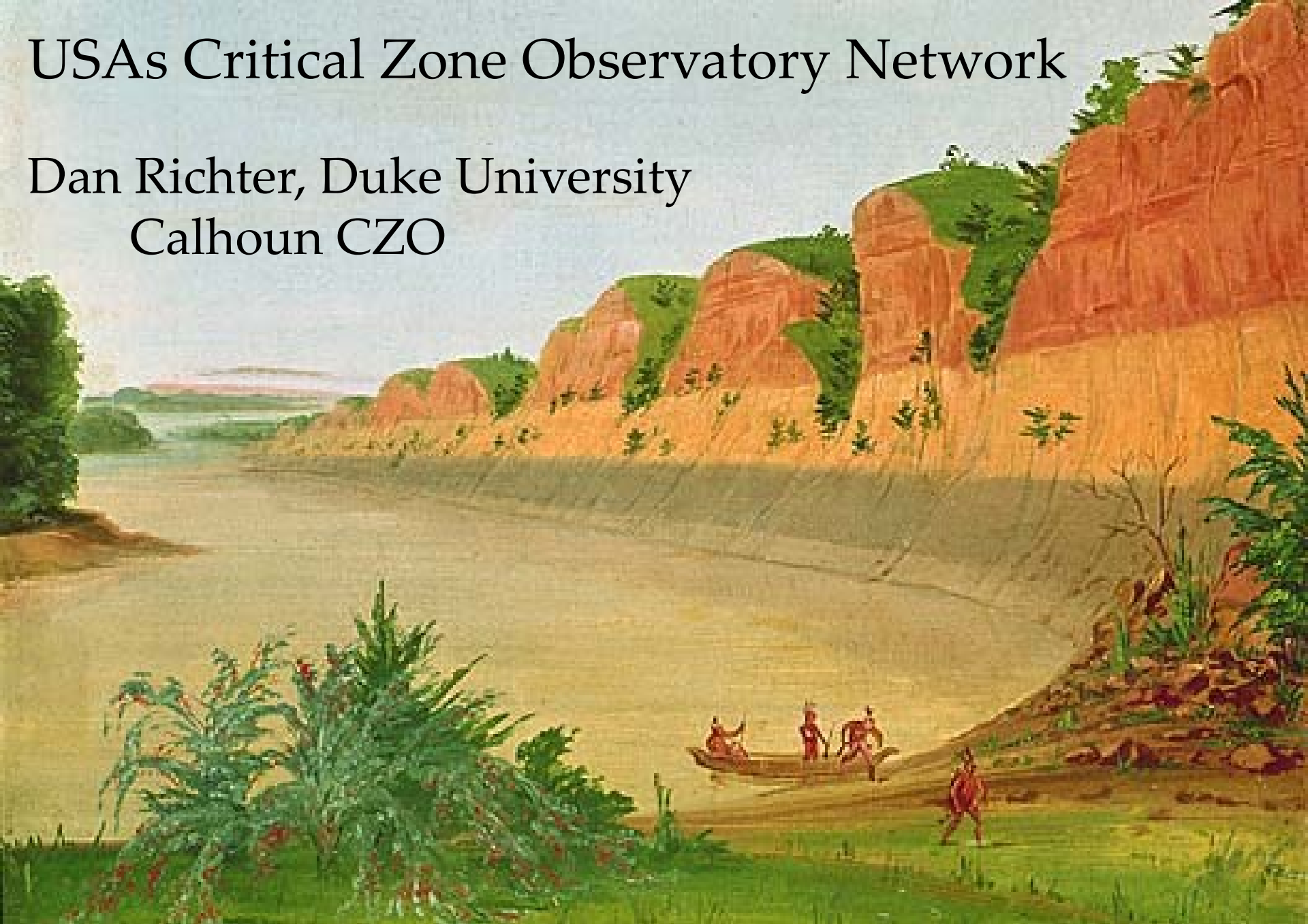
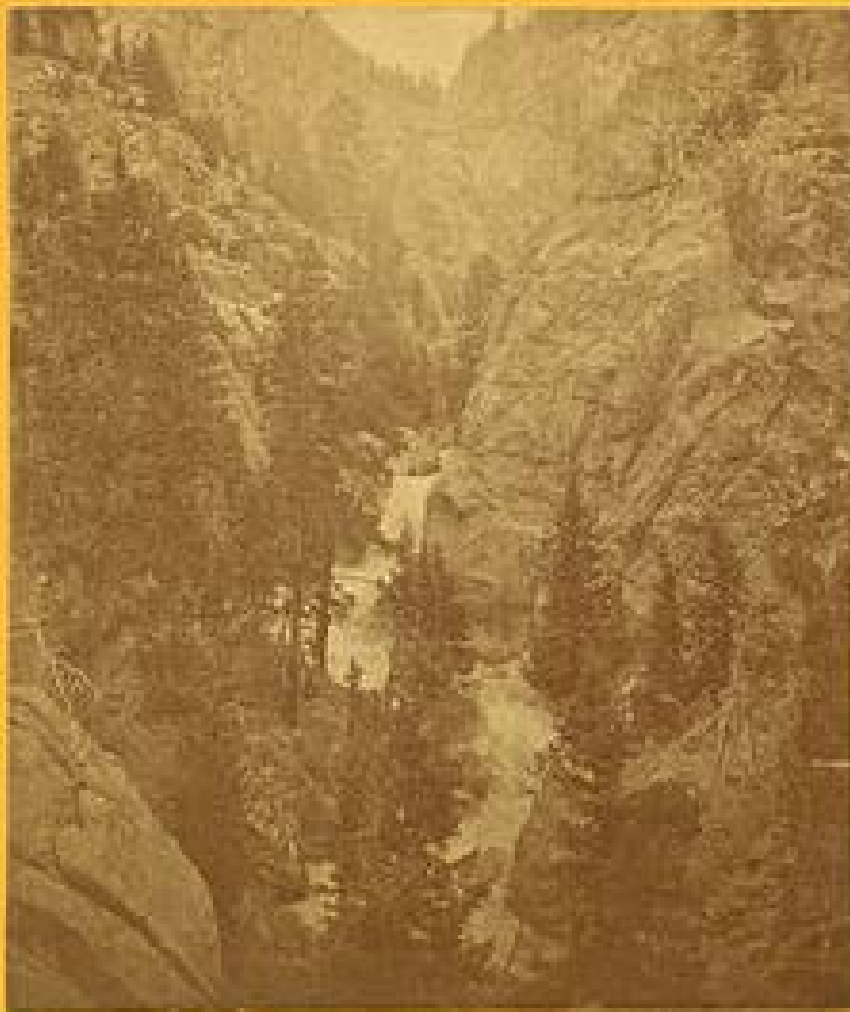


# USAs Critical Zone Observatory Network

Dan Richter, Duke University  
Calhoun CZO



*Southside of the Missouri, George Catlin 1832*



Suzanne Anderson,  
University of Colorado  
Boulder Creek CZO

*Boulder Canyon, falls*, stereo image by  
Kirkland, George W., -- Photographer,  
1865? [Public domain], via Wikimedia  
Commons

**Earth's critical zone 1st described Jordan et al 2001**  
the solid system & body: “from treetop to bedrock!”  
as fluid system: from the atmosphere to deep aquifers!



## *Critical Zone science should “go critical” because*

- CZ structures & processes support all life
- CZs being altered by human activities worldwide
- CZs have yet to be studied by scientific teams motivated by interactions among the disciplines

*Re: a slogan for CZ science -- Darwin couldn't have been Darwin without Sir Charles Lyell!!*

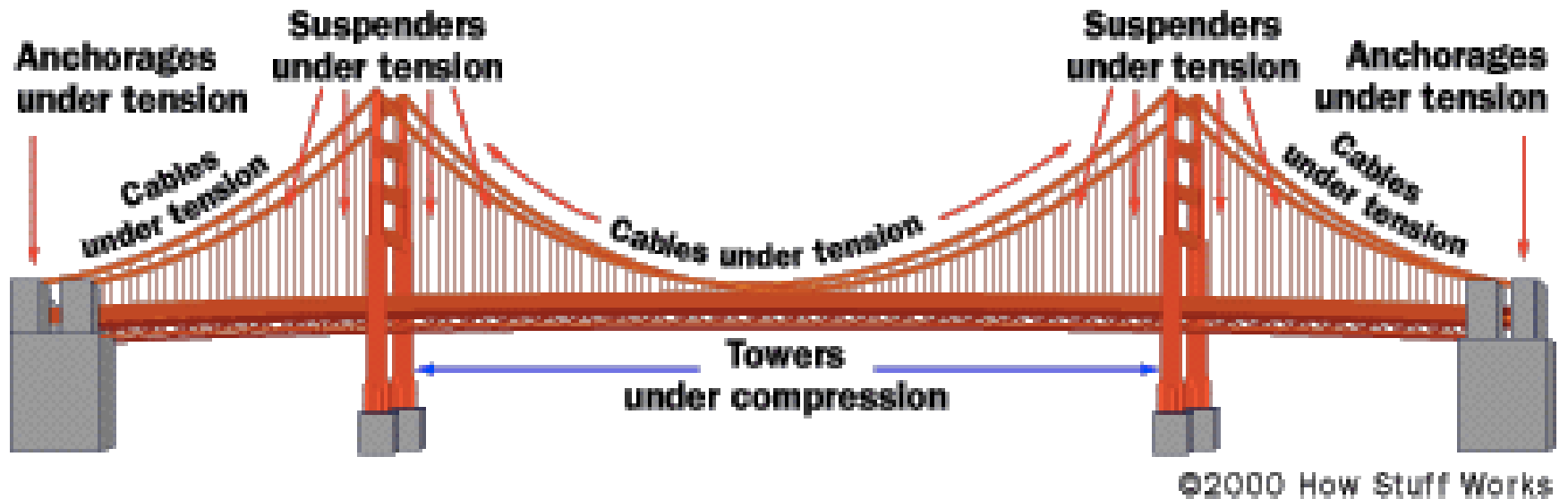
Central argument of CZ science is its  
interdisciplinarity --

*The disciplines of Earth-sciences have so  
accelerated in recent decades that great  
advances are possible from interactions  
among the disciplines*



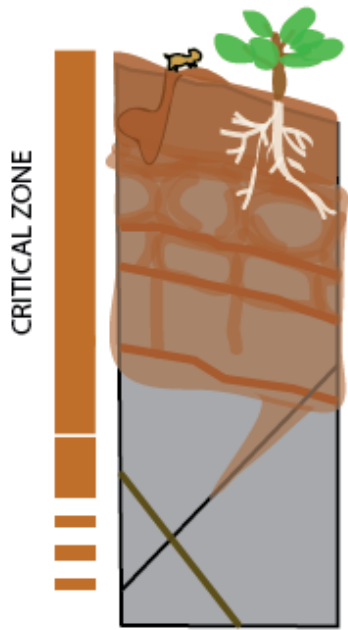
# An evolution in CZ science



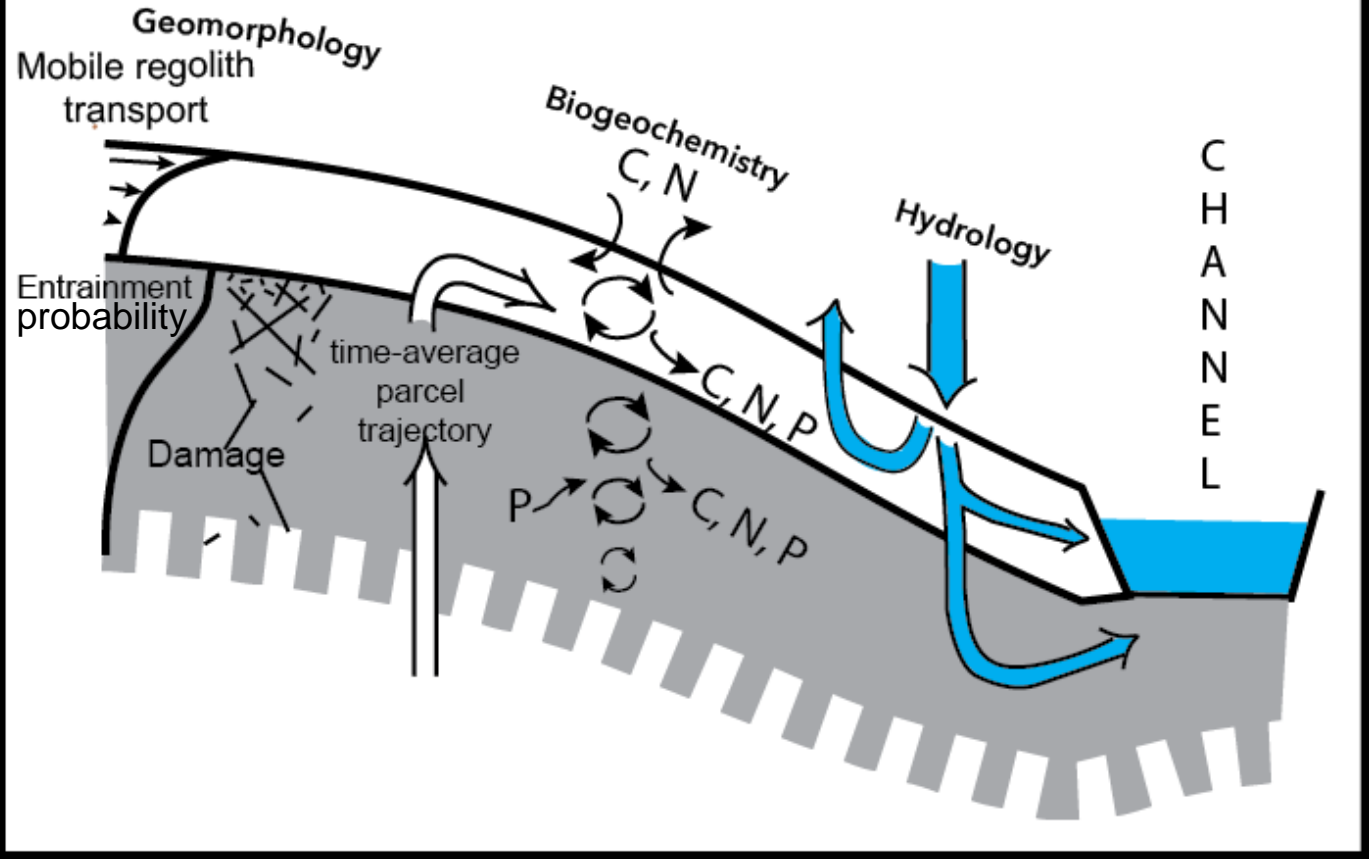


Focus on **questions** that require integration

# Architecture



# Process



We actively explore connections between presently observable processes, occurring on short timescales, and long timescale evolution of CZ architecture

Modified from Anderson RS et al. (2012) *Earth Surf Process Landfm*

Partly inspired by: Hoke and Turcotte (2002) "Weathering and damage" *JGR*



## CZ scientists' aspirations – coordinate observatories for monitoring, modeling, & experiments

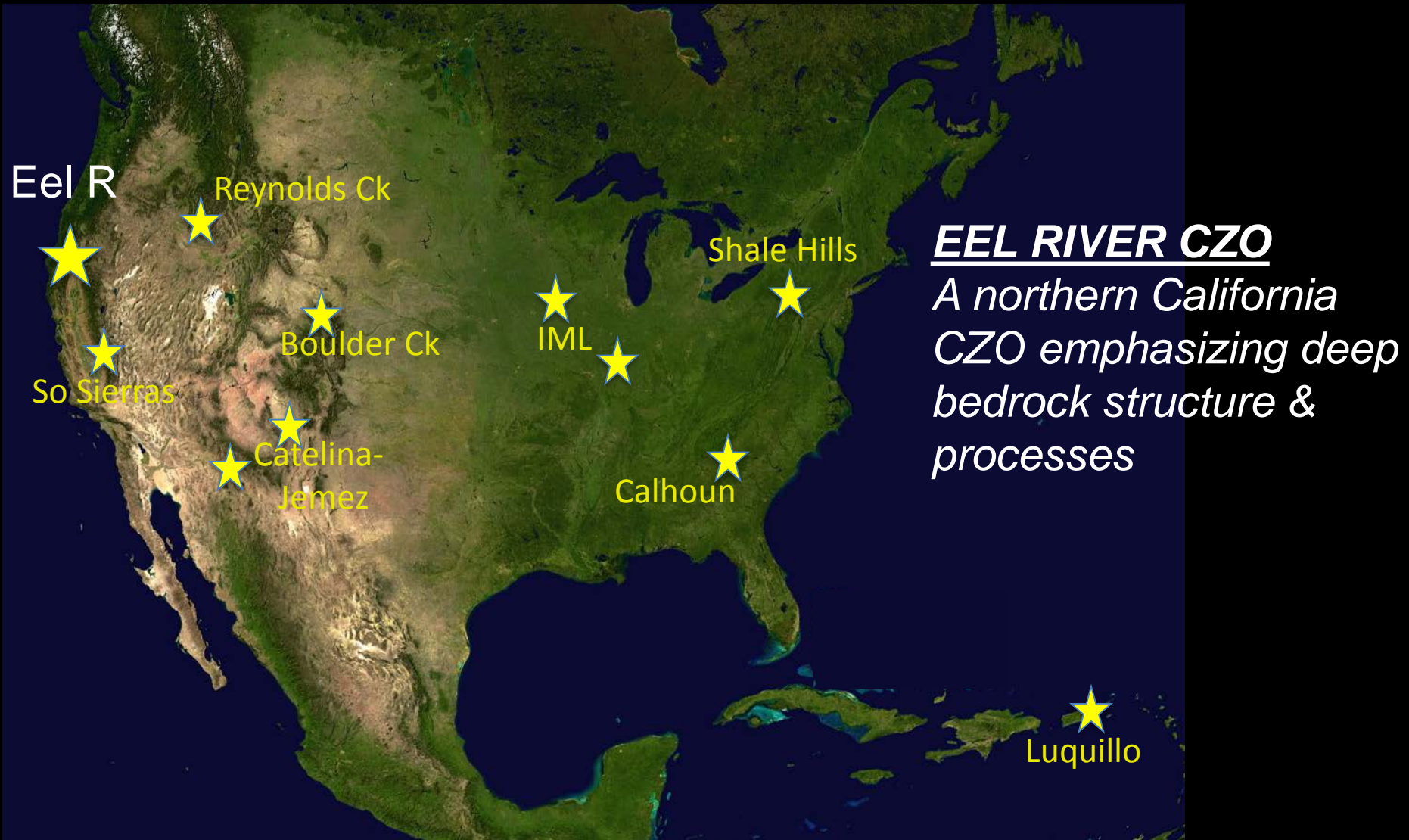
Each wirelessly streaming real-time data that tie driving processes of atmosphere, canopy boundary layers, biota, soil and weathering profiles down through deep aquifers and underlying solid substrata

All to better quantify & model prominent forcings from land use & land-use history

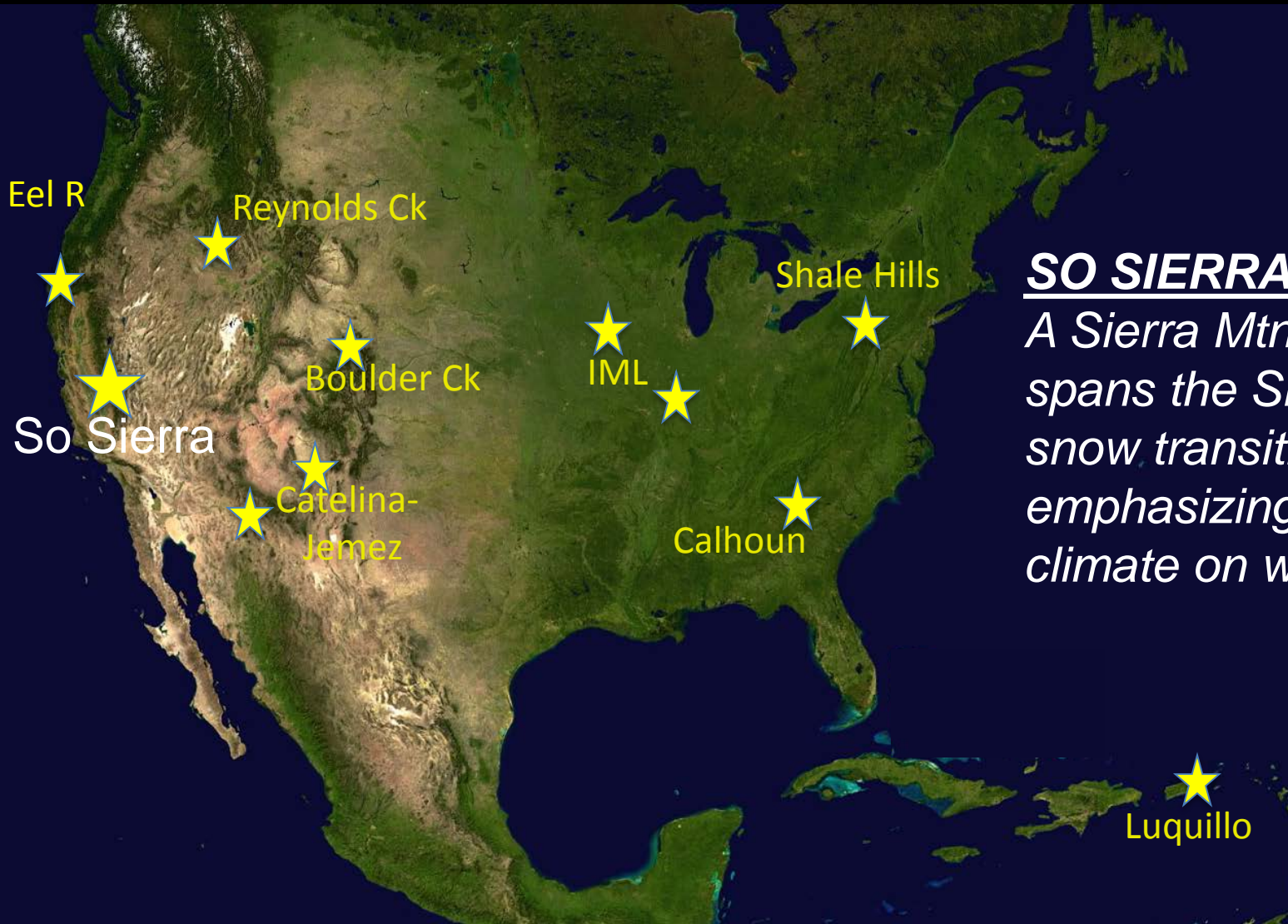
USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



**SO SIERRA CZO**

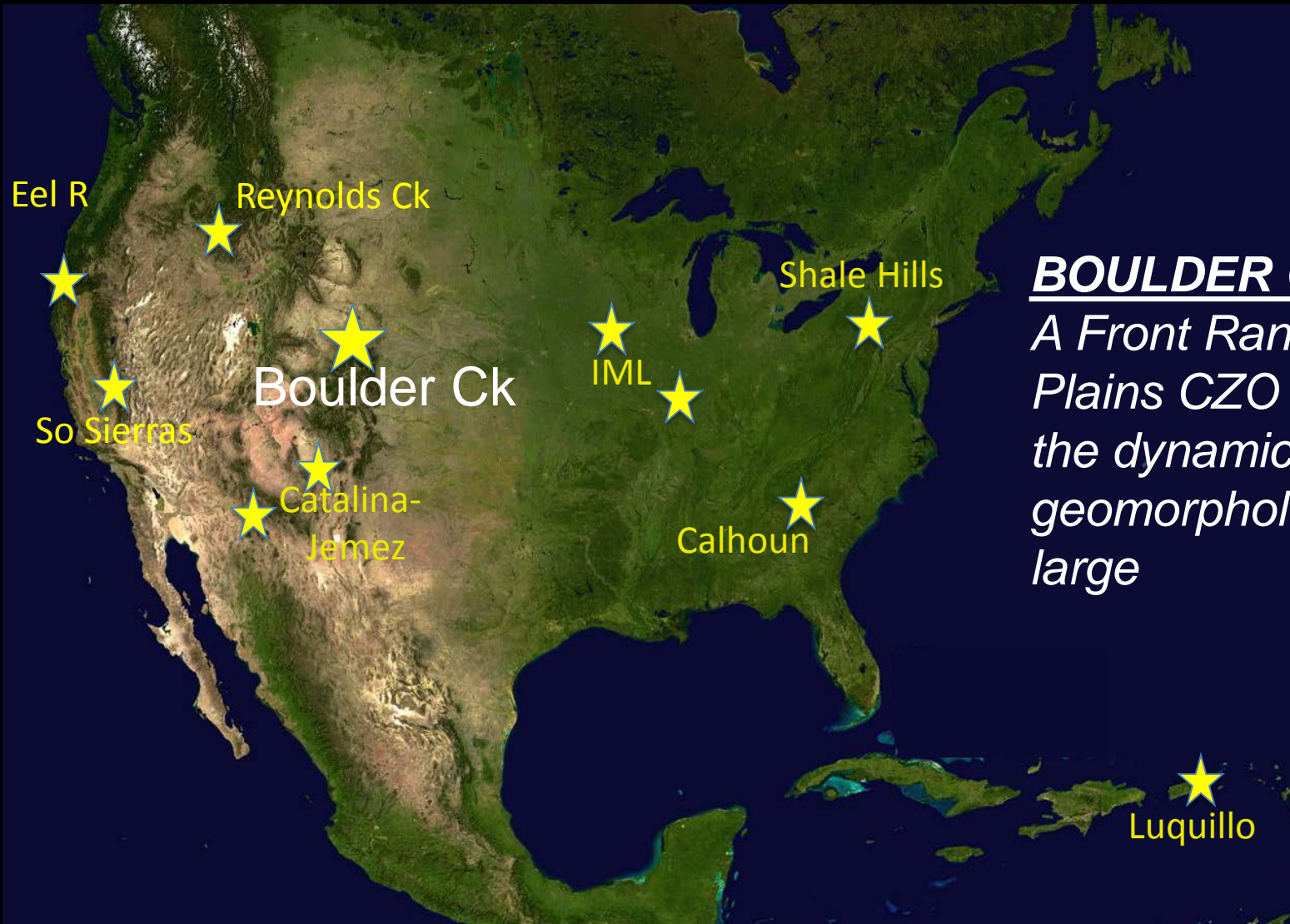
*A Sierra Mtn CZO that spans the Sierra rain-snow transition, emphasizing impact of climate on water cycling*

USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



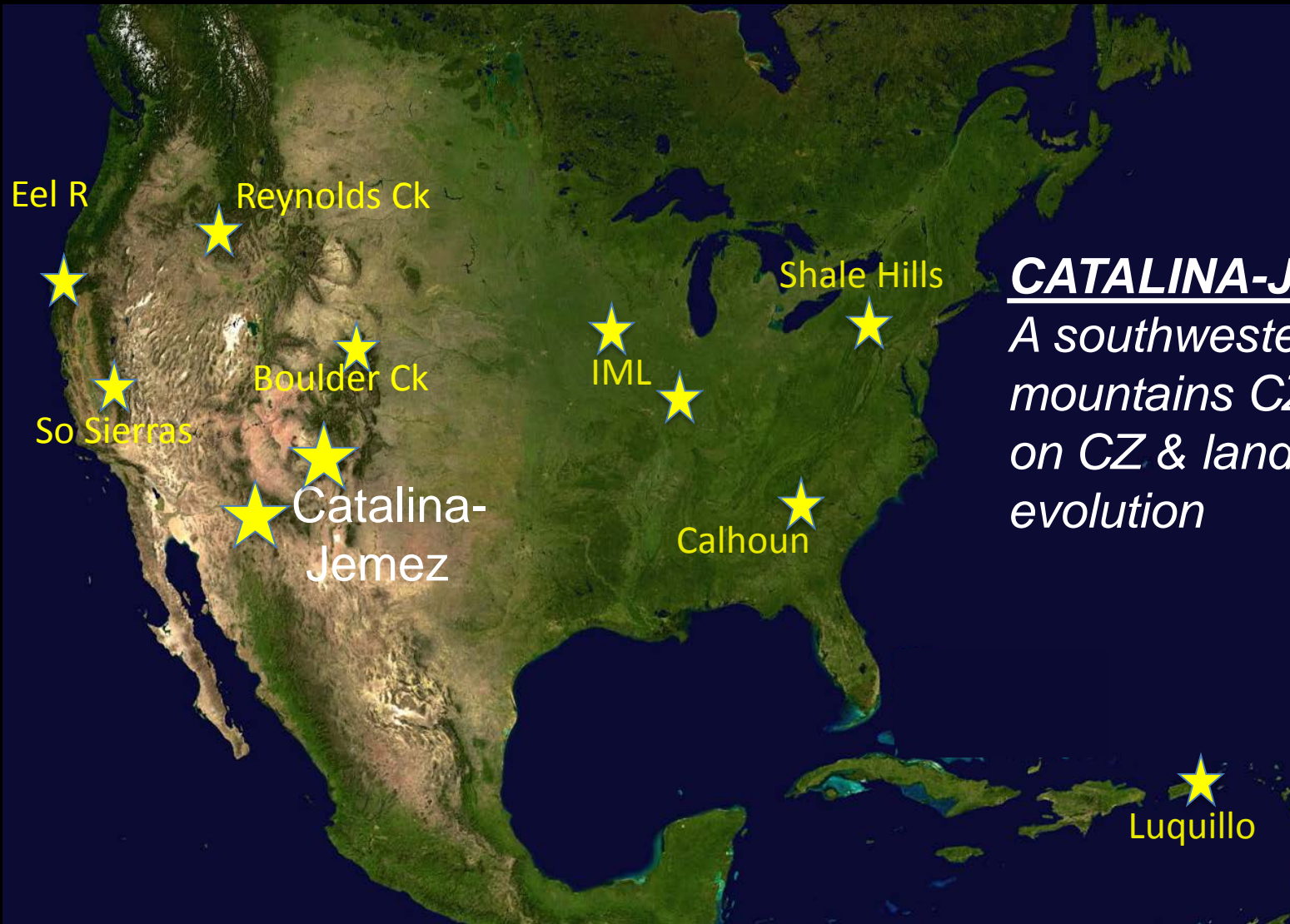
**REYNOLDS CK CZO**  
*A semi-arid grazed and fire-prone CZ focusing on carbon cycling & storage*

USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



**BOULDER CK CZO**  
*A Front Range to High Plains CZO focusing on the dynamics of geomorphology writ large*

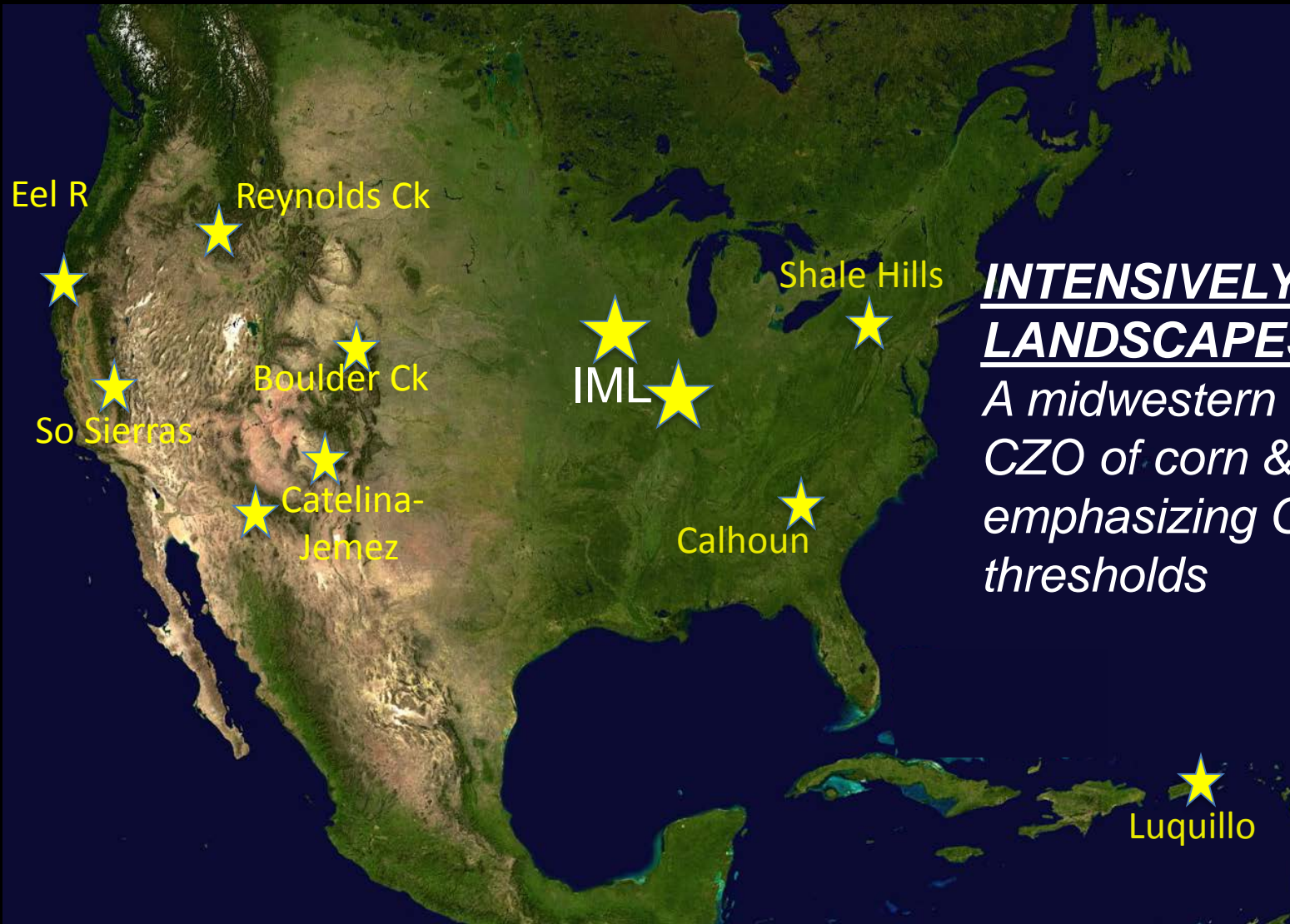
USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



**CATALINA-JEMEZ CZO**

*A southwestern desert to mountains CZO focusing on CZ & landscape evolution*

USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning

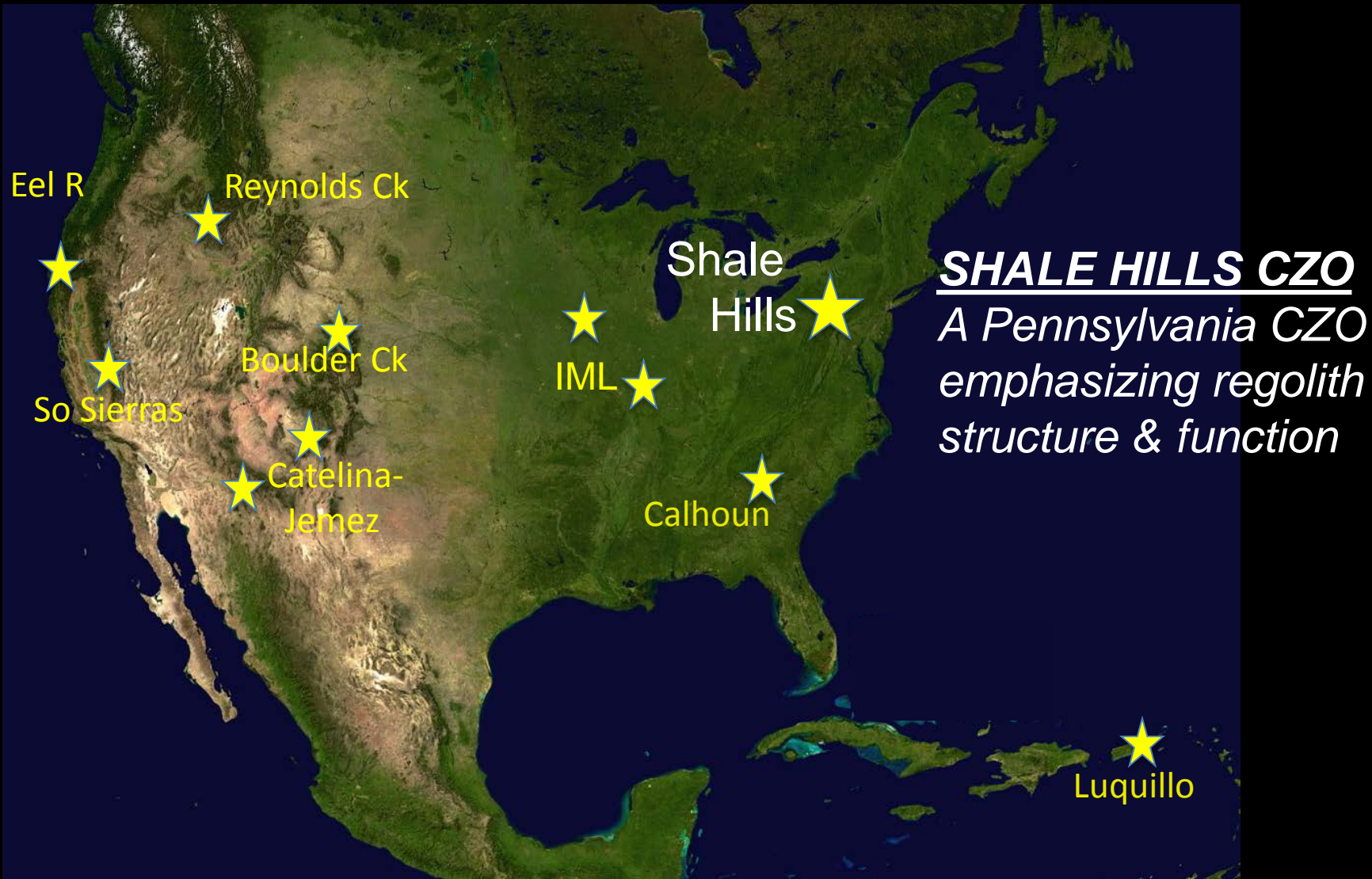


**INTENSIVELY MANAGED  
LANDSCAPES CZO**

*A midwestern agricultural CZO of corn & soybeans emphasizing CZ thresholds*



USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



**LUQUILLO CZO**

*A Caribbean island CZ focusing on how hot spots and moments drive CZ function & evolution*

USA's CZO program with 9 observatories that study process coupling, & energy & mass transfers: each distinctive in their CZ structures & functioning



**CALHOUN CZ**

*An ancient, deep & extremely weathered CZ  
In Southern Piedmont, highly altered by environmental history*

# USA's CZO program with 9 observatories

>500 active scientists

~150 presentations at 2015 AGU



