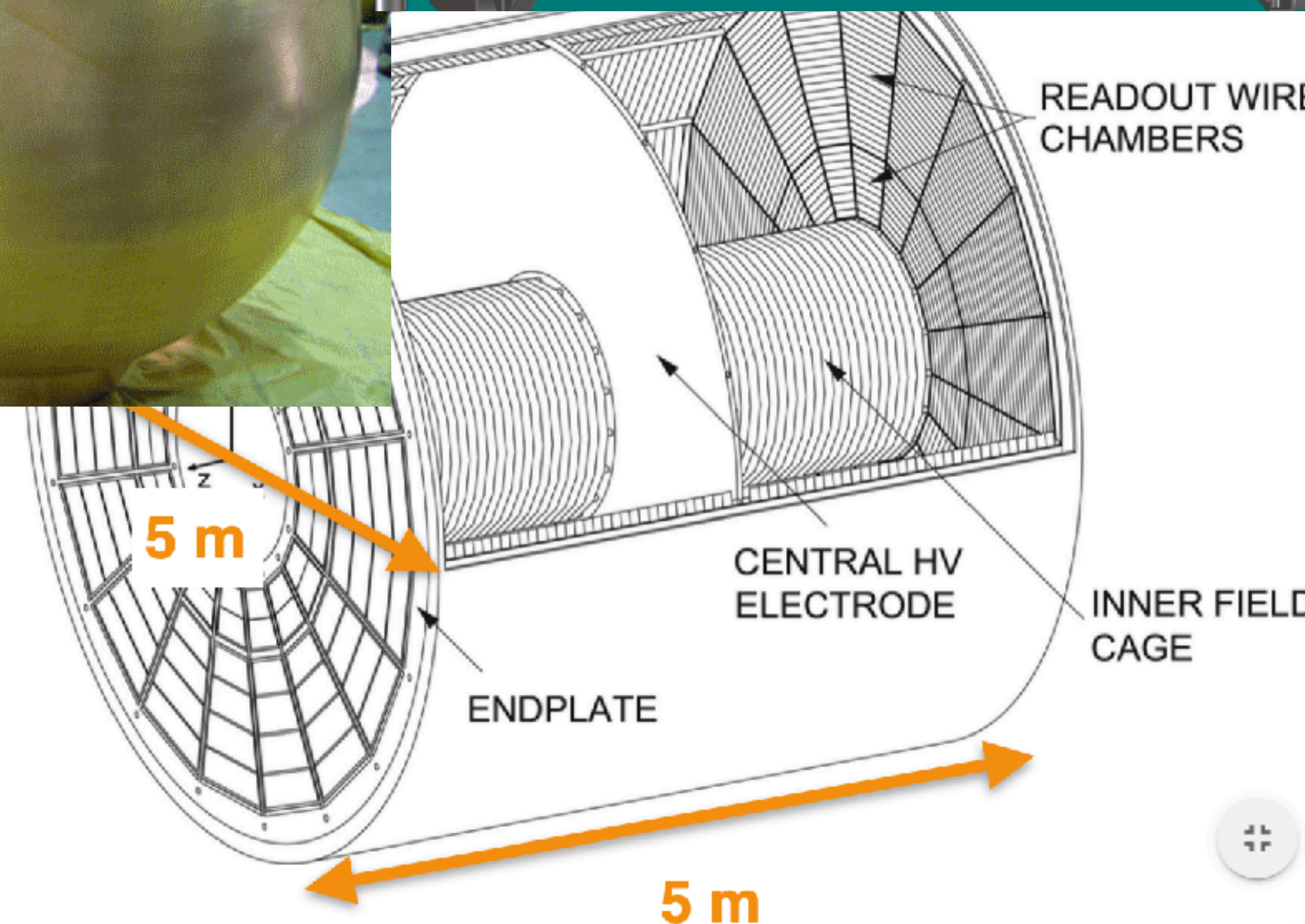
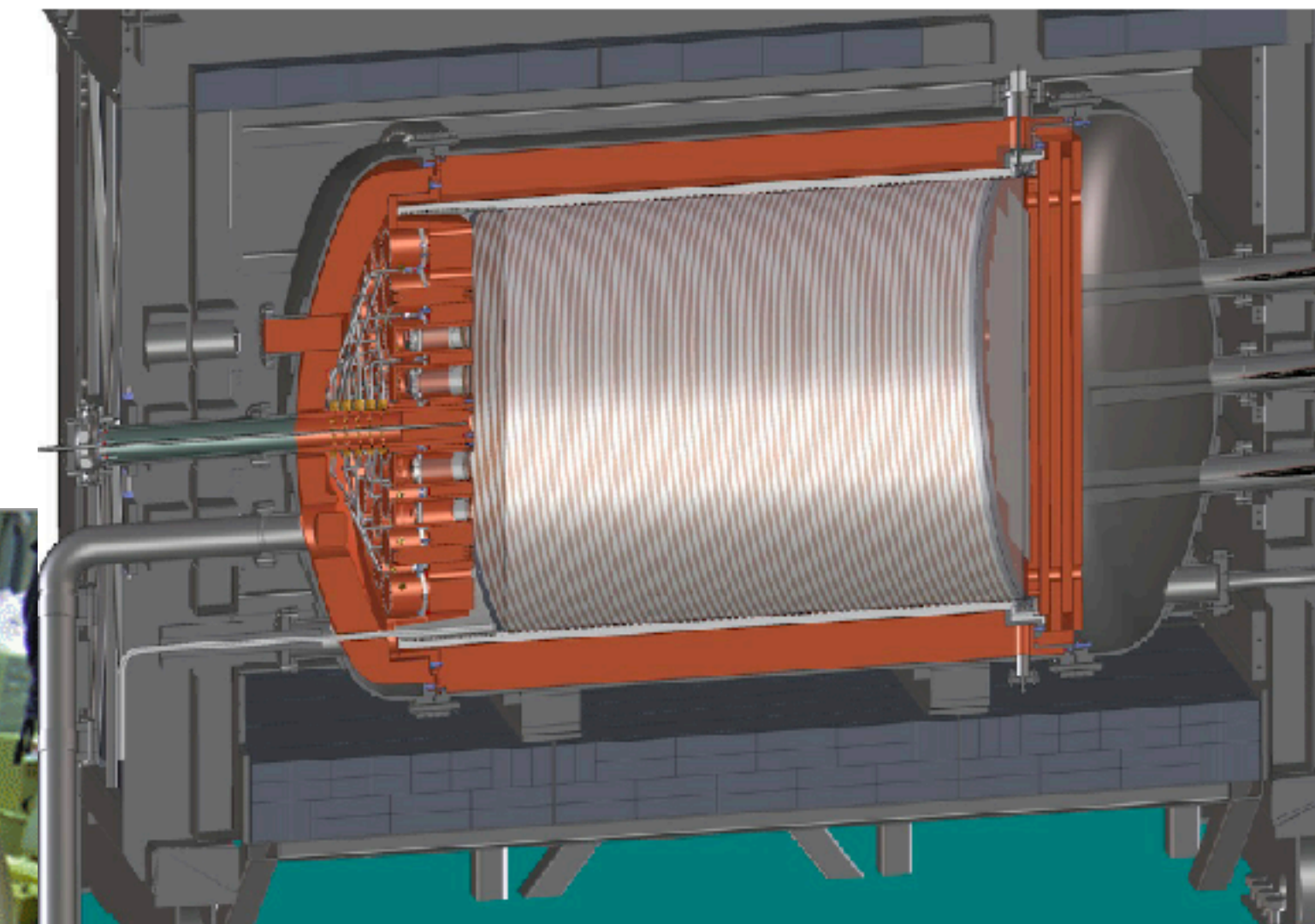


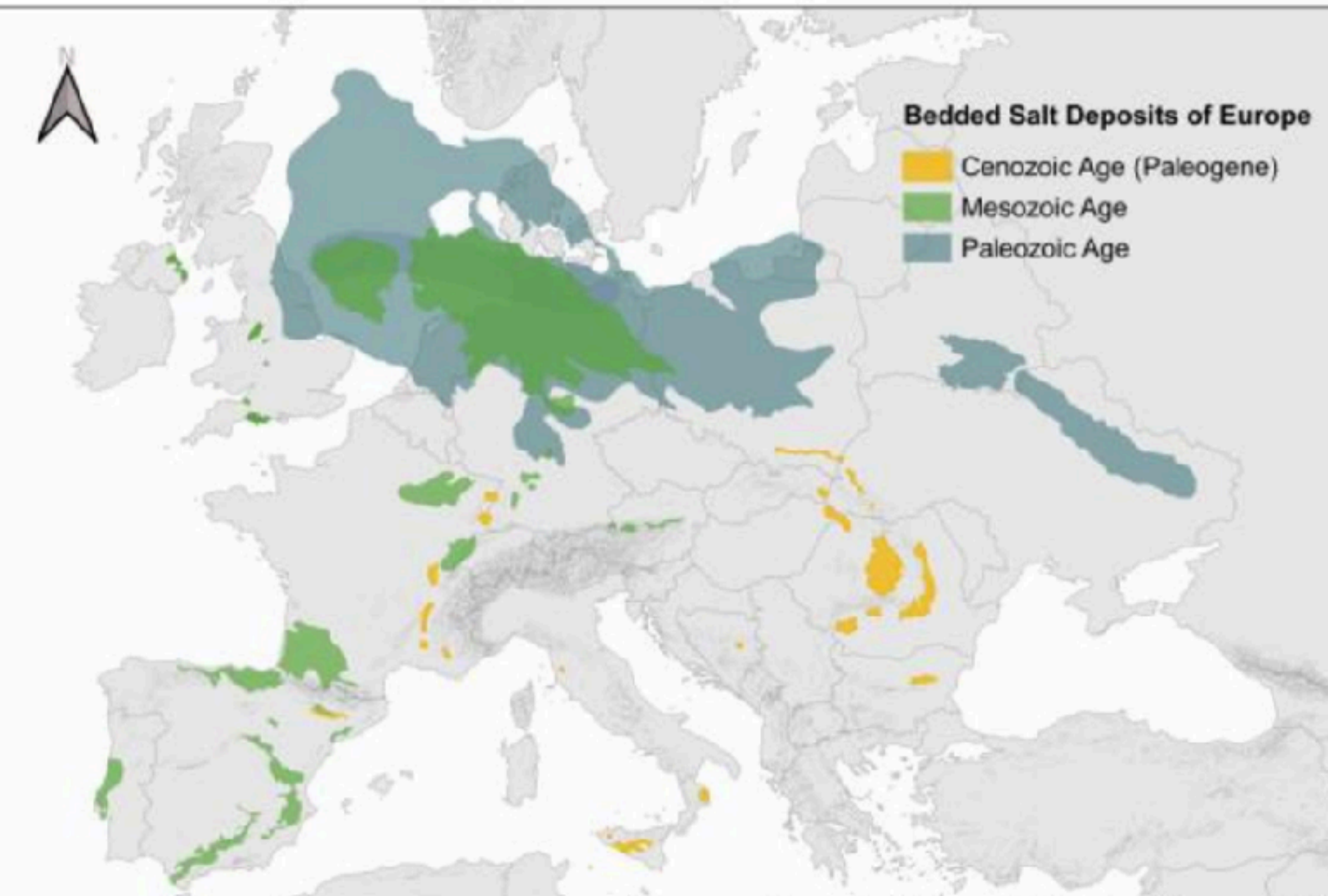
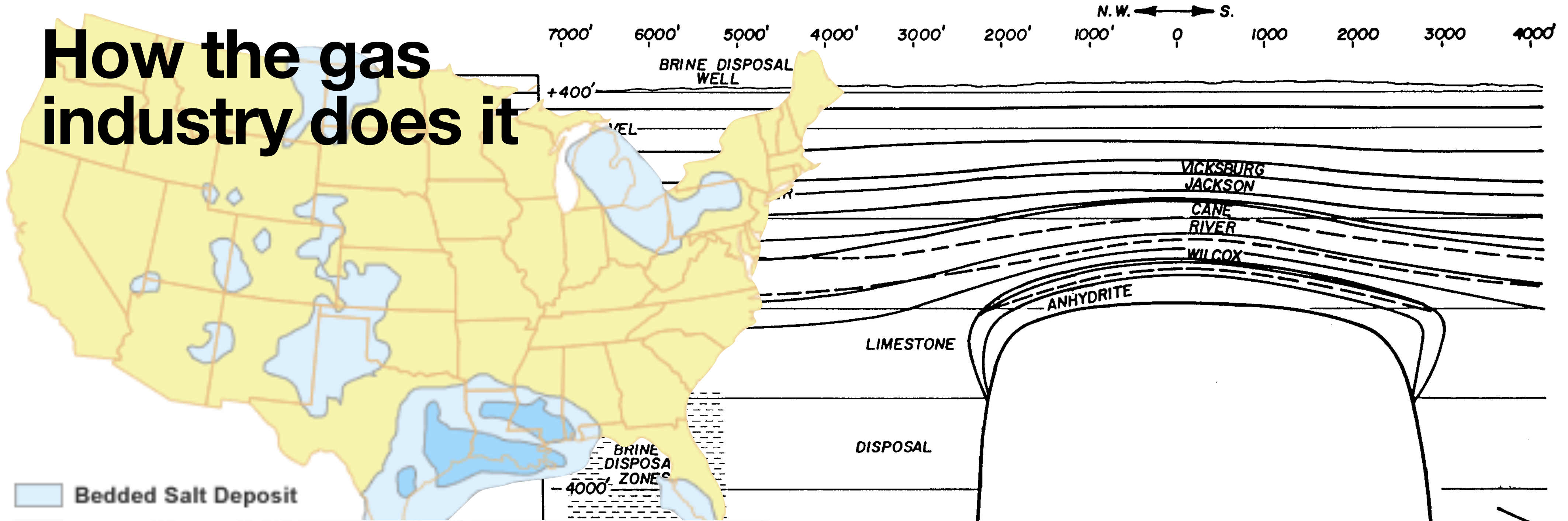
# Future giant gas TPCs in salt caverns

Ben Monreal, Case Western Reserve U

- High pressure gas is a superb detector medium
  - Long tracks
  - Fano factor  $< 1$
- BUT! We can't build pressure vessels big enough, not even for self-shielding
  - NEXT  $\rightarrow$  100 kg Xe at 10 bar
  - NEWS-G  $\rightarrow$   $< 1$  kg He at 10 bar
  - HPgTPC  $\rightarrow$  1t Ar at 10 bar
- If someone handed you a giant underground pressure vessel, you'd design a TPC to fit it



# How the gas industry does it



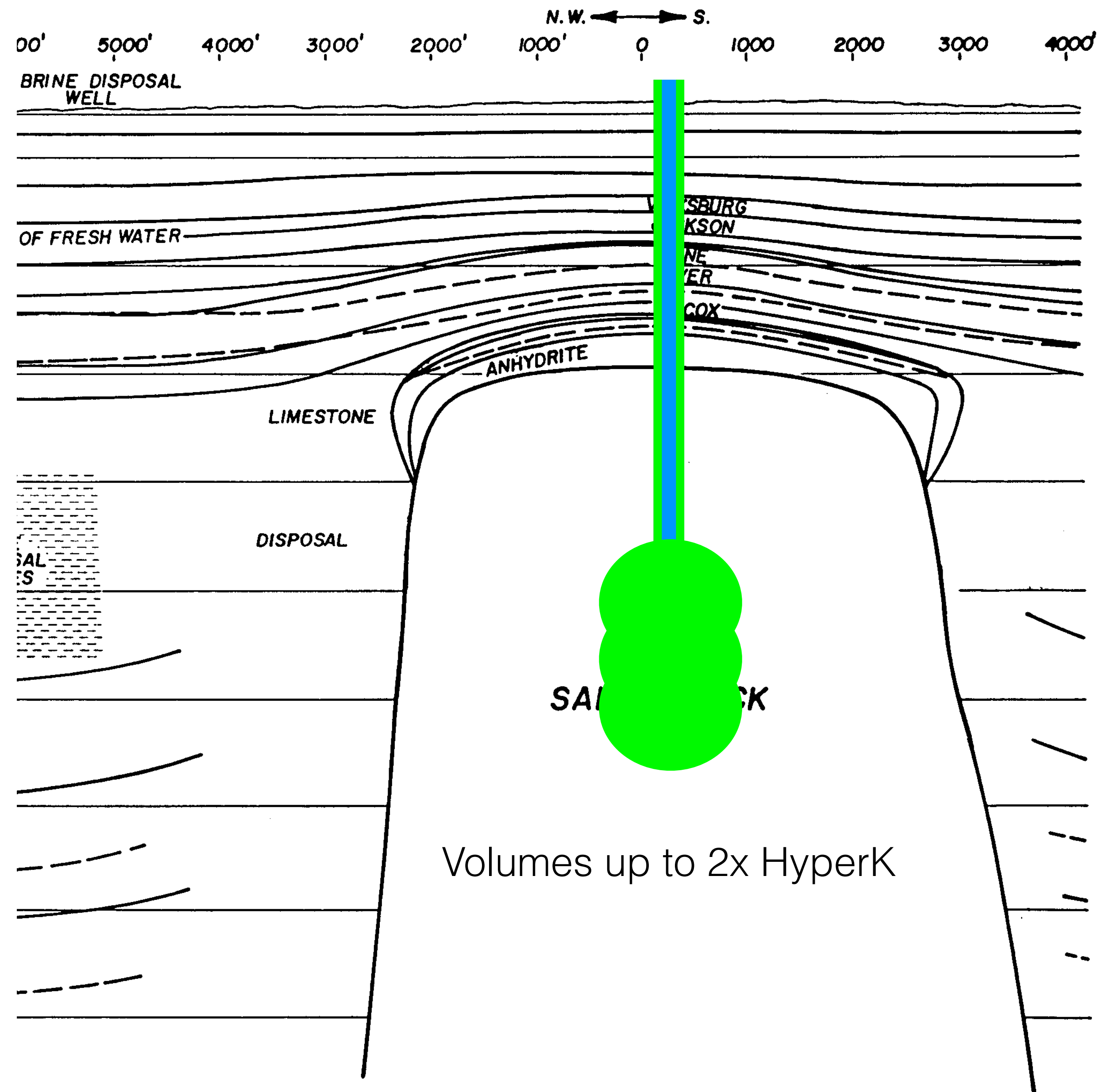
Coates et. al., Proc. 6th Intl Symp. on Salt, 1982  
nce Salt Dome (After Fenix & Scisson, 1980).

# How the gas industry does it

- "Solution mining"
  - Drill into a salt dome
  - Pump fresh water into well
  - Salt dissolves around injection site
  - Discard brine

DOE Strategic Petroleum Reserve is stored like this.  
(13Mm<sup>3</sup> mined at \$2/m<sup>3</sup>)

Also H<sub>2</sub>, natural gas,  
compressed air



Coates et. al., Proc. 6th Intl Symp. on Salt, 1982

Diagram of Eminence Salt Dome (After Fenix & Scisson, 1980).

Putting high-pressure gas in an already-pressurized cavern gets you huge target masses

contain with thin balloons rather than thick steel

(Plus as much veto/shielding space as you want!)

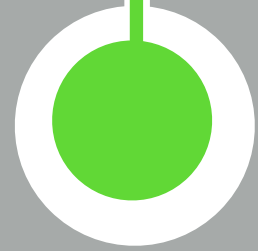
NEXT-100 pressure vessel for scale ---> ■

"proposed" Case Underground Salt Observatory

10m diameter  
500 m<sup>3</sup>

At 60 bar:

2 T H<sub>2</sub>  
5 T He  
30 T Ne  
50 T Ar  
300 T Xe --> DARWIN



SuperK tank for scale

39ø x 42m  
5x10<sup>4</sup> m<sup>3</sup>

A medium-scale cavern compatible with thick bedded salt

16ø x 90m

7x10<sup>4</sup> m<sup>3</sup>

At 100 bar:

500 T H<sub>2</sub>  
1 kT He  
6 kT Ne  
12 kT Ar  
70 kT Xe

plausible dimensions for a single cylindrical drift volume

The largest caverns in routine use are 80ø x 500m

Thats 2x10<sup>6</sup> m<sup>3</sup>

At 100 bar:

20 kT H<sub>2</sub>  
40 kT He  
200 kT Ne  
400 kT Ar  
2 MT Xe

I don't know *how* to instrument this but surely it's worth thinking about

# Is it possible to put a huge TPC down a well into a salt cavern?

I think so! See LOI references for my ideas! But your ideas may be better

But "one PI's side project" can only get so far :(

Seeking collaborators; lots of low-hanging fruit

DM/0vbb/accelerator/reactor/proton decay ...

