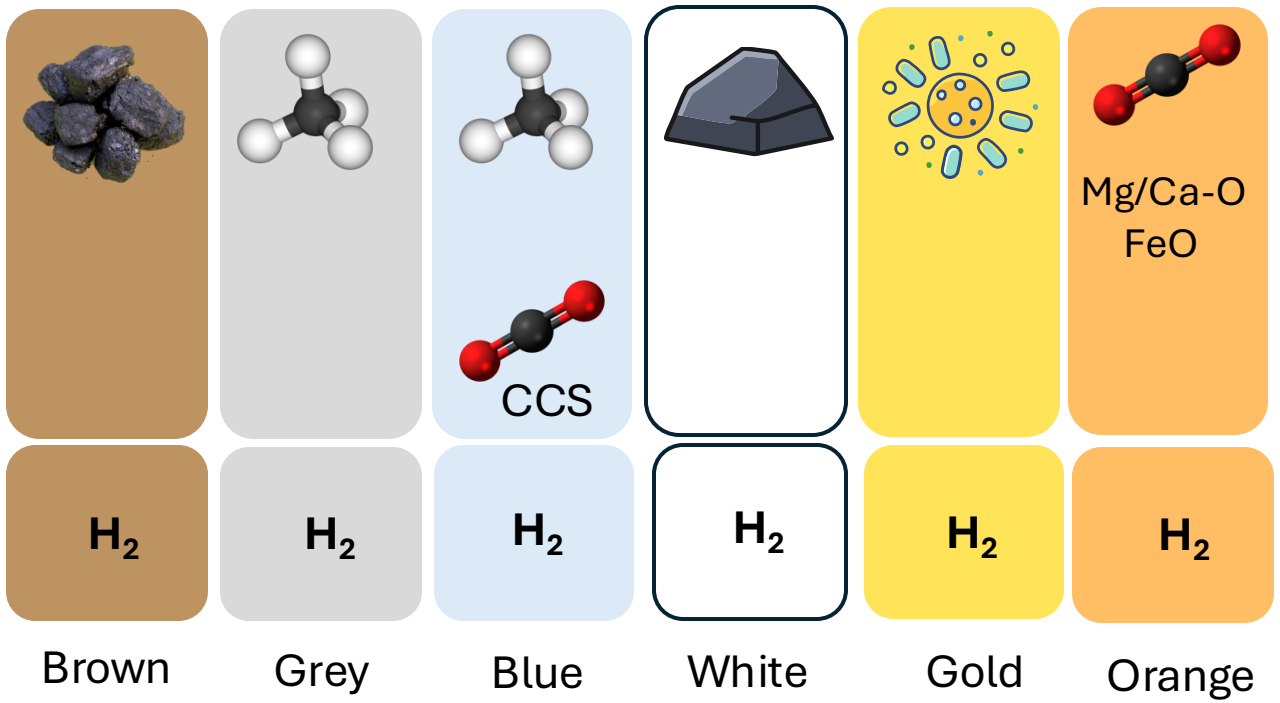
Sources of Hydrogen



Hydrogen in the Subsurface

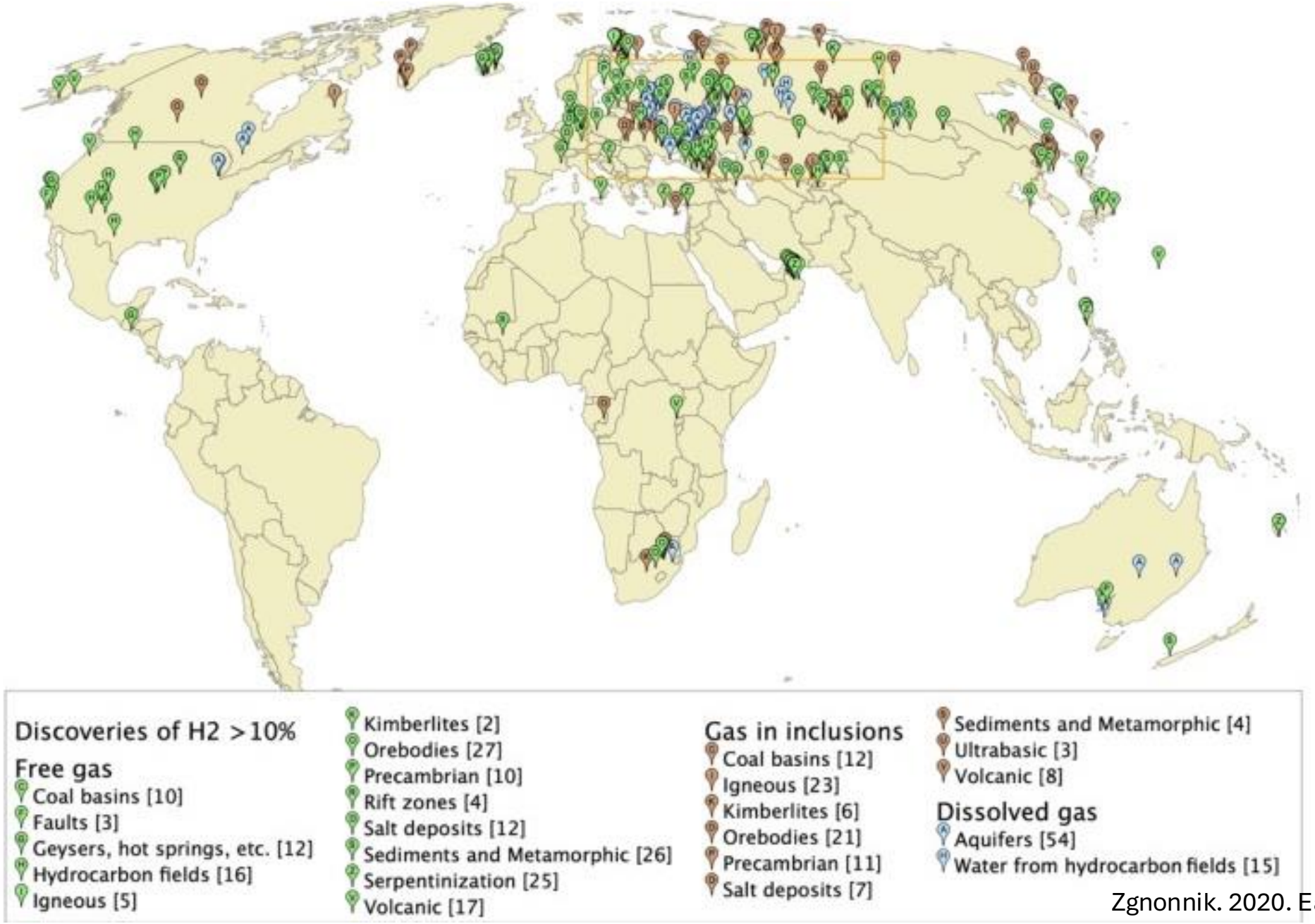


Osselin et al. 2022. Nature Geoscience



Hydrogen (H_2) is ubiquitous on Earth

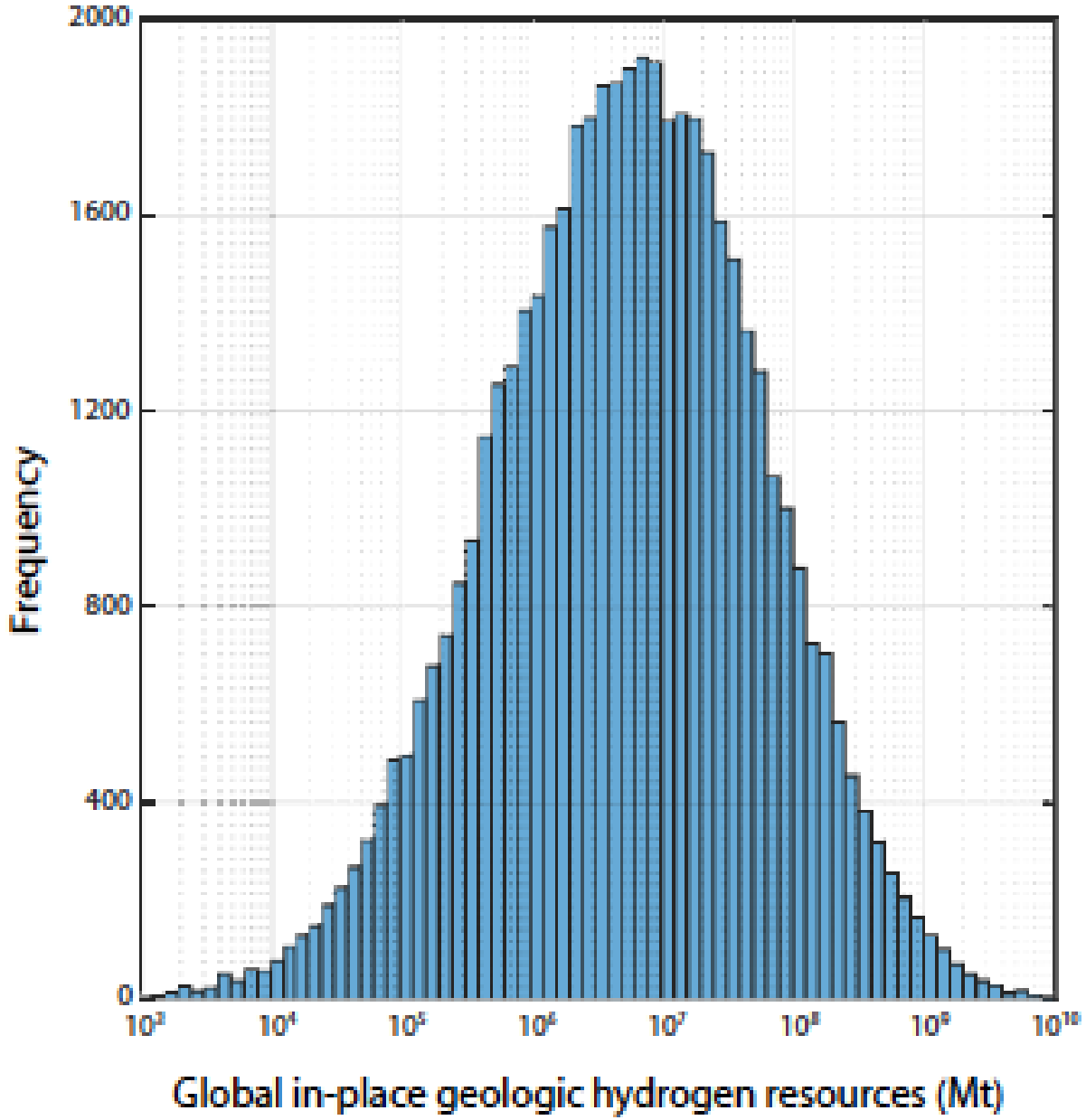
Hydrogen measured to exceed 10% of gas composition from various sources



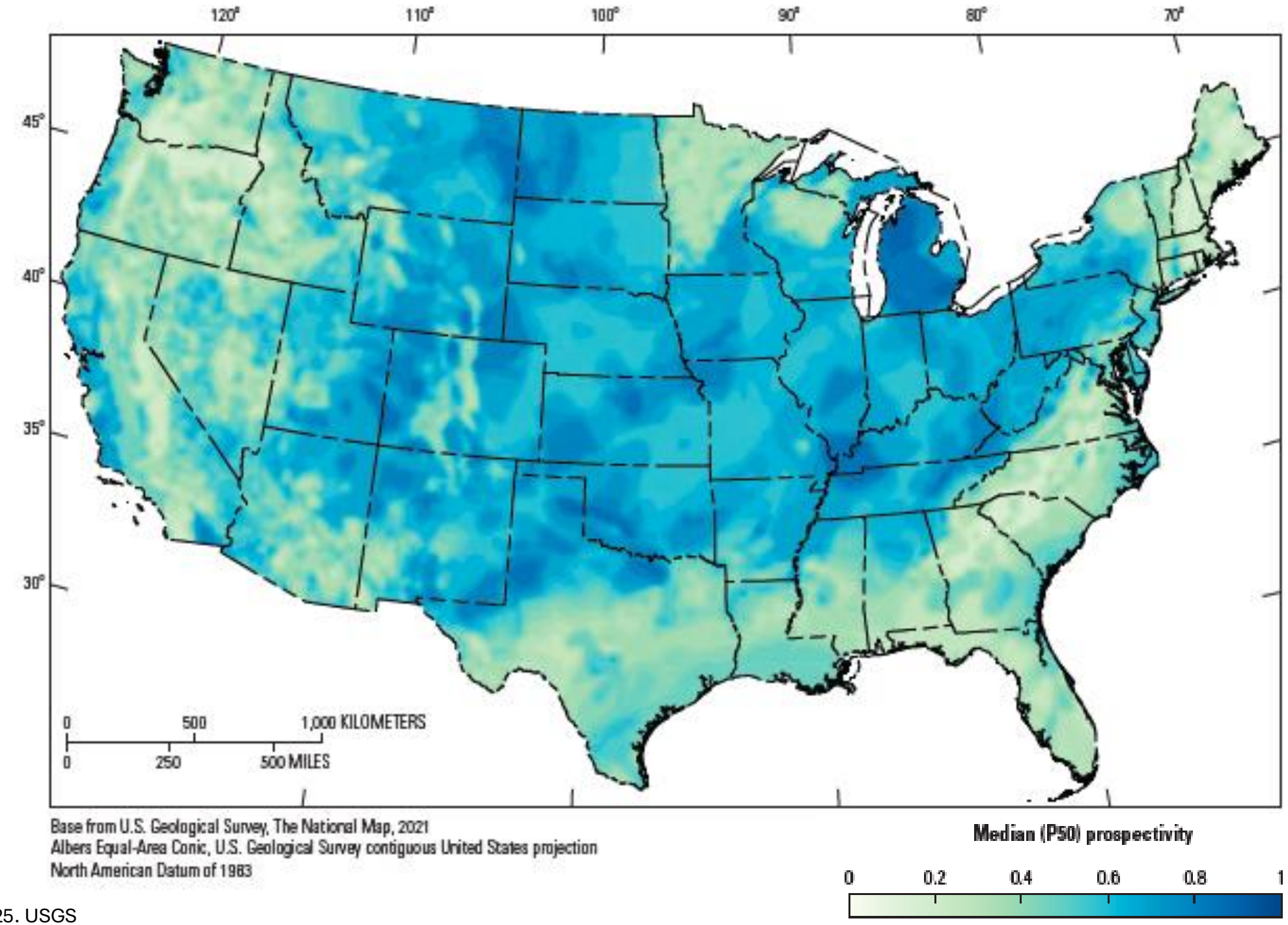
Zgnonnik. 2020. Earth-Science Rev.

Global annual demand of H_2 gas in 2050 = 500 Mt

Lowest estimates of geological H_2 exceed demand

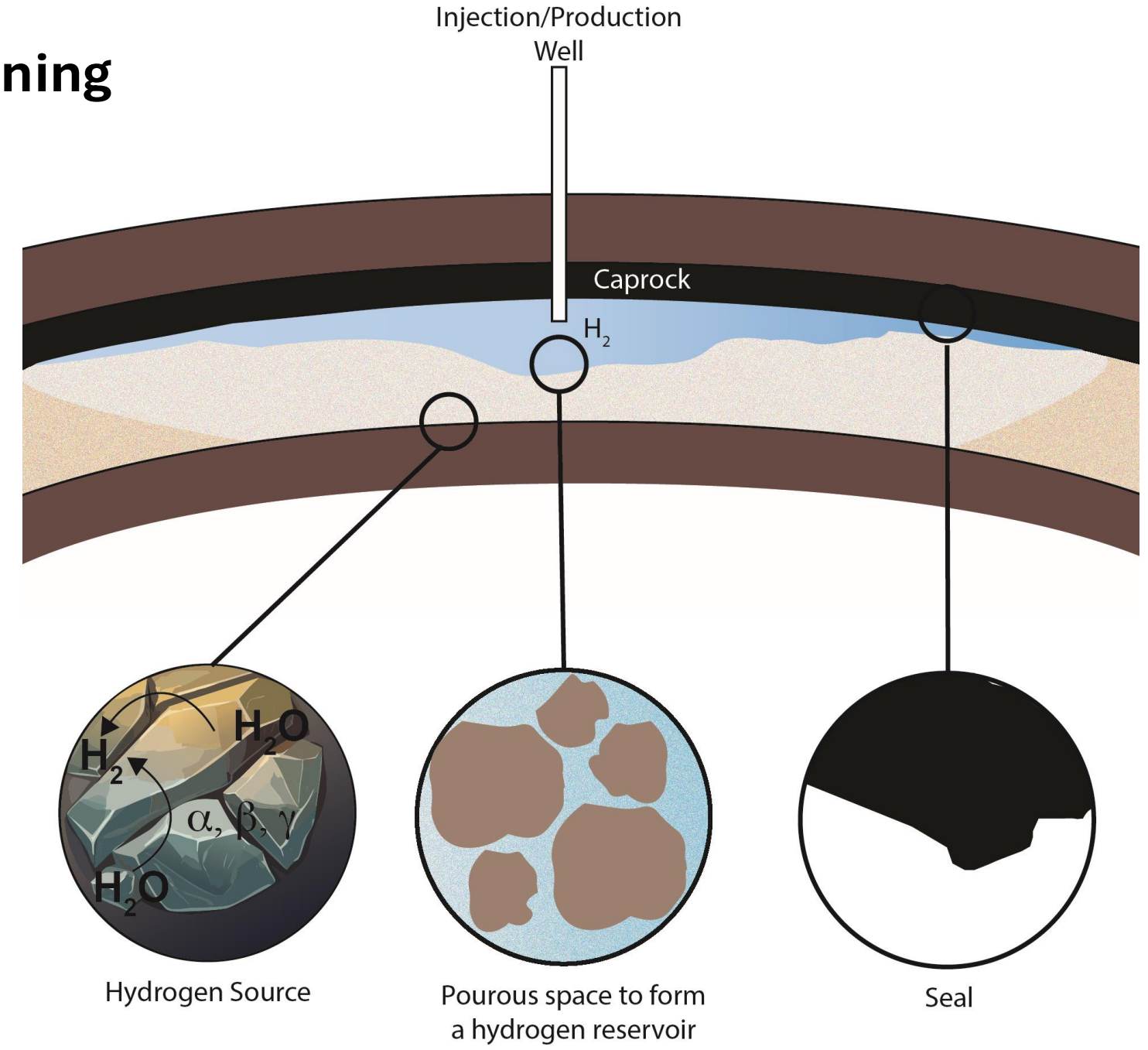


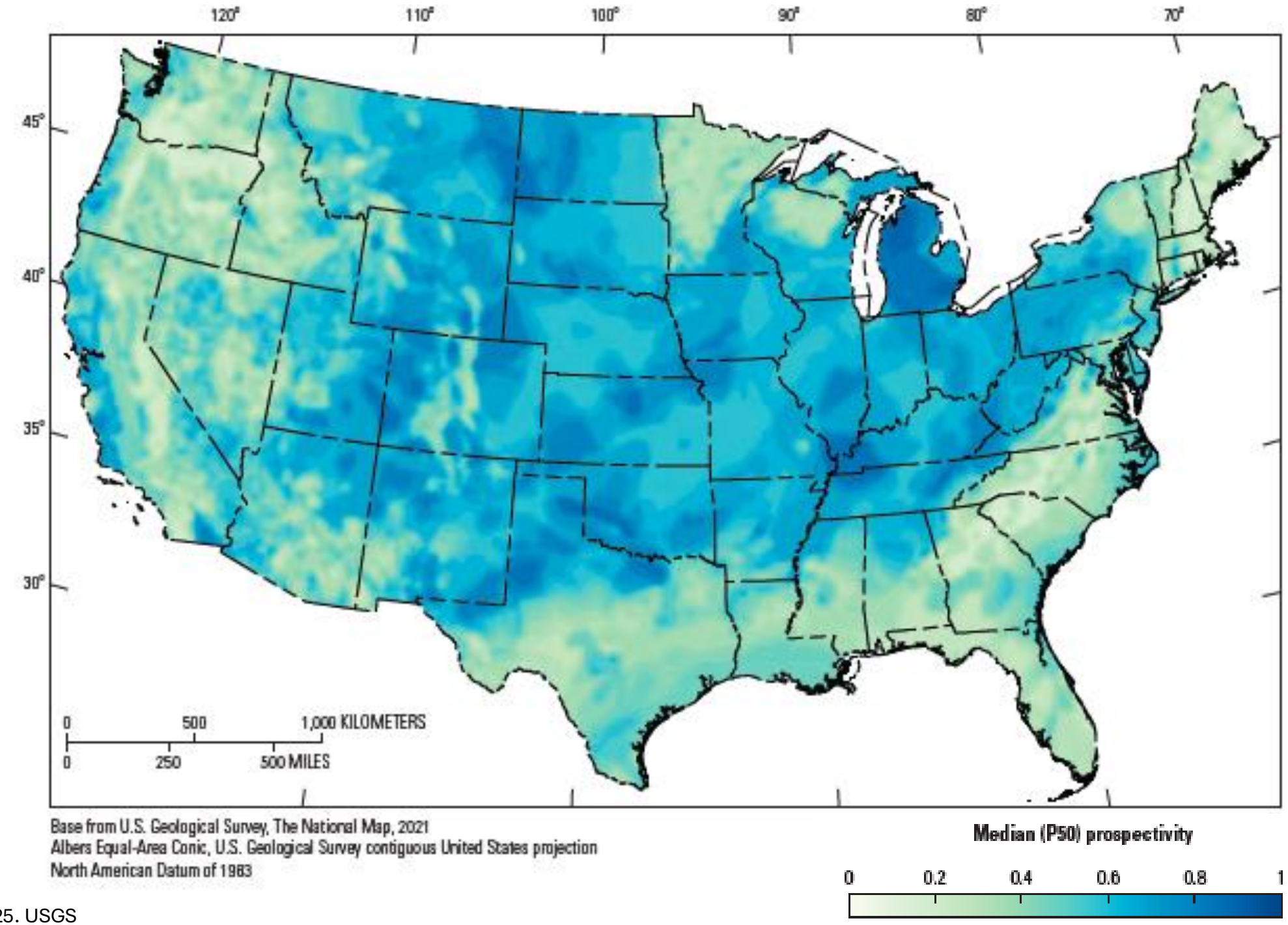
Ellis and Gelman 2024. Sci. Advances.



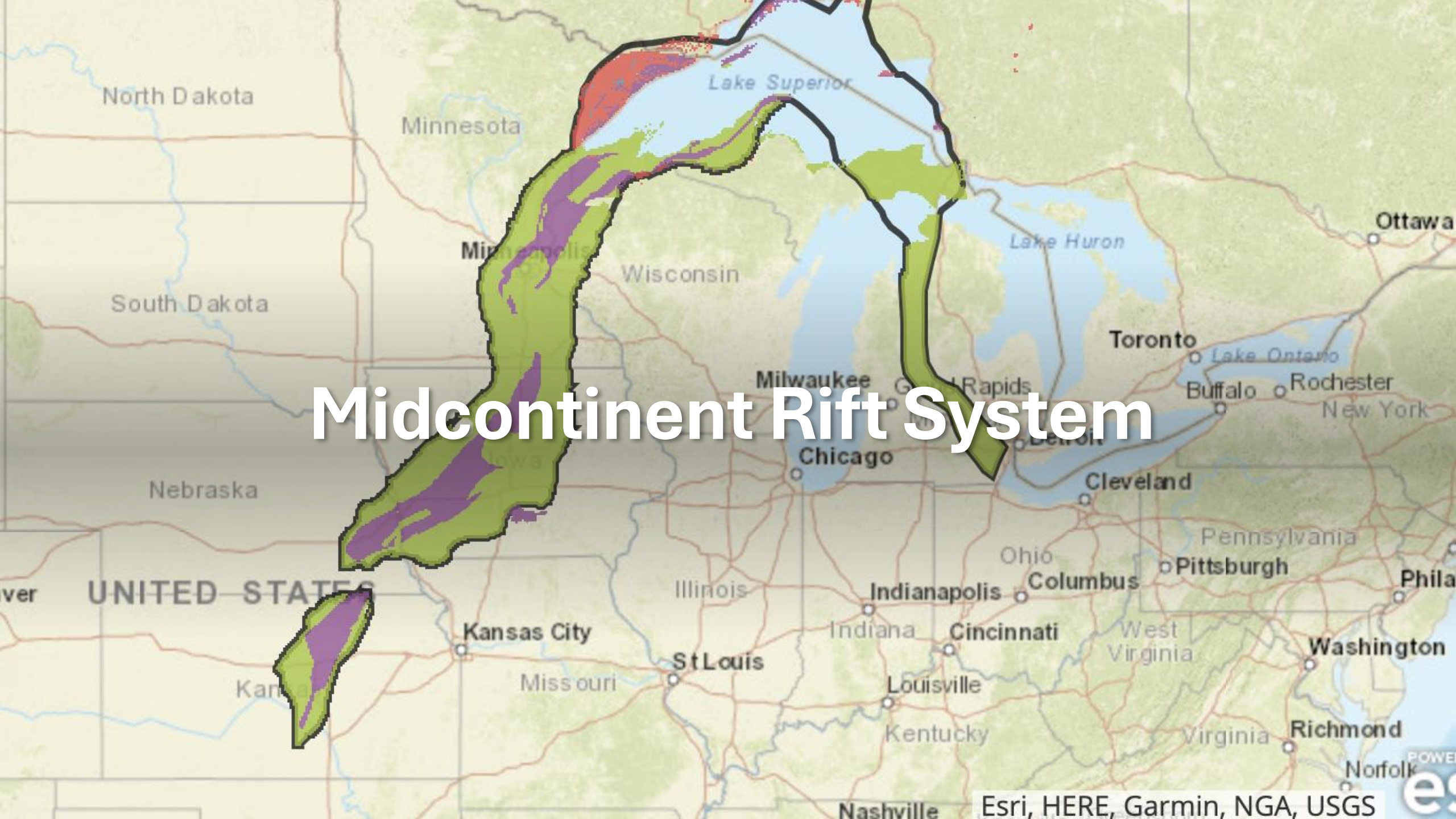
Gelman et al. 2025. USGS

Characteristics Underpinning Hydrogen Reservoirs

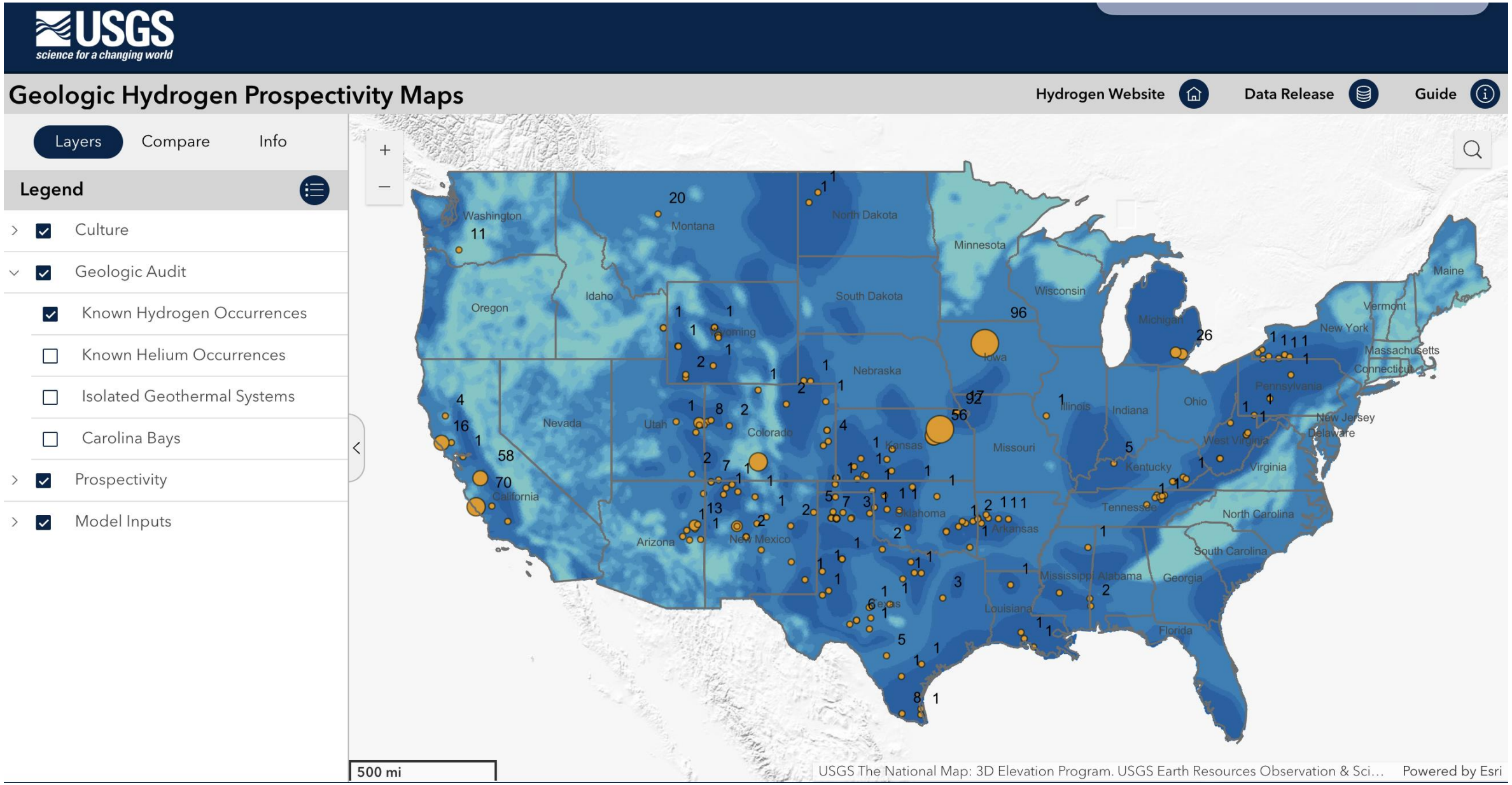


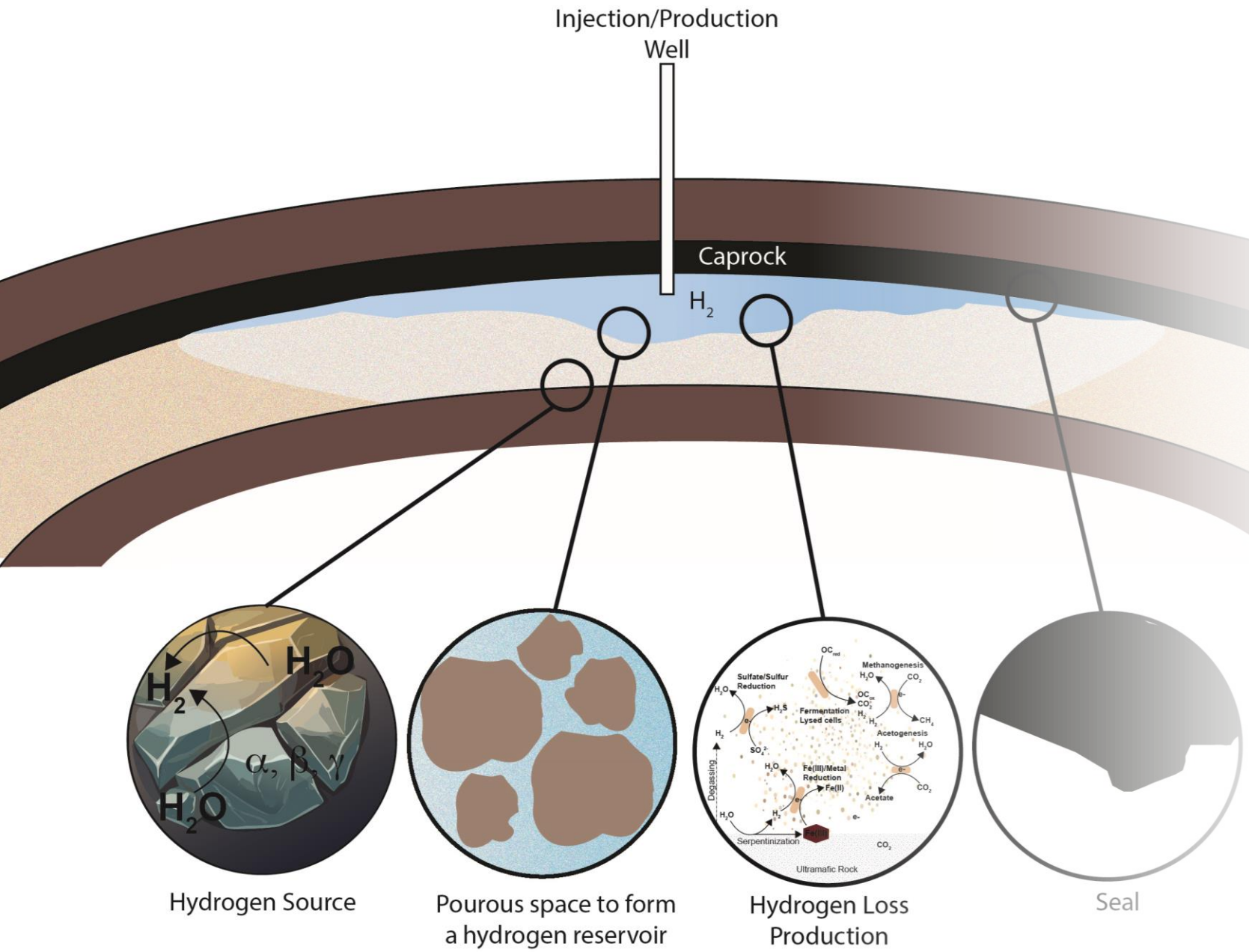


Gelman et al. 2025. USGS

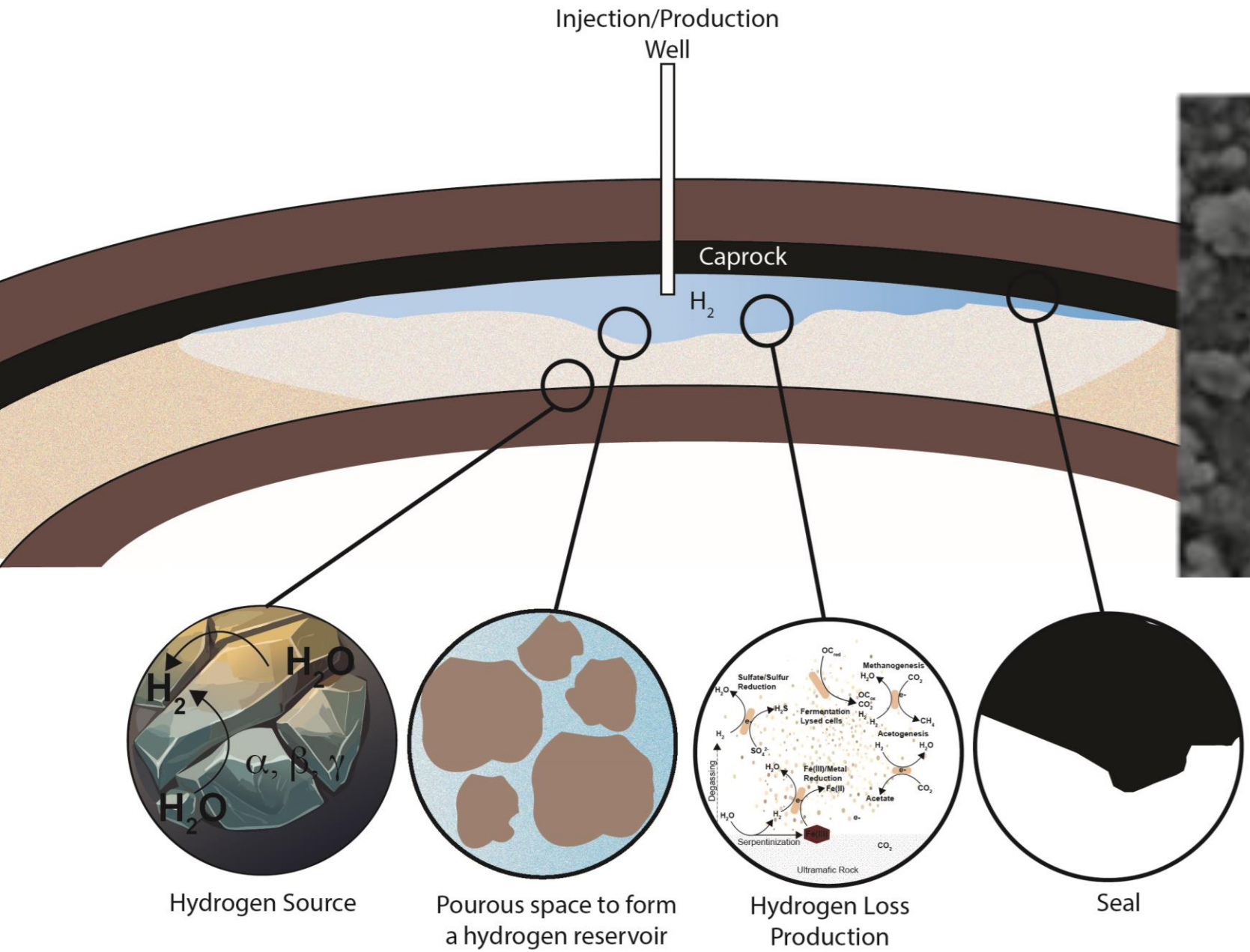

Midcontinent Rift System
North Dakota
Minnesota
Lake Superior
Lake Huron
Ottawa
Wisconsin
South Dakota
Toronto
Lake Ontario
Milwaukee
Rapids
Buffalo
Rochester
New York
Chicago
Cleveland
Nebraska
Pennsylvania
Ohio
Pittsburgh
Columbus
Illinois
Indianapolis
Kansas City
Indiana
Cincinnati
West Virginia
Washington
St Louis
Missouri
Louisville
Kentucky
Virginia
Richmond
Norfolk
Nashville
Esri, HERE, Garmin, NGA, USGS

Previously measured H_2 supports potential along the Midcontinent Rift





Subsurface Hydrogen Reservoirs—Production and Loss

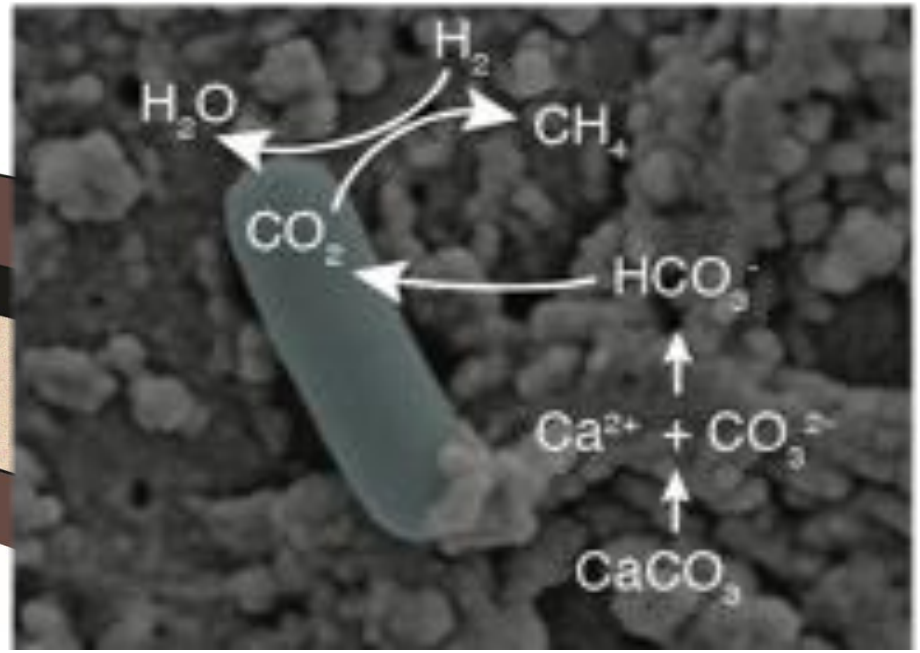


Hydrogen Source

Pourous space to form a hydrogen reservoir

Hydrogen Loss Production

Seal



Fiore et al., 2025. Comm Earth Environ.

Geological Hydrogen in the Subsurface

- Potential energy source across the US
- Natural hydrogen production midcontinent

Collaborators
Dr. Seunghee Kim, UNL, Civil and Environmental Engineering
Dr. Hyun Seob-Song, UNL, Biological Systems Engineering
Dr. Viacheslav Zgonnik, Hyreveal
Dr. Nicole Fiore, former UNL Ph.D. student

NEBRASKA CENTER FOR ENERGY SCIENCES RESEARCH
Nebraska Public Power District
Always there when you need us
NSF