



East Turkey Creek
A Billion Years of Geologic History Revealed

Sharon Minchak

Geologic Time Scale

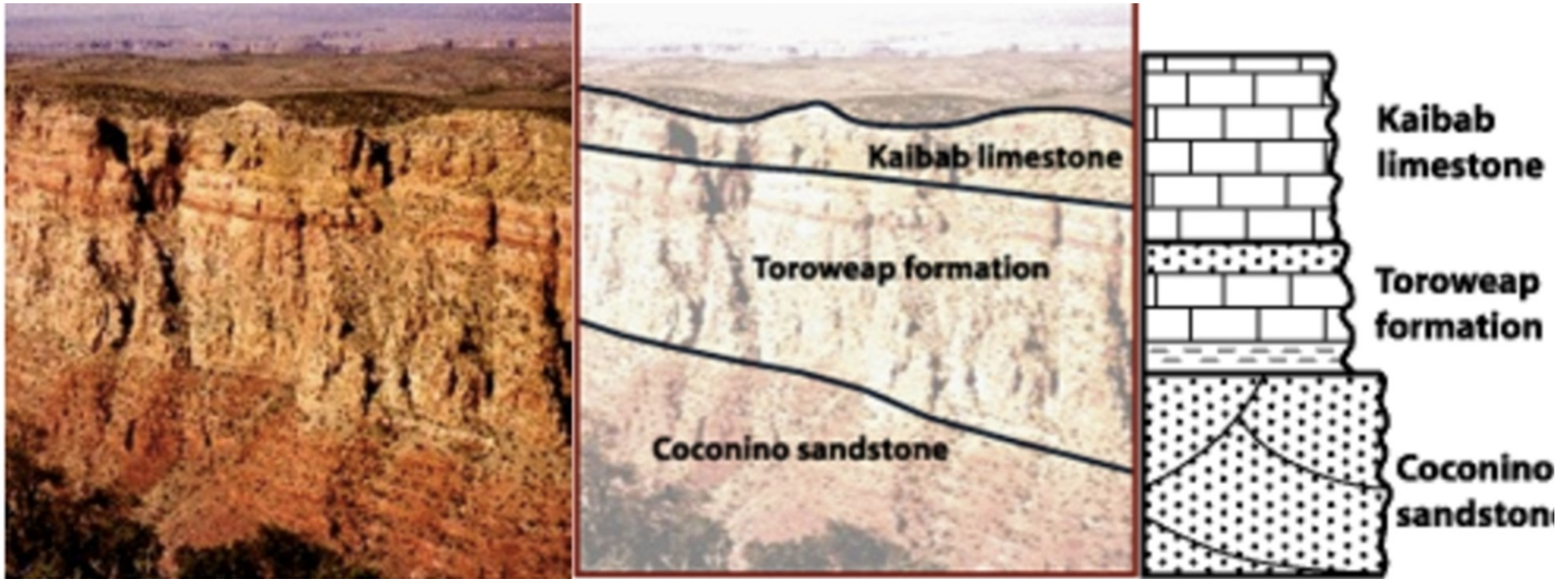
Dec 31, 11:12 pm – Start of recorded human history

Dec 31, 8:15 pm – *Homo sapiens* appear on Earth

Nov 17 – Spread of multicellular life

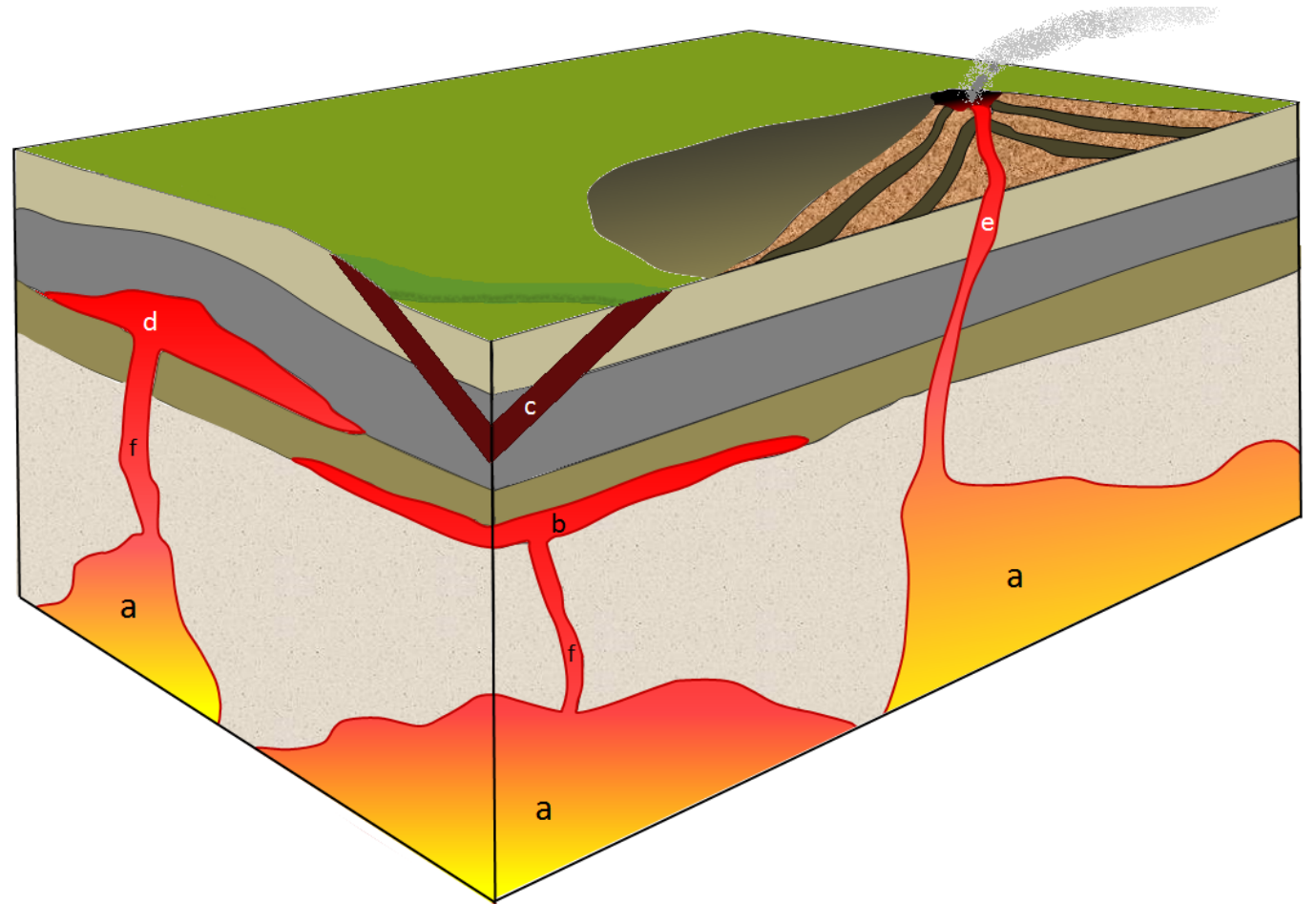
Jan 1 – Formation of the Earth

EON	ERA	PERIOD	MILLIONS OF YEARS AGO
Phanerozoic	Cenozoic	Quaternary	1.6
		Tertiary	66
	Mesozoic	Cretaceous	138
		Jurassic	205
		Triassic	240
	Paleozoic	Permian	290
		Pennsylvanian	330
		Mississippian	360
		Devonian	410
		Silurian	435
		Ordovician	500
		Cambrian	570
	Proterozoic	Late Proterozoic Middle Proterozoic Early Proterozoic	
Archean	Late Archean Middle Archean Early Archean		3800?
Pre-Archean			



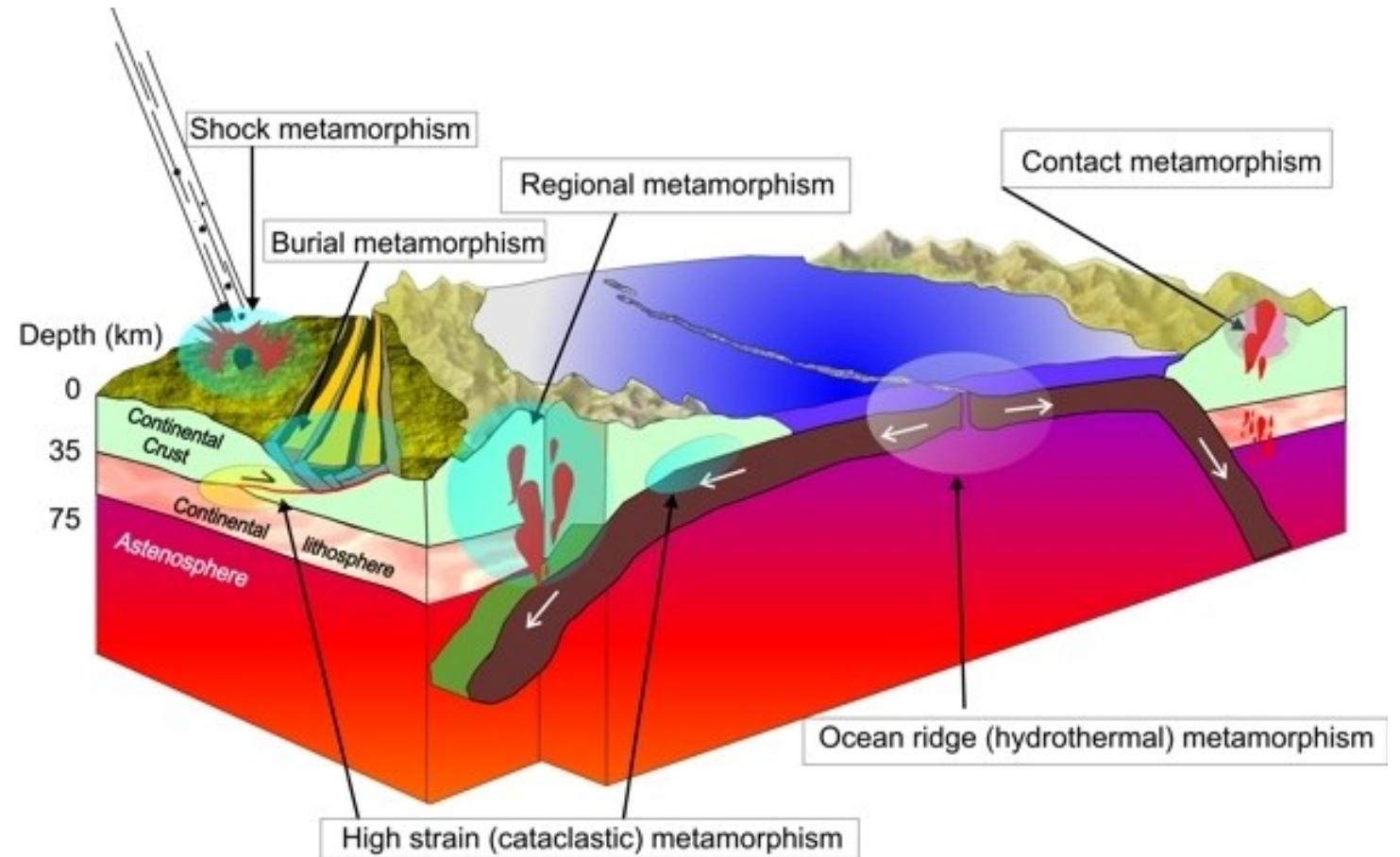
Sedimentary Rocks are clastic or chemical sediments deposited from a fluid (wind, water, ice) and lithified by a cementing agent

Igneous Rocks
are derived
from molten
magma or
lava

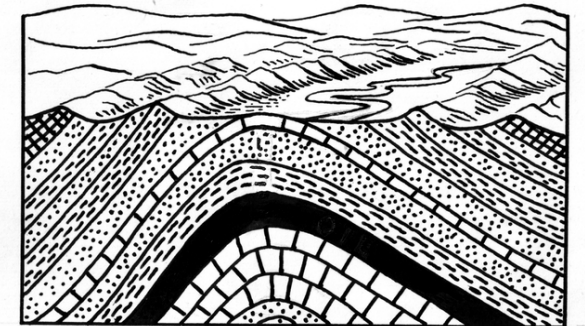
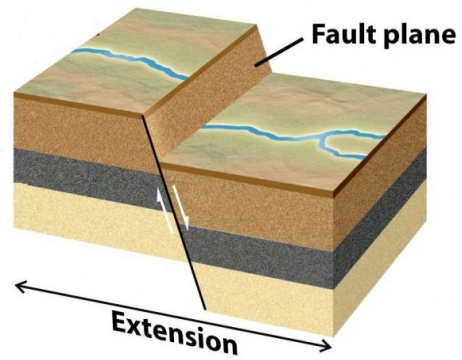


Metamorphic Rocks – rocks that have been chemically and/or physically altered by extreme conditions

- Pressure
- Temperature
- Stress
- Fluids

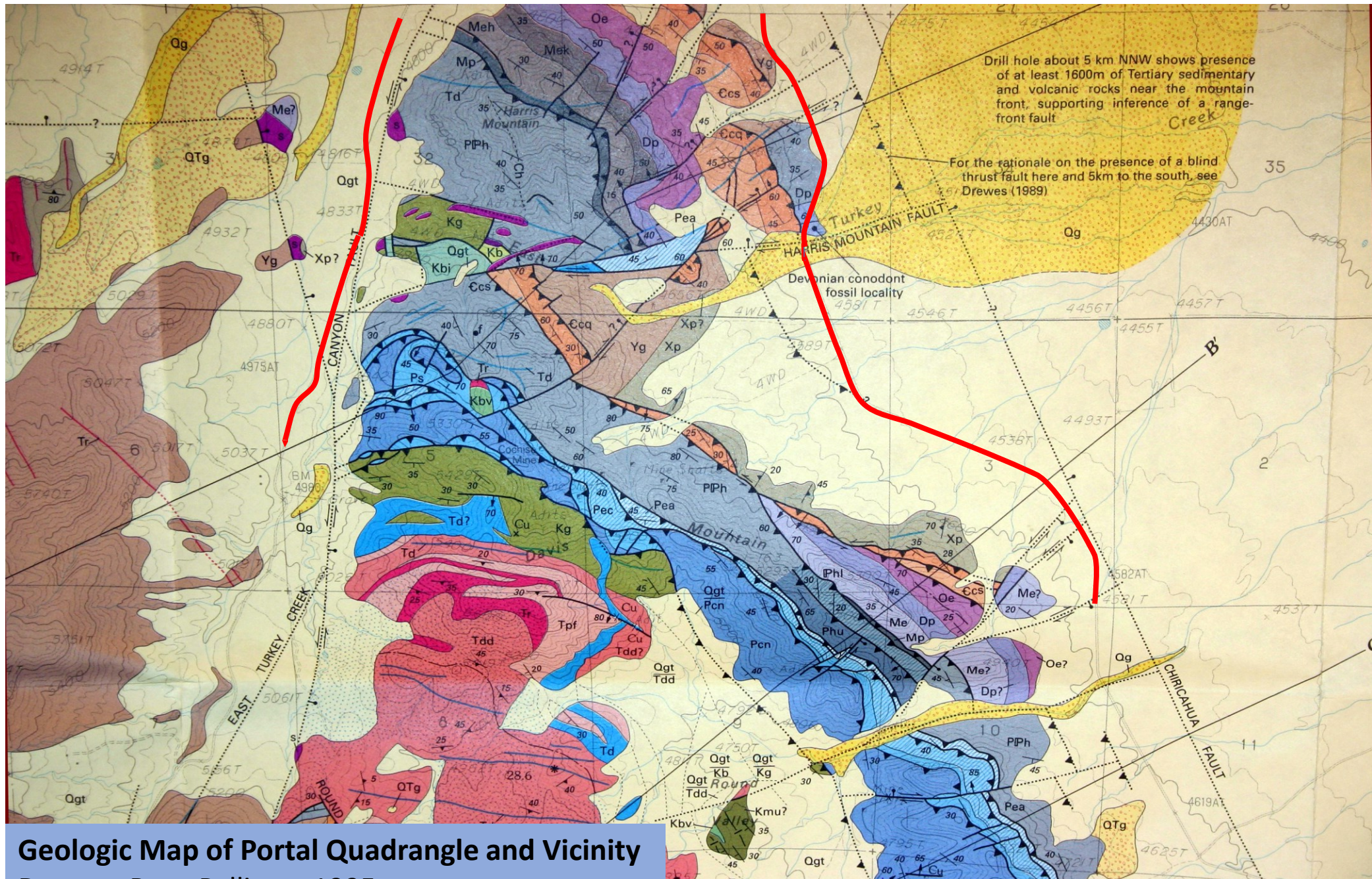


Structural Deformation – Rocks are subjected to brittle and plastic deformation



A Stroll Up
Section along
East Turkey Creek
and the Harris
Mountain Fault





Proterozoic Era – The first stop on our tour

A mere billion years ago....

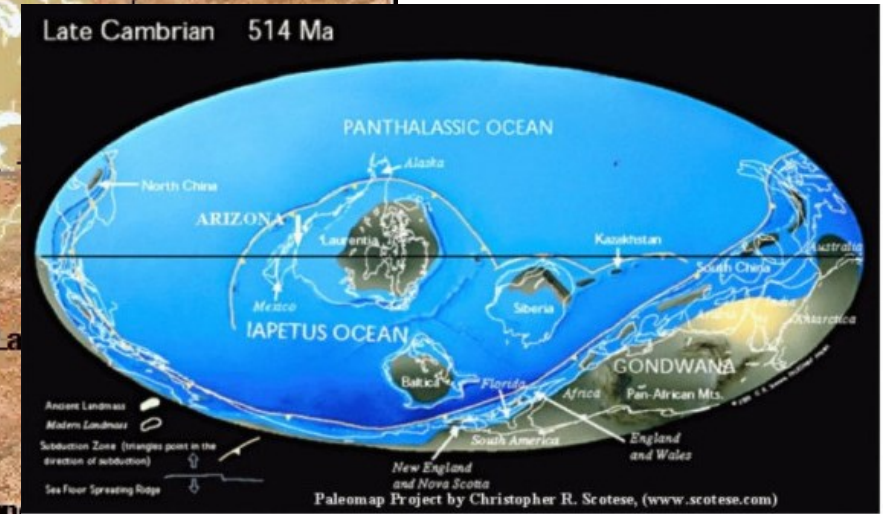
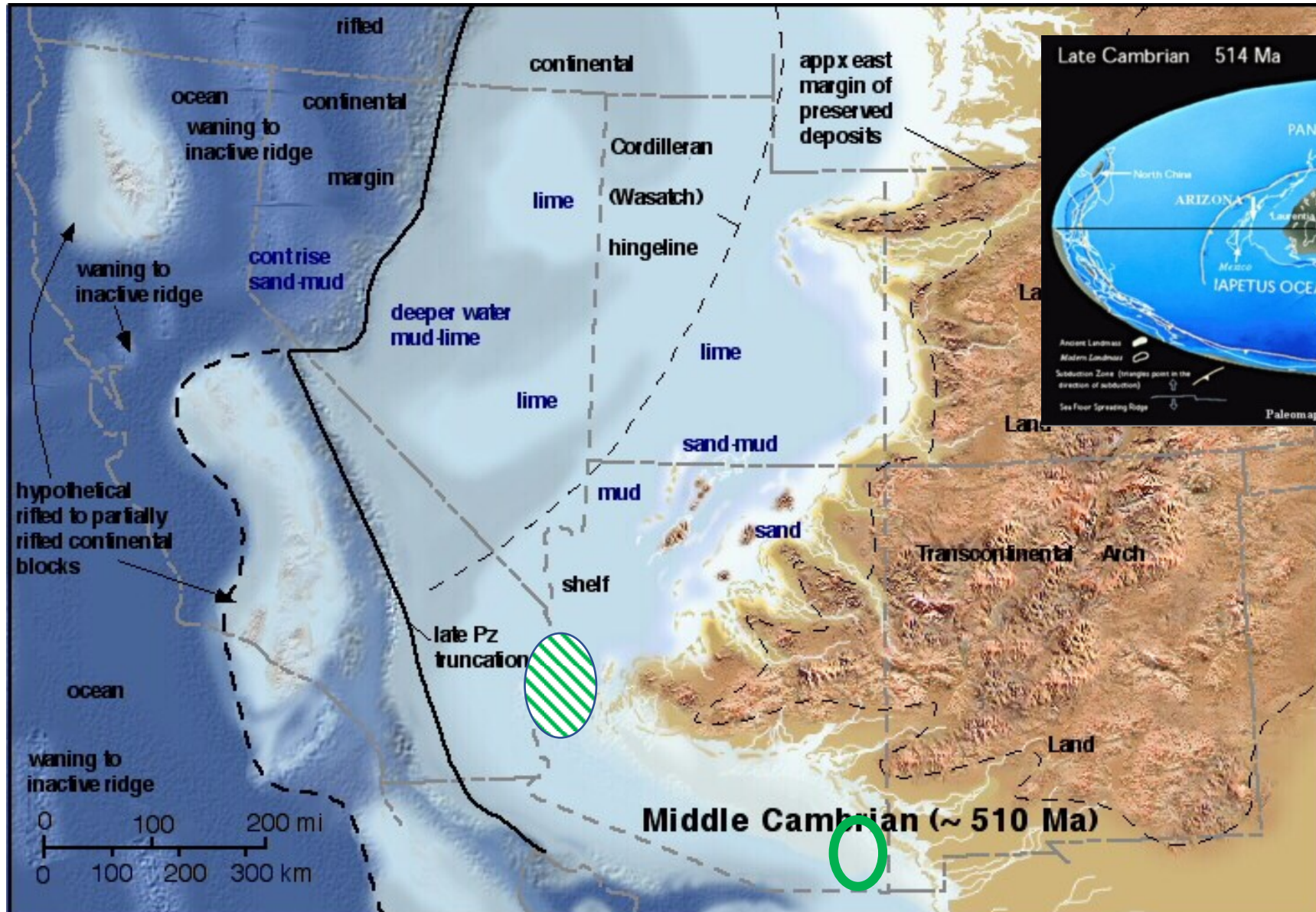


Pinal Schist (Xp) & Precambrian Granodiorite (Yg) ~1-2 Billion Years Old

Then What Happened?

- We don't know! There is a major geologic unconformity between the Proterozoic and Paleozoic rock sequences in the Portal area.
- Essentially the slate has been wiped clean by the ever-present forces of erosion and gravity
- Without rocks to study we are constrained in our ability to decipher all the things that took place during this period
- In the Portal area there is roughly 400 million years of missing history

Paleozoic Era Middle Cambrian (500-520 Ma)



Coronado Sandstone (Ccq)

Massive quartzite beds
(1-2 m thick)

Basal gravel unit of 5-10 mm gravel



Paleozoic Era Devonian (360-410 Ma)



Portal Formation (Dp)

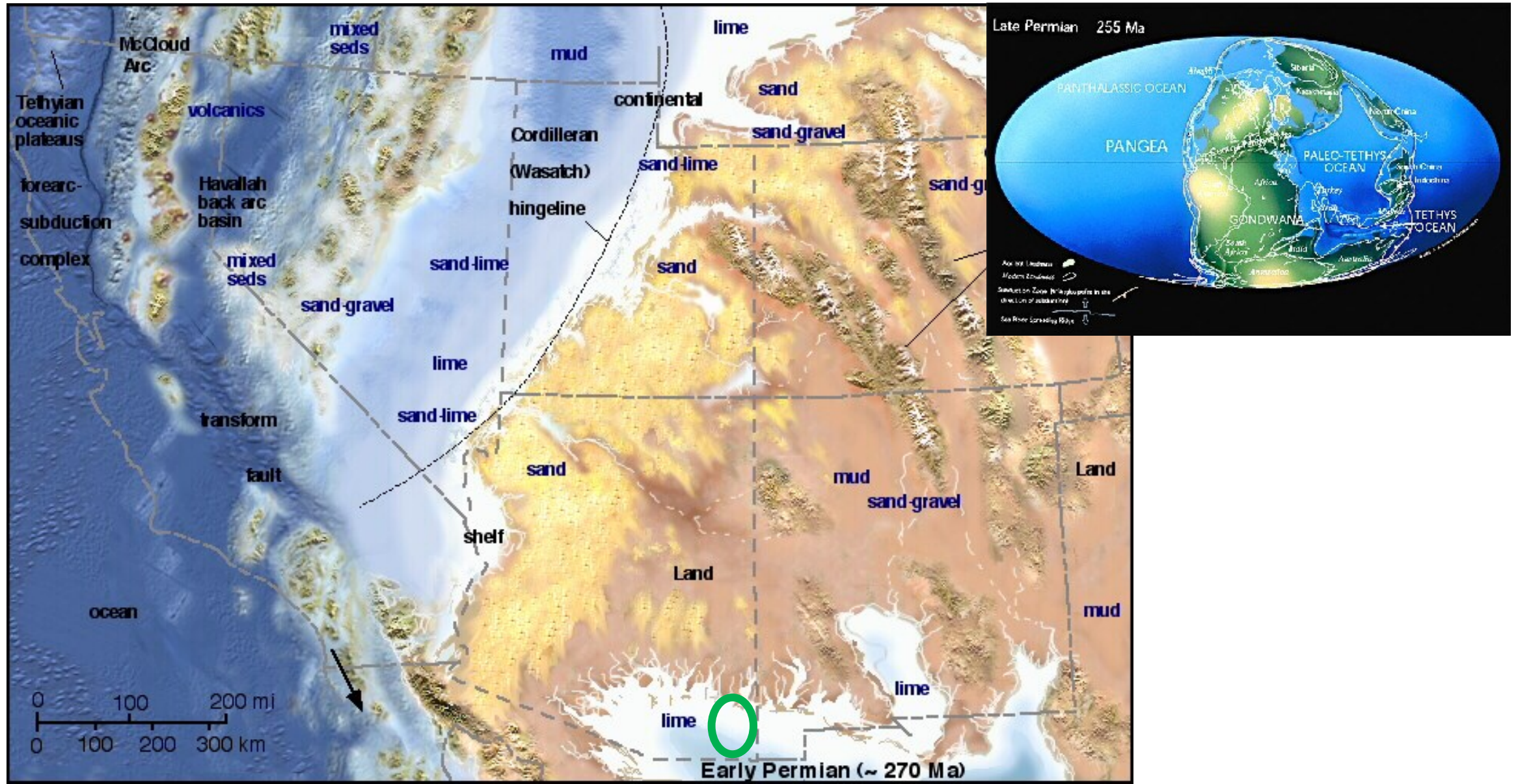
Fossiliferous Limestone

Crinoid Fossils

Brachiopod Fossils



Paleozoic Era Permian (240 - 290 Ma)



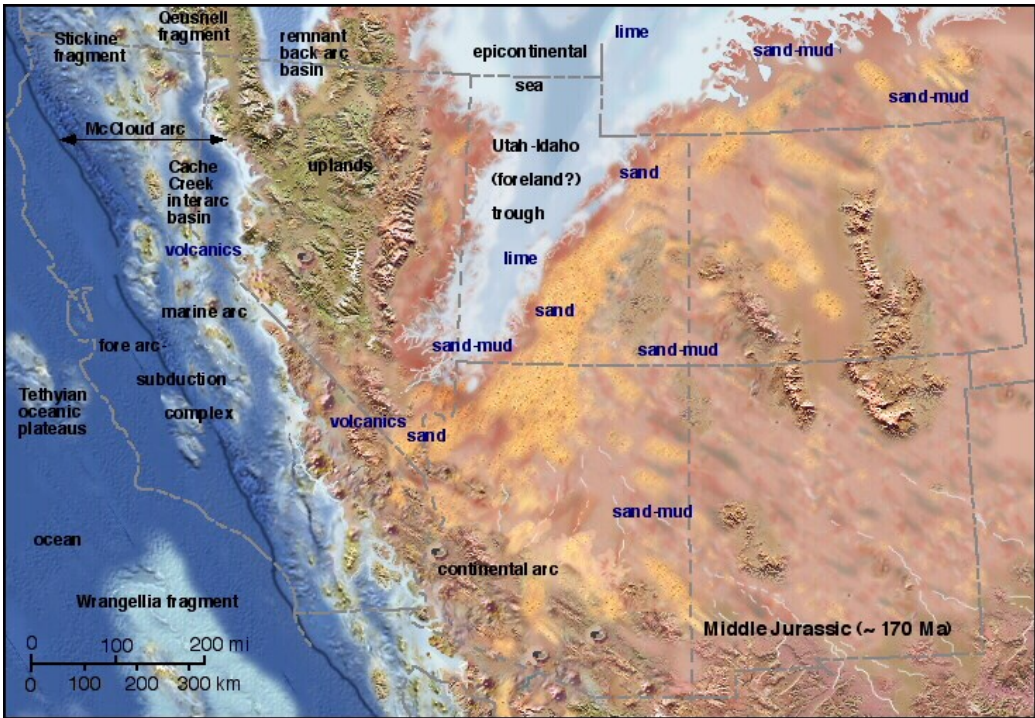
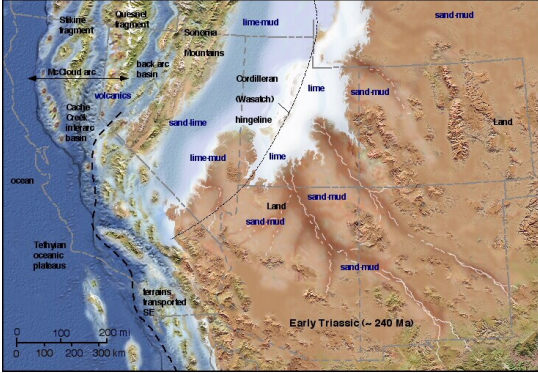
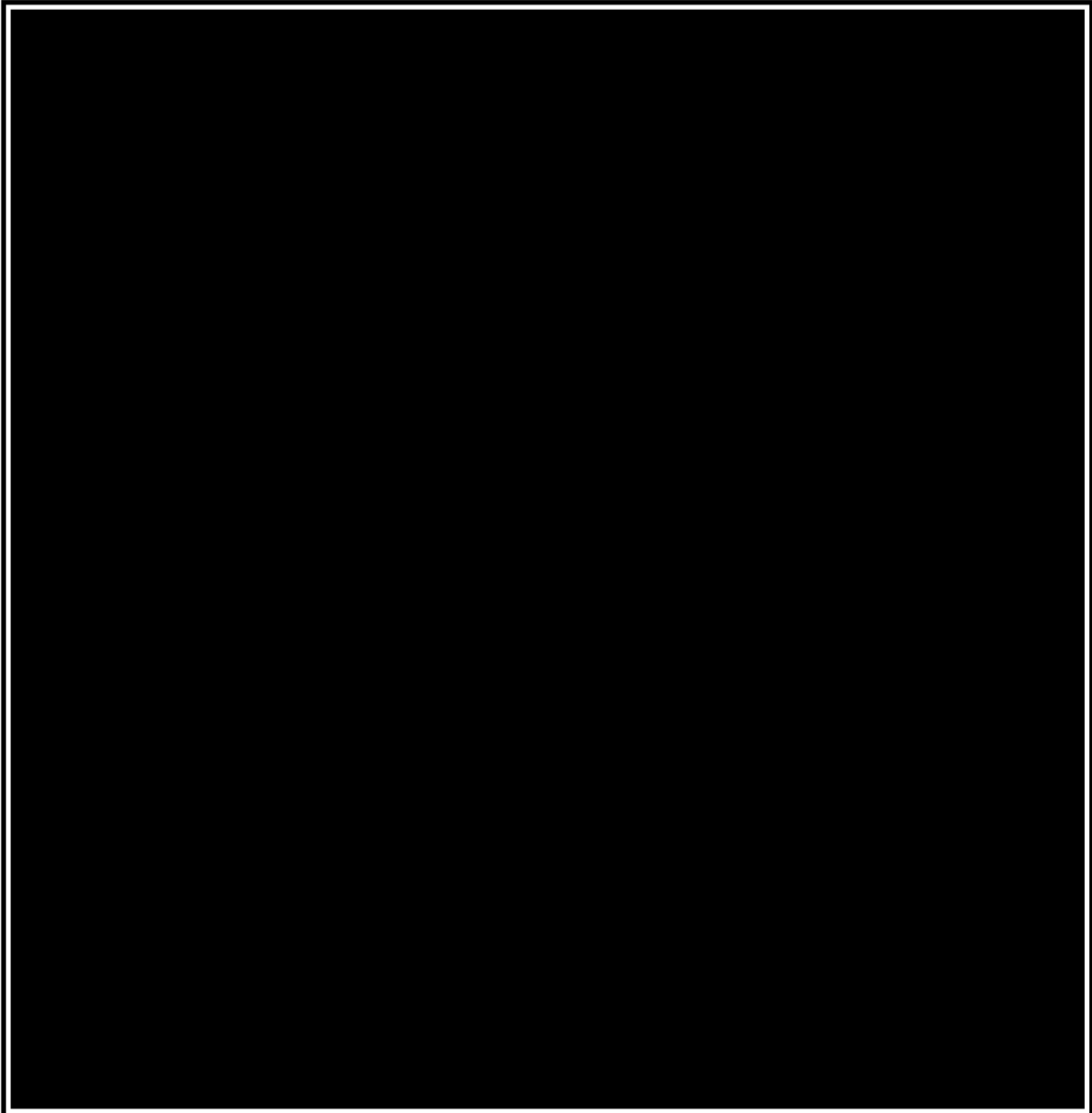
Horquilla Limestone (PPh) and Earp Formation (Pe)

Shale, Siltstone, and Limestone

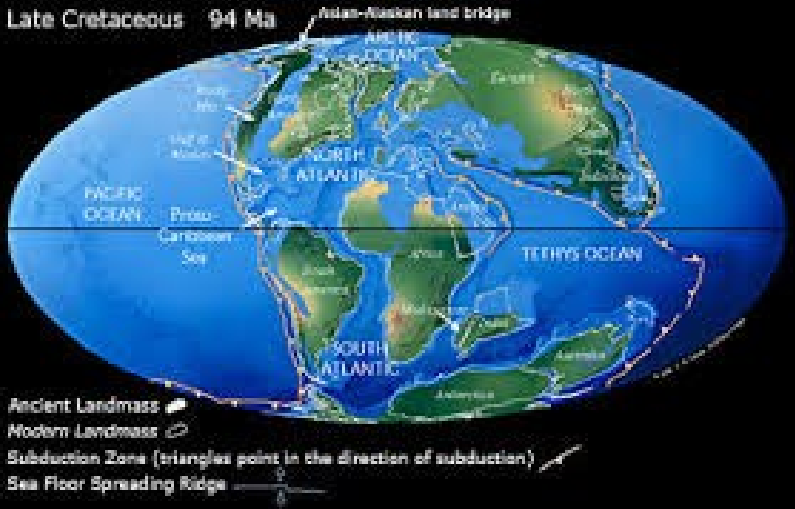
Red-brown shale unit

Underlain and overlain with more
resistant limestone beds





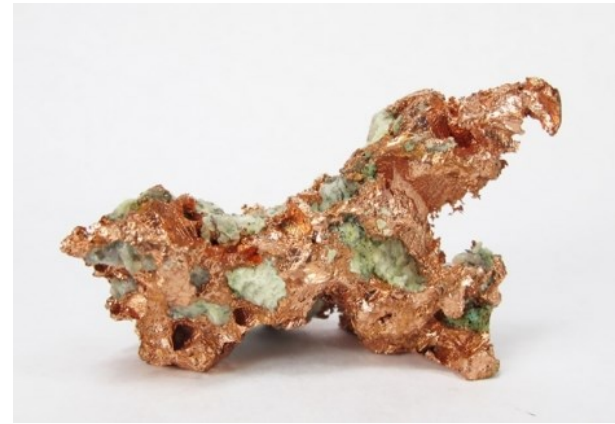
Mesozoic Era Cretaceous (66 - 138 Ma)



Bisbee Group (Kb)

Series of Cretaceous clastic sedimentary rocks (Cintura Fm, Mural Fm, Morita Fm, and Glance Conglomerate)

Deposited in rivers, deltas, and near shore environments as Portal area sat at edge of a growing inland sea.

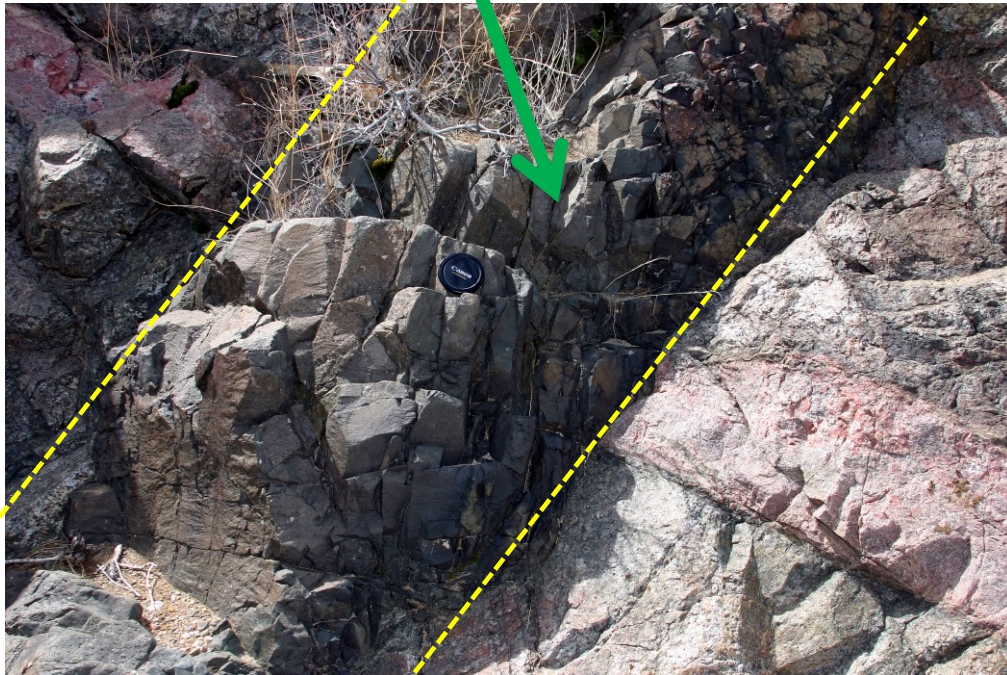


Cretaceous Volcanism

Basalt Flows, Intrusions, Dikes, and Sills

Basalt Flow

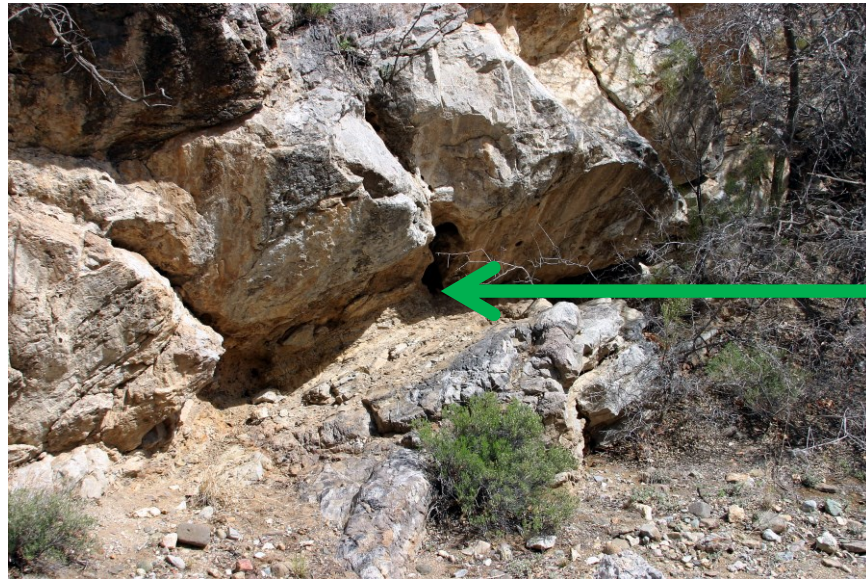
Basaltic dike, cross cuts vertically through older rock beds



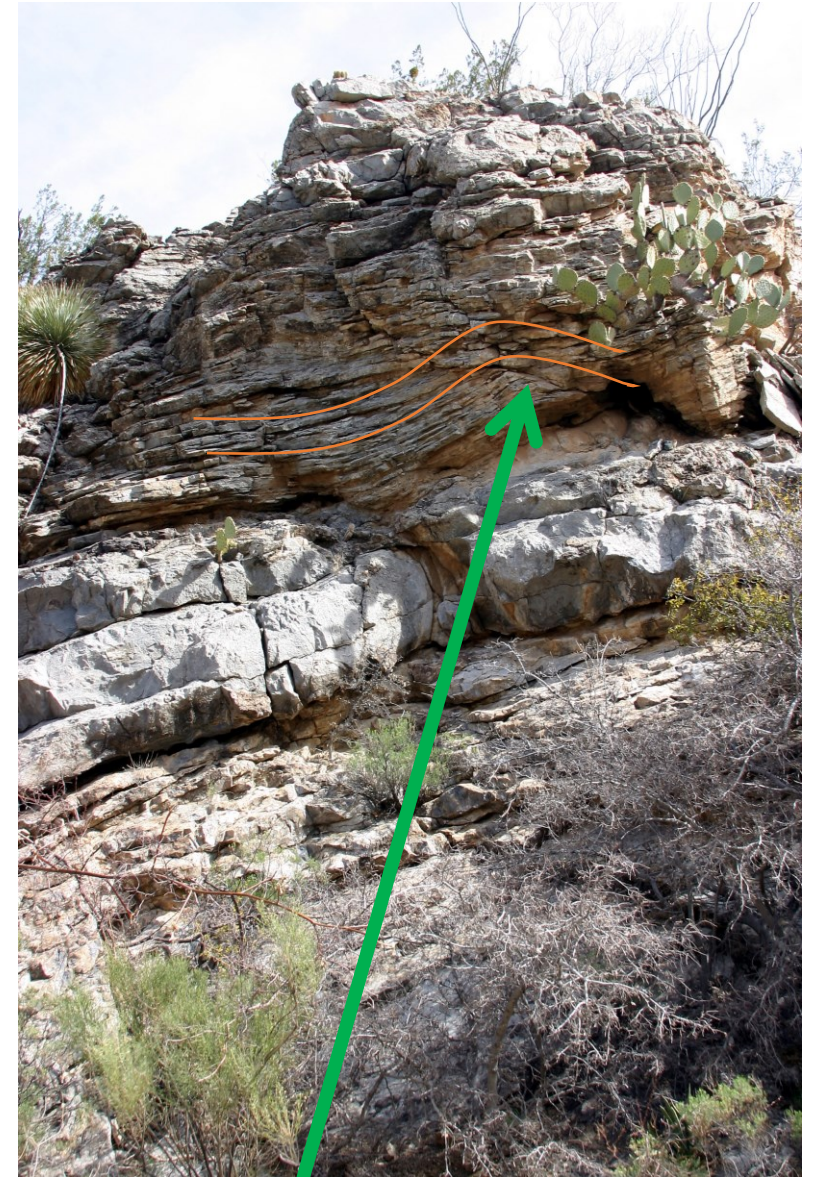
Cretaceous Deformation

Folding & Faulting associated with Cordilleran orogeny (~55-85 Ma)

Response to subduction along western North America coastline which was located along western edge of current day Arizona

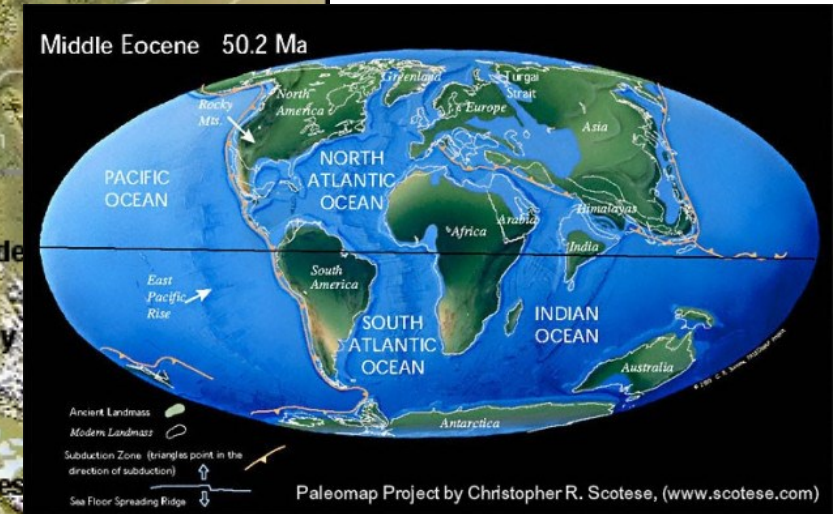


Fault Zone



Folding deformation of rock units

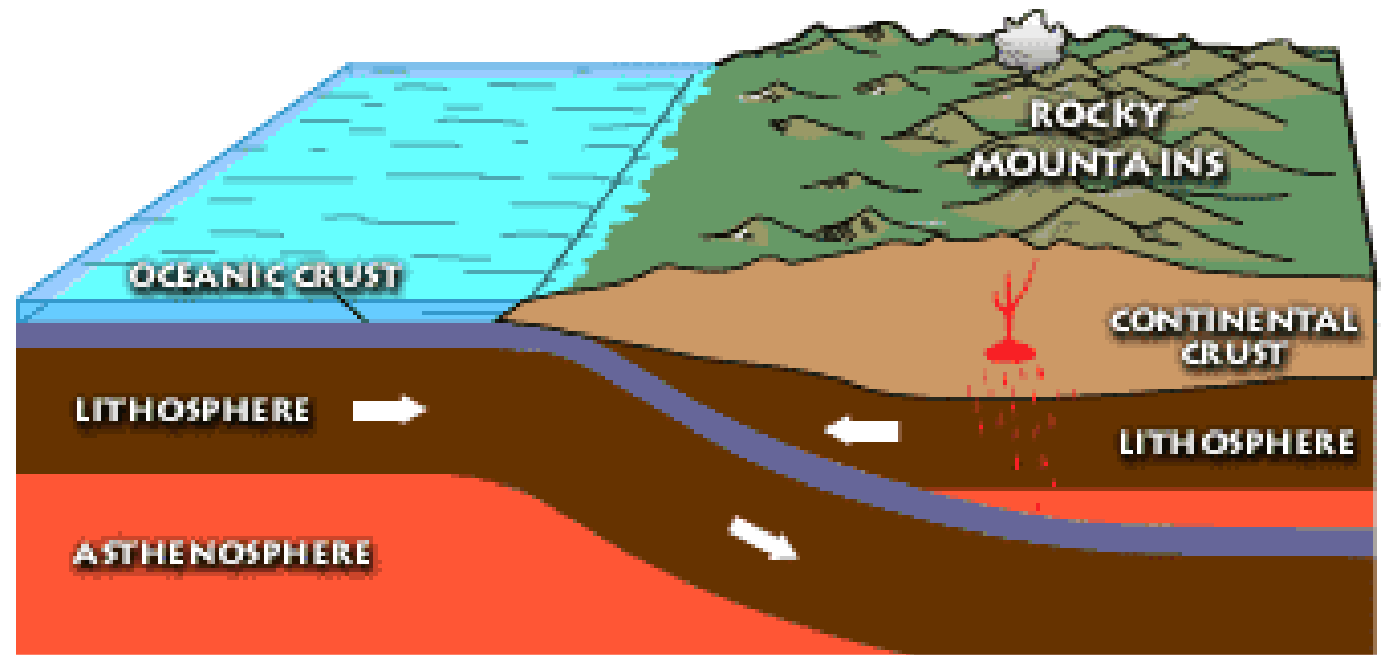
Cenozoic Era Tertiary (1 - 66 Ma)



Tertiary Volcanism

Massive volcanism begins in the area of the modern day Chiricahua Mountains about 25-29 million years ago

Formation of large underground magma chambers (Jhus Stock) is fueled by ongoing subduction along western edge of North America



Turkey Creek Volcanism

Some magma reached the ground surface and was extruded as the Silver Peak Dacite (Tds) and Cave Creek Rhyolite (Tcc)



Turkey Creek Caldera

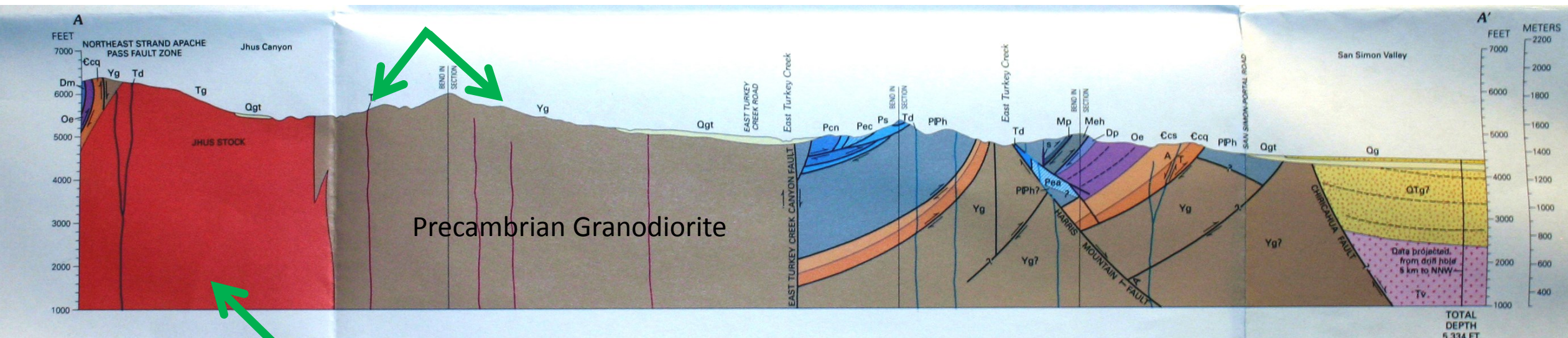
Late-stage magma chamber contained sufficient volatile gases, and rose near enough the ground surface, that the pressure was explosively released in a caldera forming event. Deposited nearly 2,000 feet of pyroclastic ash tuff deposits.



These tuff deposits have eroded into the spires and rock formations of the Chiricahua Monument

Caldera Formation and Volcanism Cause Widespread Faulting and Fault Reactivation

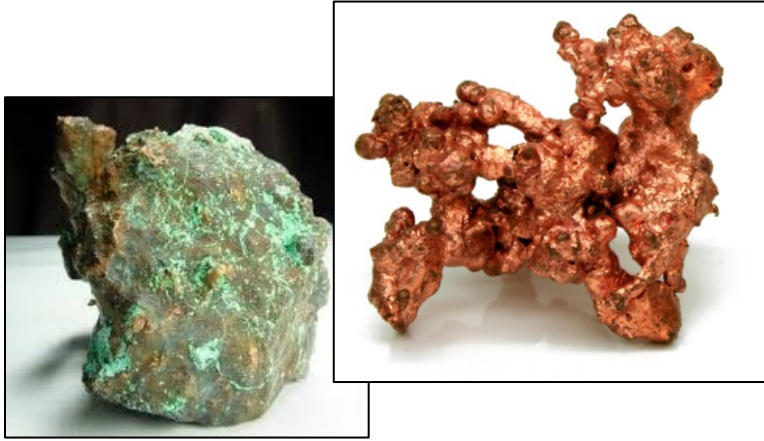
Highly mineralized, hydrothermal fluids migrate into surrounding rock



Large intruded igneous Jhus Stock

Large movement and displacement along old and new fault lines

Mineralization of Native Rock Units

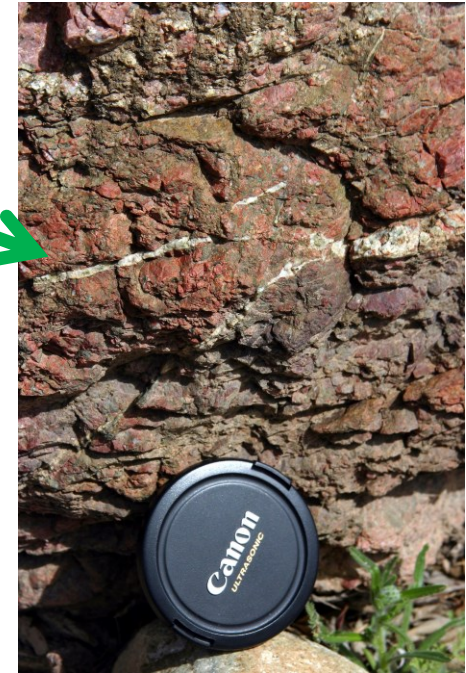


Native Copper & Copper Bearing Minerals

Epidote Alteration



Quartz veins



Large, well formed quartz crystals



Quaternary Geology

*Civilization exists by geological
consent, subject to change without
notice.*

Will Durant