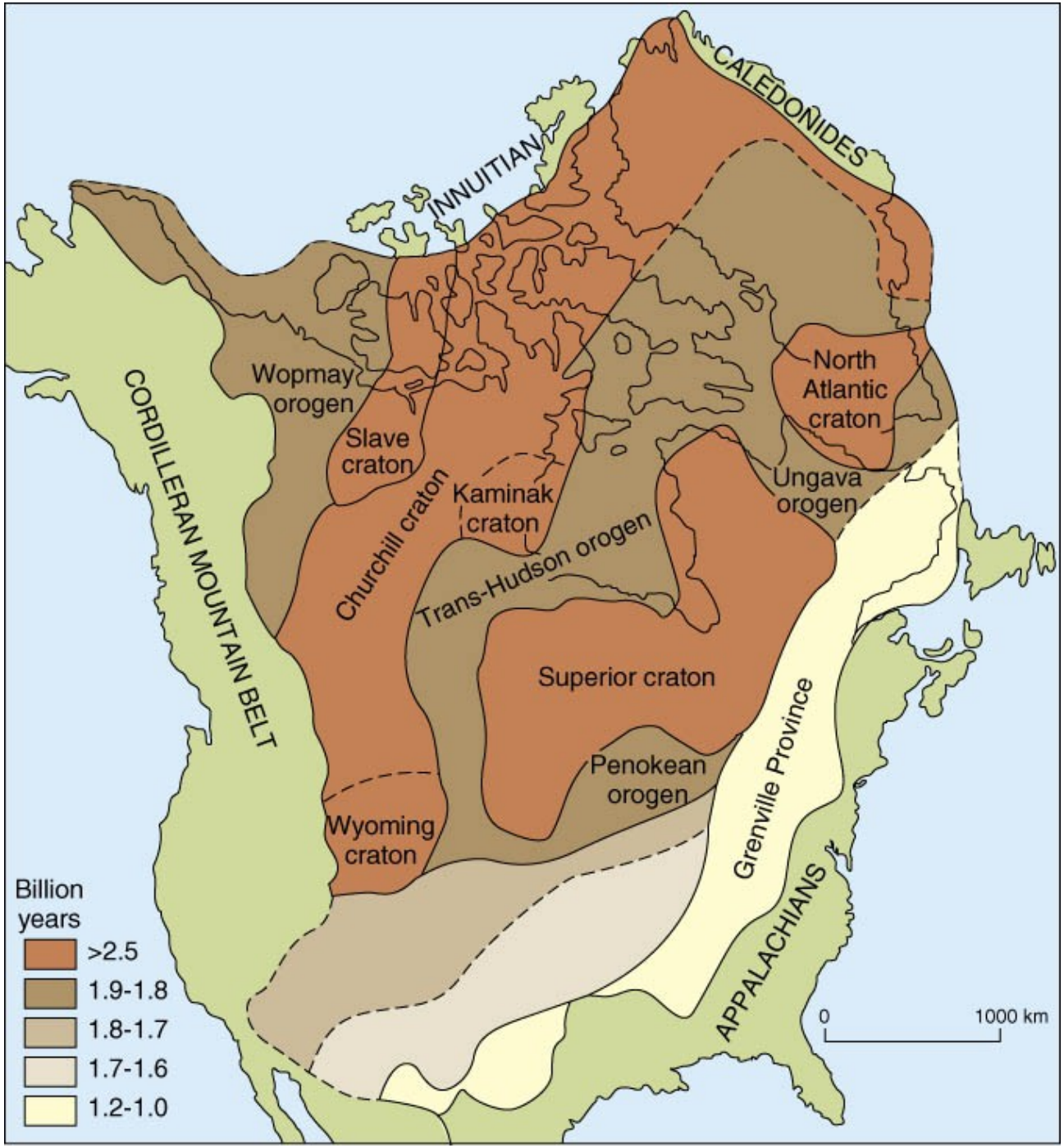
Fanerozoické mobilní zóny

Apalačskou mobilní zónu a na ní navazující pásmo Quatchita-Marathon

Kordilerská mobilní zóna

Franklinsko-inuitská mobilní zóna


Franklin mobile belt
Cordilleran mobile belt
Canadian Shield
Williston Basin
Appalachian Basin
Michigan Basin
Cincinnati Arch
Platform
Illinois Basin
Nemaha Ridge
Ozark Dome
Appalachian mobile belt
Nashville Dome
Permian Basin
Ouachita mobile belt
© 2001 Brooks/Cole Publishing/ITP


CALEDONIDES
INNUITIAN
Wopmay orogen
Slave craton
Churchill craton
Kaminak craton
Trans-Hudson orogen
North Atlantic craton
Ungava orogen
Superior craton
Penokean orogen
Wyoming craton
CORDILLERAN MOUNTAIN BELT
Grenville Province
APPALACHIANS
Billion years
>2.5
1.9-1.8
1.8-1.7
1.7-1.6
1.2-1.0
0
1000 km

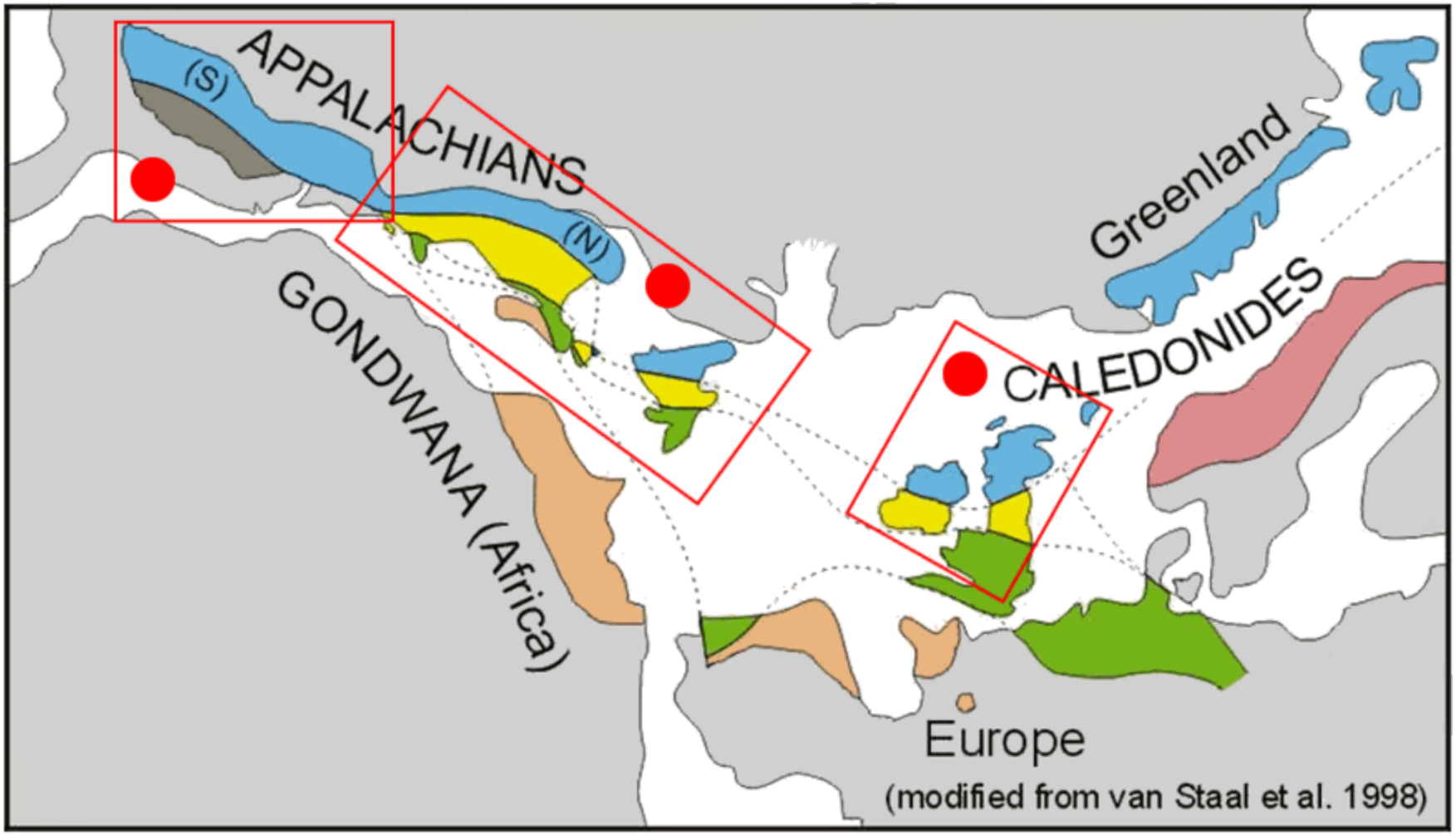
KALEDONSKO-VARISKÁ OROGENEZE

Grónské kaledonidy - kolize se skandinávskou části Evropy

Apalače – **teránní stavba, kaledonské (takonská, akadská) i variské (alleghanská) fáze**

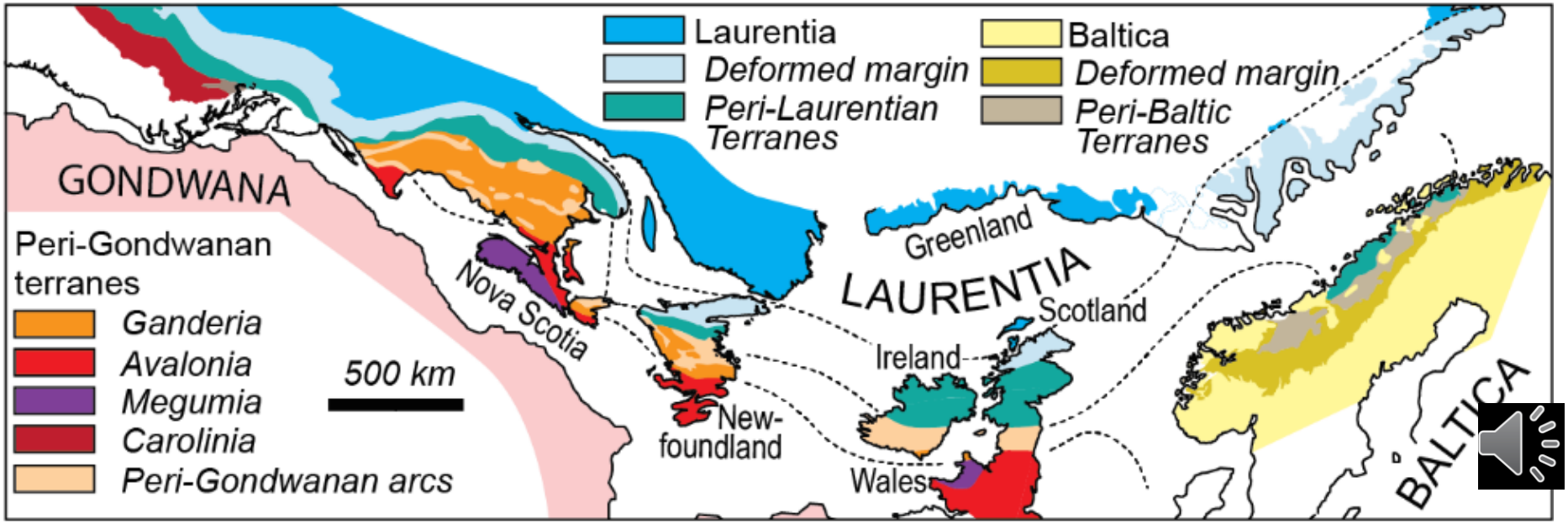
Pásmo Quatchita-Marathon – **alleghanská fáze, kolize s jihoamerickou části Gondwany**


LAURENTIA
BALTICA
AVALONIA
ARMORICA ??
Acadian orogeny
Mid-European Caledonides
Fida
Scotia
Caledonides
Greenland Caledonides
Scandinavian Caledonides
North-German-Polish Caledonides


APPALACHIANS
(S)
(N)
GONDWANA (Africa)
Greenland
CALEDONIDES
Europe
(modified from van Staal et al. 1998)

APALAČE

Apalače představují složený orogen, jehož tvorba probíhala jak během kaledonských fází tak během variských fází. Údaje seismiky ukazují, že celá jižní část Apalačí je pravděpodobně podstýlána velkou zónou odlepení a celý horský hřeben je alochtonní.
Apalače byly utvářeny při 3 orogenezích. **Takonská** orogeneze zahrnovala kolize perilaurentskými mikrokontinenty a s ostrovním oblouky situovanými v oceanu Iapetus v části přiléhající k Laurentii. **Akadská** a **neoakadská** fáze kolizi superteránu **Gander**, **Avalonie** a **Meguma** na severu a superteránu Carolina na jihu s tehdejším okrajem Laurentie. **Alleghanská** orogeneze potom kolizi s **Gondwanou**.



Laurentia – Humber, more to the south Valley and Ridge, Blue-Ridge teranes

- **Centrální zóna** – terány II a III, složitá akreční melanž teránů různé povahy situvaných v oceánu Iapetus a při jeho okrajích. Kontinentálních fragmenty, vulkanické oblouky, oceánické sedimenty. V podstatě se dají rozlišit terány, které vznikaly při okraji Laurentie a terány, které vznikaly při okraji perigondwany.
- V severní části Apalačí pří laurentském okraji Humberu to je zejména zóna Notre Dame, vznikající na fragmentu Humberu. Při okraji perigondwanského teránu Gander je to zóna Exploits tvořená vulkanickými oblouky oceanické a kontinentální povahy (Popelogan arc – fragment Ganderu) a horninami zaobloukové pánve.
- V jižní části Apalačí je to superterán Carolina

Gondwanské terány – terány IV a V -Avalonia, Gander, Meguma, kolize s Gondwanou

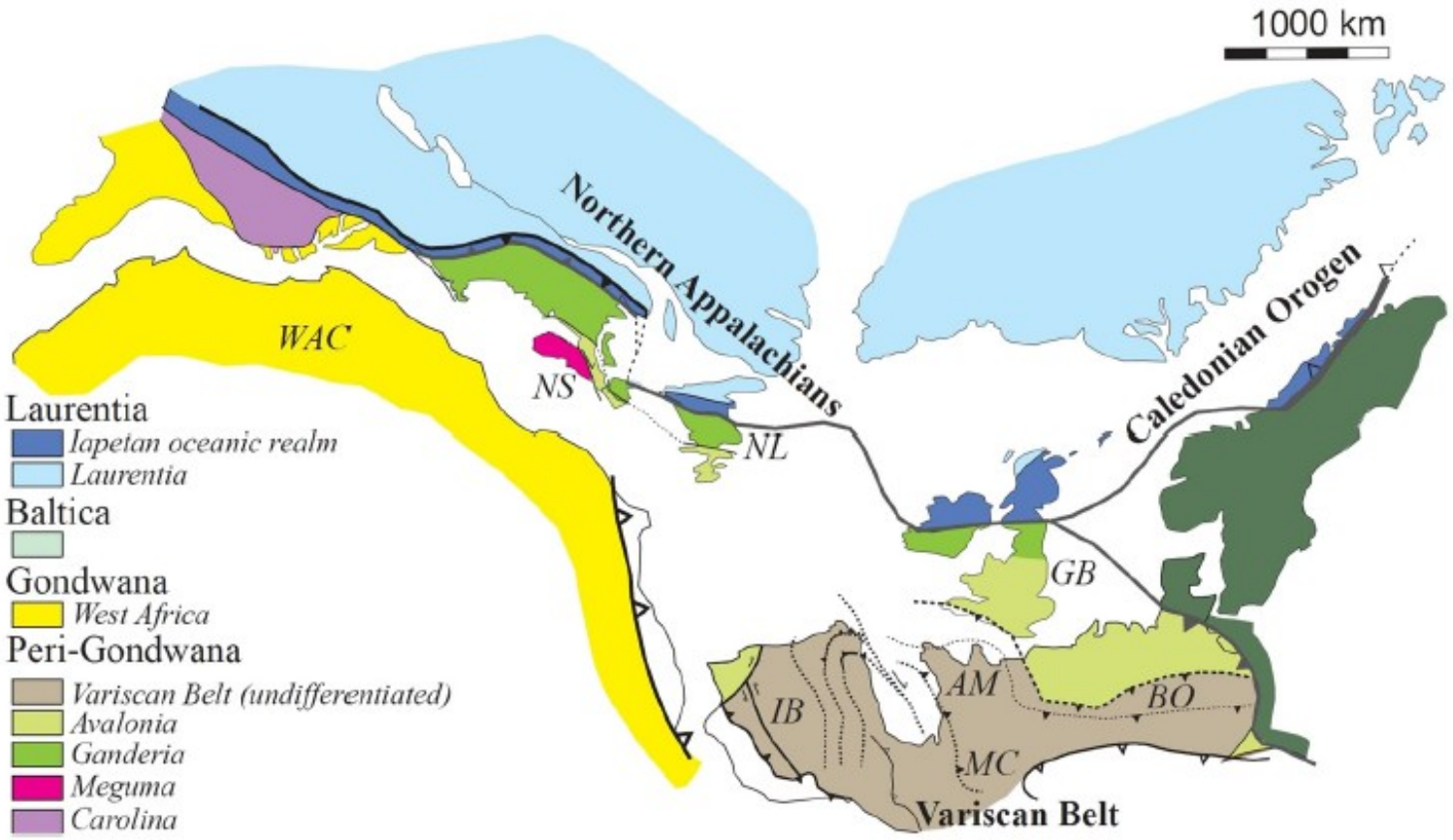


Fig. 1. Tectonicmap of the Appalachian-Variscan-Caledonian orogen. Tectonicmap showing the distribution of the Appalachian, Variscan and Caledonian belts at the end of the Paleozoic.
Shown are themajor cratonic andmicrocontinental components within the orogenic belts including Iberia (IB), Amorican Massif (AM), Massif Centrale (MC), Bohemian Massif (BO) and
theWest African Craton (WAC). This represents the approximate configuration of Pangea following late Paleozoic convergence between Laurentia and Gondwana.
The figure is modified from Hibbard et al. (2007), Barreiro et al. (2007), Keppie et al. (2008) and Pollock et al. (2011).

Severní Apalače

Terány skupiny I je tvořen sedimenty nejvyššího proterozoika a spodního paleozoika a svrchnoproterozoickým krystalinikem. Reprezentuje **fragmenty Laurentie** nebo **terány** původně situované blízko jejího kontinentálního okraje.

Terán Humber

Tektonicky mobilizovaný okraj Laurentie. Tento terán zahrnuje miogeosynklinálu situovanou na laurentinském pasivním kontinentálním okraji a takonské alochtony. Táhne se od SZ Newfoundlandu do zóny **Valley and Ridge a Blue Ridge na jihu**. Basement se skládá z **grenvilských** rul (1,0Ma) na kterých spočívají klastické a karbonátové riftové **sedimenty** kambria až spodního ordoviku

.

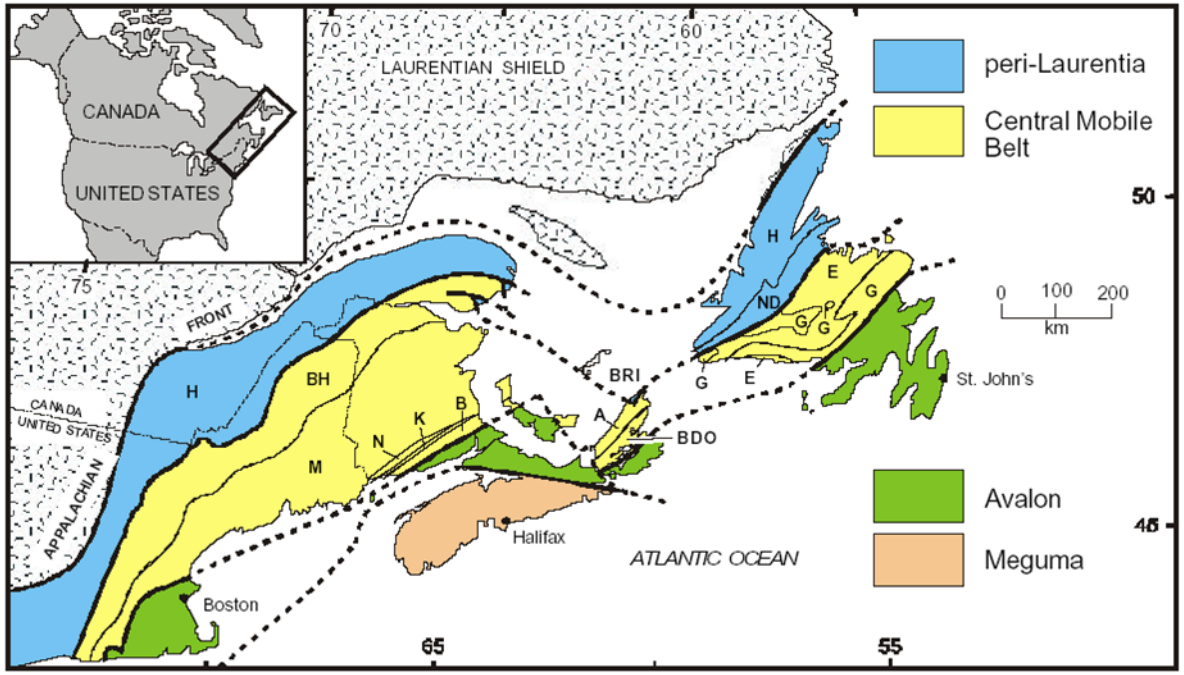
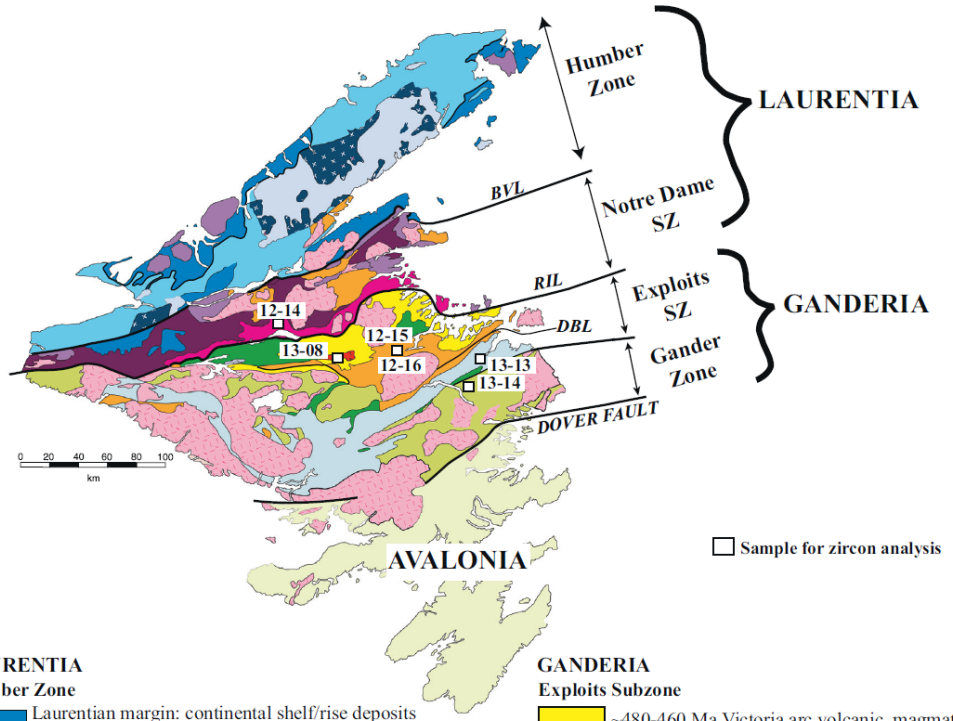


Figure 1. Simplified map of the northern Appalachian orogen showing crustal blocks and terranes (A, Aspy; B, Brookville; BDO, Bras d'Or; BH, Bronson Hill; BRI, Blair River inlier; E, Exploits; G, Gander; H, Humber; K, Kingston; M, Miramichi; N, New River; ND, Notre Dame;

Terány II a III reprezentuje **vulkanické ostrovní oblouky**, jedná se o **ofiolity** a přidruženou **akreční melánž**, Zahrnuje perihumberskou zónu **Notre Dame a periganderskou zónu Exploits**. Seismické údaje ukazují, že terány Notre Dame, zóna Exploits a Gander jsou alochtonní nad spodní kontinentální kůrou a že seveoamerický okraj pokračuje 70 km pod terán. Tyto terány představují jenom velmi hrubé rozdělení, protože **každý z nich se skládá ze značného počtu fragmentů** (nebo dílčích teránů?) různého původu. Obsahují mnoho ofiolitů a oblouků odvozených z Iapetu a deformovaných během kolize kontinentálních okrajů Laurentie a Avalonie. .



LAURENTIA

Humber Zone

- Laurentian margin: continental shelf/rise deposits & obduction melange
- ~1030-985 Ma Grenville basement intrusions
- ~1600-1000 Ma Grenville basement gneiss

Notre Dame Subzone

- ~490-456 Ma Notre Dame volcanics & plutonics
- ~485-475 Ma Annieopsquotch Accretionary tract volcanics & plutonics
- ~507-484 Ma Baie Verte Oceanic tract volcanics & ophiolitic rocks

GANDERIA

Exploits Subzone

- ~480-460 Ma Victoria arc volcanic, magmatic & sedimentary rocks
- ~475-455 Ma Exploits back-arc volcanics & sedimentary rocks
- ~515-486 Ma Penobscot arc volcanics and ophiolitic rocks

Gander Zone

- ~515-480 Ma Gander Group
- ~565 Ma Crippleback Granite suite

AVALONIA

- Undifferentiated Avalonian rocks

Overstep

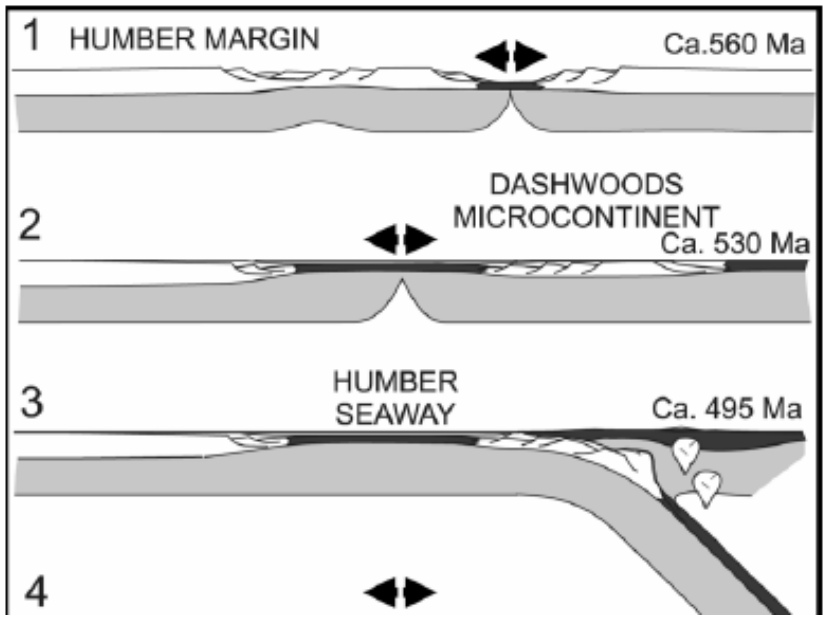
- ~440 Ma and younger plutons
- ~443-410 Ma shallow marine sedimentary rocks

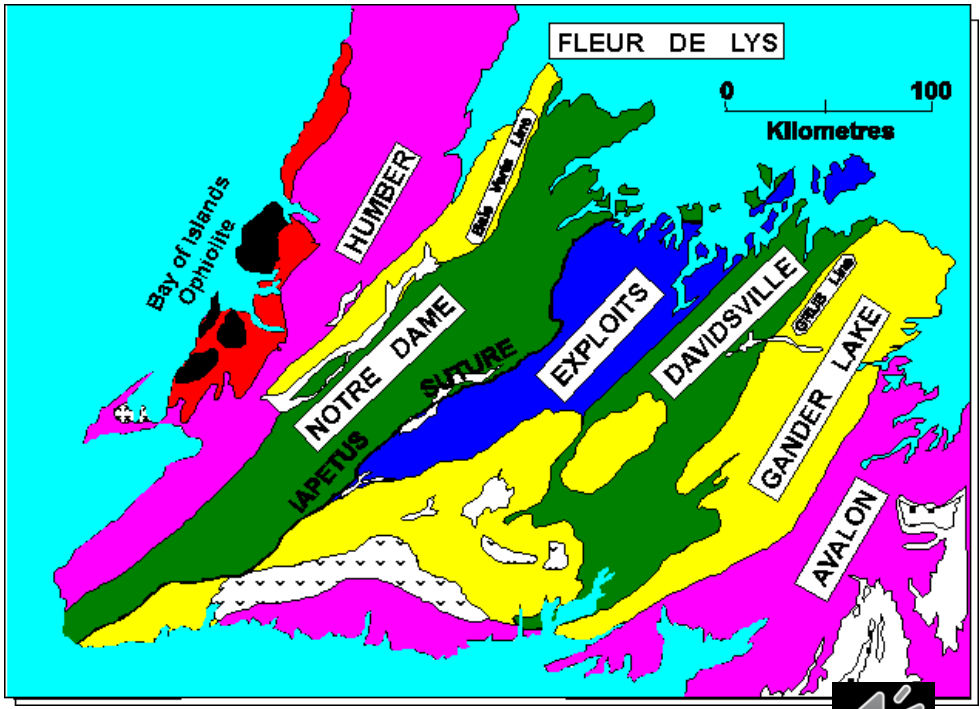
Notre Dame zone

Takonská orogeneze

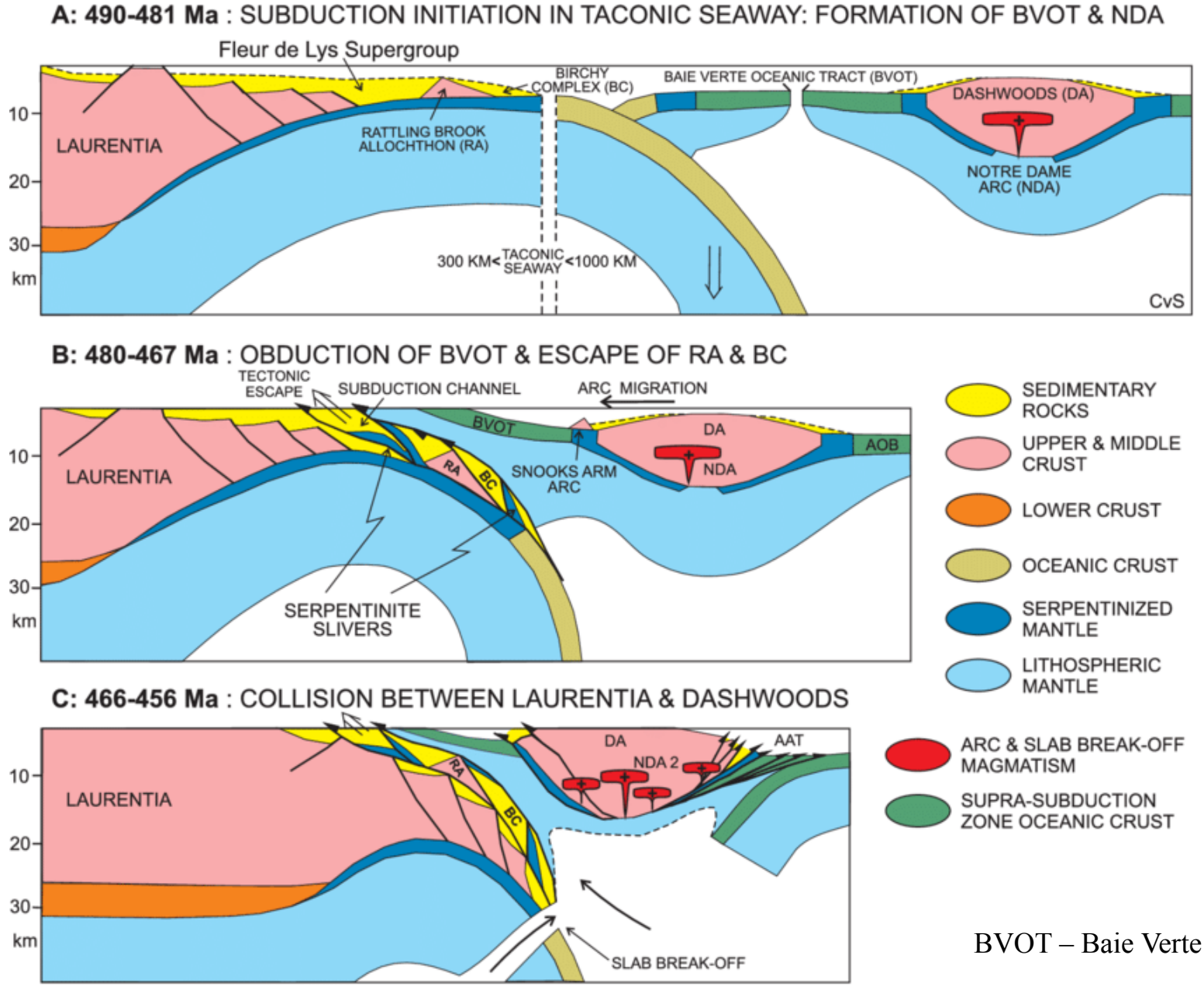
Takonská orogeneze zahrnuje tektonické eventy v období svrchní kambrium – svrchní ordovik. V první fázi se od terránu Humber odděli terán Dashwood. Takonská orogeneze potom souvisela s uzavíranímokrajového oceánu a s kolizí terránu Dashwood s terránem Humber.

Na kontinentální okraj jsou obdukovány **dva typy teránů** – **Fleur de Lys Supergroup** (metapelity a meetapsamity interpretované jako sedimenty kontinentálního svahu na jv od karbonátové sedimentace + ofiolity) a **velké alochtony** obsahující **ofiolity** jako jsou **Bay of Island Complex** nebo **Baie Verte** oceanic tract), který byly obdukovány v llanvirnu.



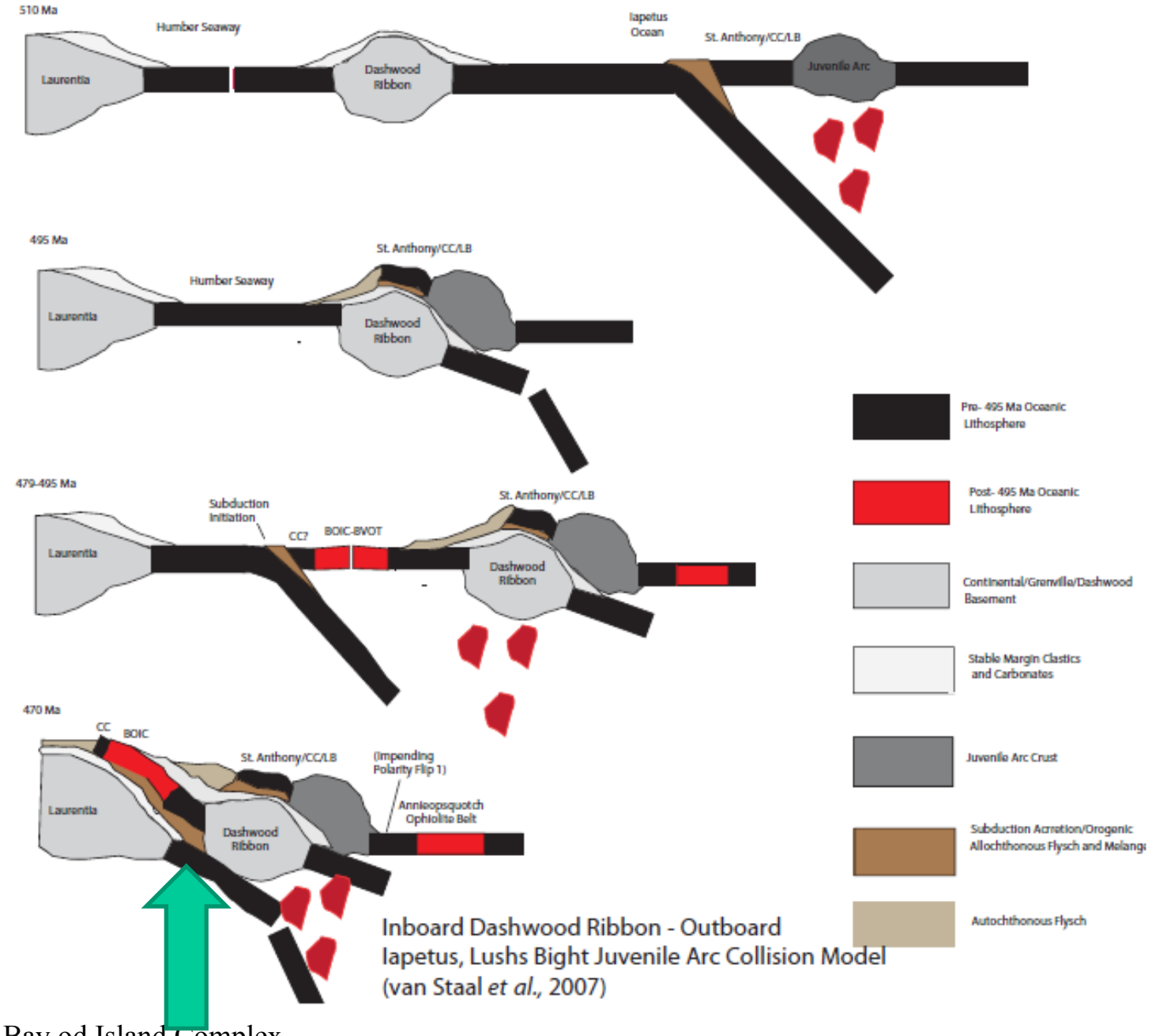


Vznik komplexu Bay of Island



BVOT – Baie Verte oceanic tract

Figure 11. Schematic tectonic evolution of the closure of the Taconic sea-way and the Notre Dame arc-Laurentia collision between 490 and 456 Ma.. **A**: **Initiation of eastdirected subduction** in the Taconic sea-way at ca. 490 Ma, which led to suprasubduction zone spreading and formation of the boninitic ophiolites of the Baie Verte oceanic tract (BVOT) and **first phase of the Notre Dame arc** (489-476 Ma). The BVOT became basement to the forearc basin attached to the Notre Dame arc, as indicated by ample continental arc fragments in the basal part of the Flat Water Pond/Snooks Arm groups deposited above the BVOT (Skulski et al. 2010). These figures are a continuation of Figure 9 of van Staal et al. (2013), which illustrated the progressive hyperextension of the Humber margin with exhumation of lithospheric continental mantle onto the seafloor and the subsequent spreading that led to formation of the oceanic Taconic sea-way and isolation of Dashwoods.**B**: **Start of the Taconic collision**. Entrance and partial escape of former extensional allochthons (Rattling Brook allochthon) and transitional oceanic crust (Birchy Complex) of the hyperextended Humber margin of Laurentia into a progressively widening subduction channel. The hanging wall lid of the subduction channel is the partially obducted BVOT. Progressive steepening of the down-going Humber margin slab caused arc magmatism to locally migrate onto the BVOT, forming the 476-467 Ma extensional Snooks Arm arc. Onset of collision had initiated west-directed subduction east of Dashwoods (outside picture) forming the suprasubduction zone Annieopsquotch ophiolite belt (AOB, van Staal et al. 2007). **C**: **Further steepening of the down-going slab, fullscale collision between Dashwoods and Humber** margin, obduction of the BVOT onto the margin platform and further escape of the Rattling Brook allochthon and Birchy Complex above the closure temperature for argon diffusion in white mica. Magmatism following influx of asthenosphere after slab break-off took place in Dashwoods and locally in the obducted BVOT. Westdirected subduction east of Dashwoods formed the Annieopsquotch accretionary tract (AAT).

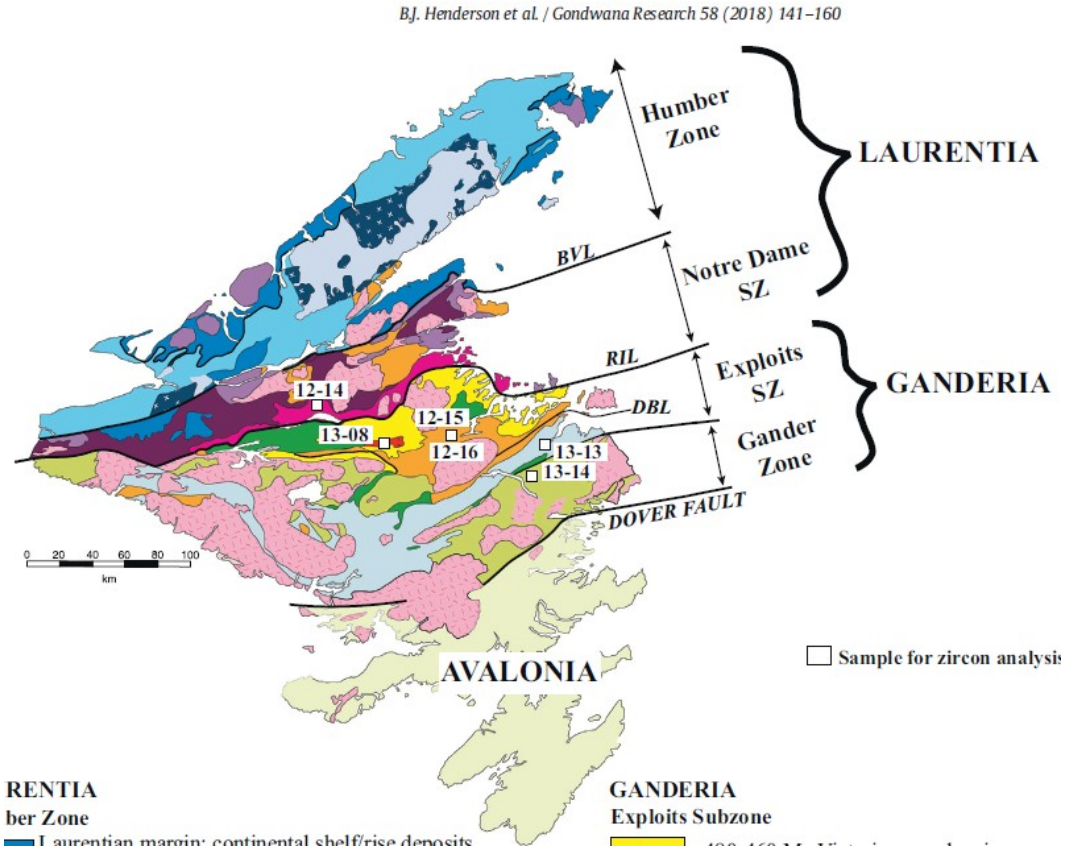


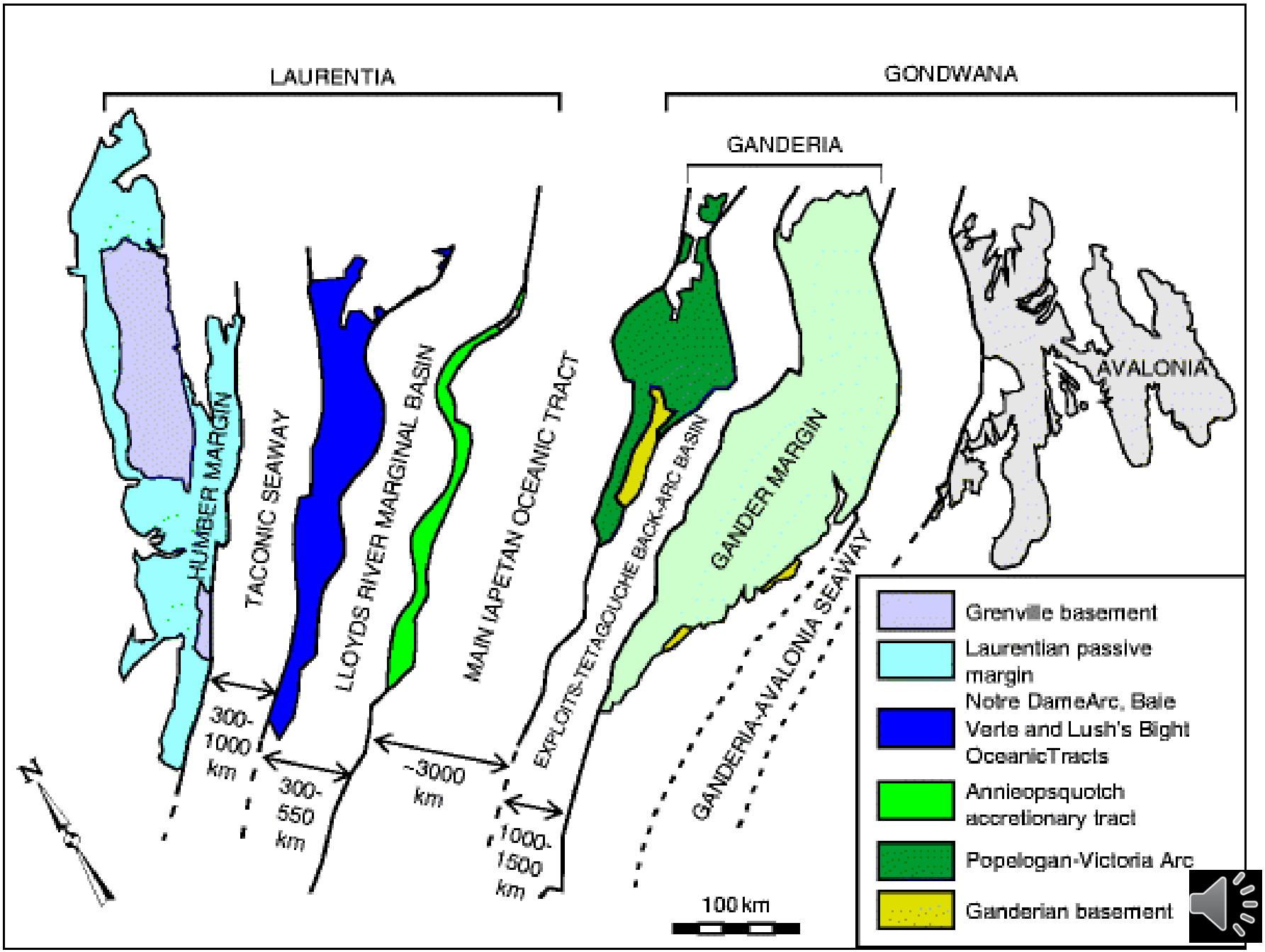
Inboard Dashwood Ribbon - Outboard Iapetus, Lushs Bight Juvenile Arc Collision Model (van Staal *et al.*, 2007)

Bay od Island Complex

Exploits Subzone

Zóna Exploits je tvoří spolu s teránem **Gander Ganderii**. Terán **Gander** se oddělil od Gondwany na konci proterozoika. Zahrnuje v**ulkanické oblouky a zaobloukové pánve**, které vznikaly v **důsledku subdukce pod okraj terénu Gander.** Riftimg nejprve oddělil okraj Ganderu a vytvořil mezi odděleným vulkanickým obloukem **Penobscot** zaobloukovou pánev (~515–485 Ma), která byla uzavřena po **penobscotské orogenezi** na počátku ordoviku~485 Ma . Další subdukce potom na okraji Ganderu vytvořila ostrovní oblouk **Popelogan-Victoria** a za ním zaobloukovou pánev~478 and 450 Ma. K uzavření zaobloukové pánve i oceánu **Iapetus** došlo **kolizí Ganderie s Laurentii** došlo během **salinické** fáze na počátku siluru.




LAURENTIA
GONDWANA
GANDERIA
AVALONIA
HUMBER MARGIN
TACONIC SEAWAY
LLOYDS RIVER MARGINAL BASIN
MAIN IAPETAN OCEANIC TRACT
EXPLOITS-TETAGOUCHE BACK-ARC BASIN
GANDER MARGIN
GANDERIA-AVALONIA SEAWAY
300-1000 km
300-550 km
~3000 km
1000-1500 km
100 km
Grenville basement
Laurentian passive margin
Notre DameArc, Baie Verte and Lush's Bight OceanicTracts
Annieopsquotch accretionary tract
Popelogan-Victoria Arc
Ganderian basement

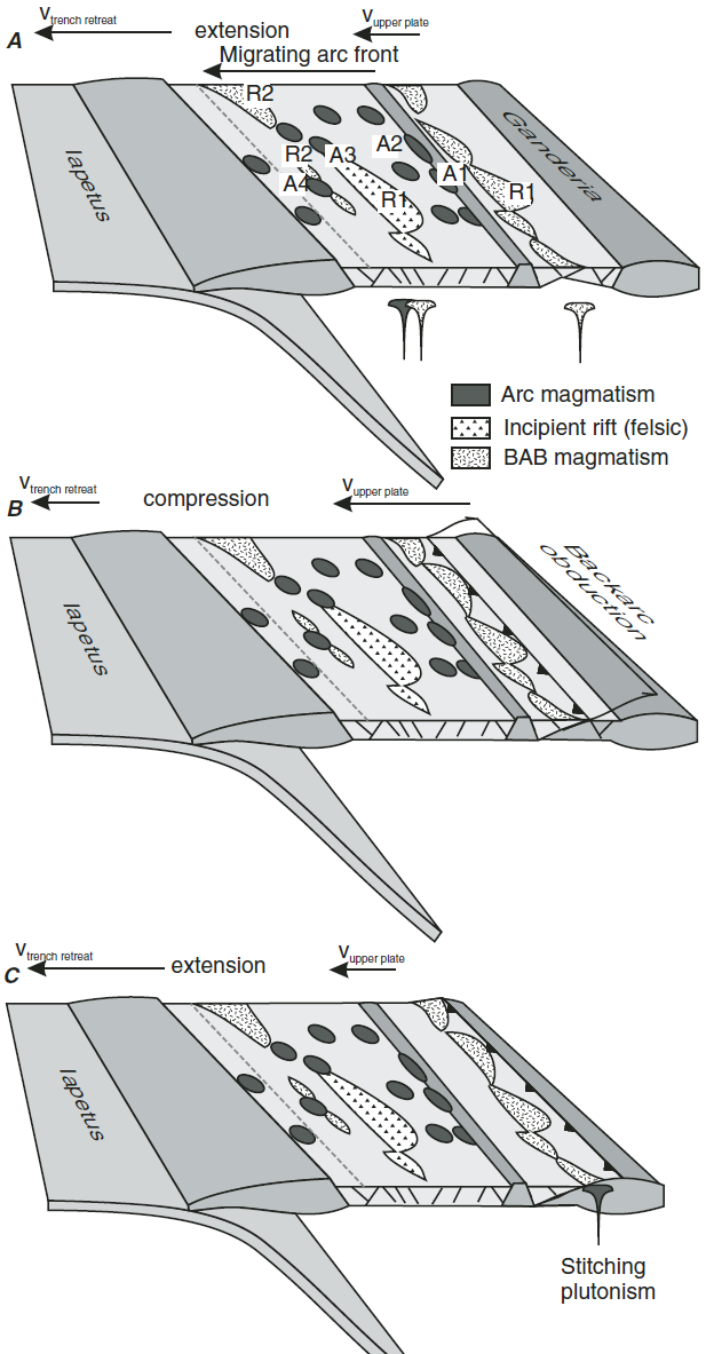


Figure 12. Schematic Cambrian to Early Ordovician development of
the Penobscot Arc and backarc on the Ganderian margin.

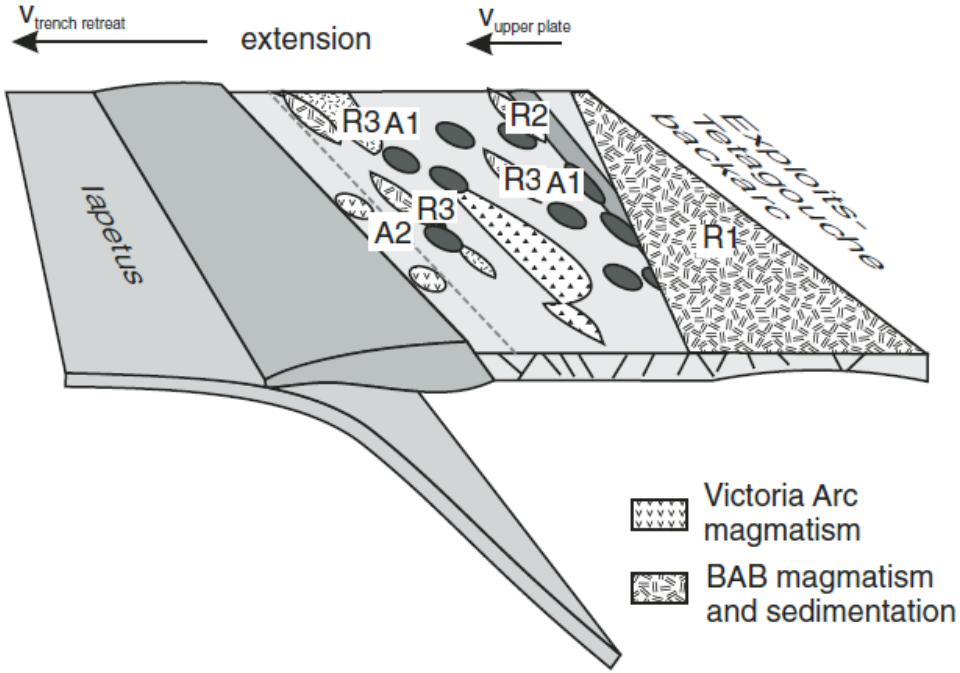
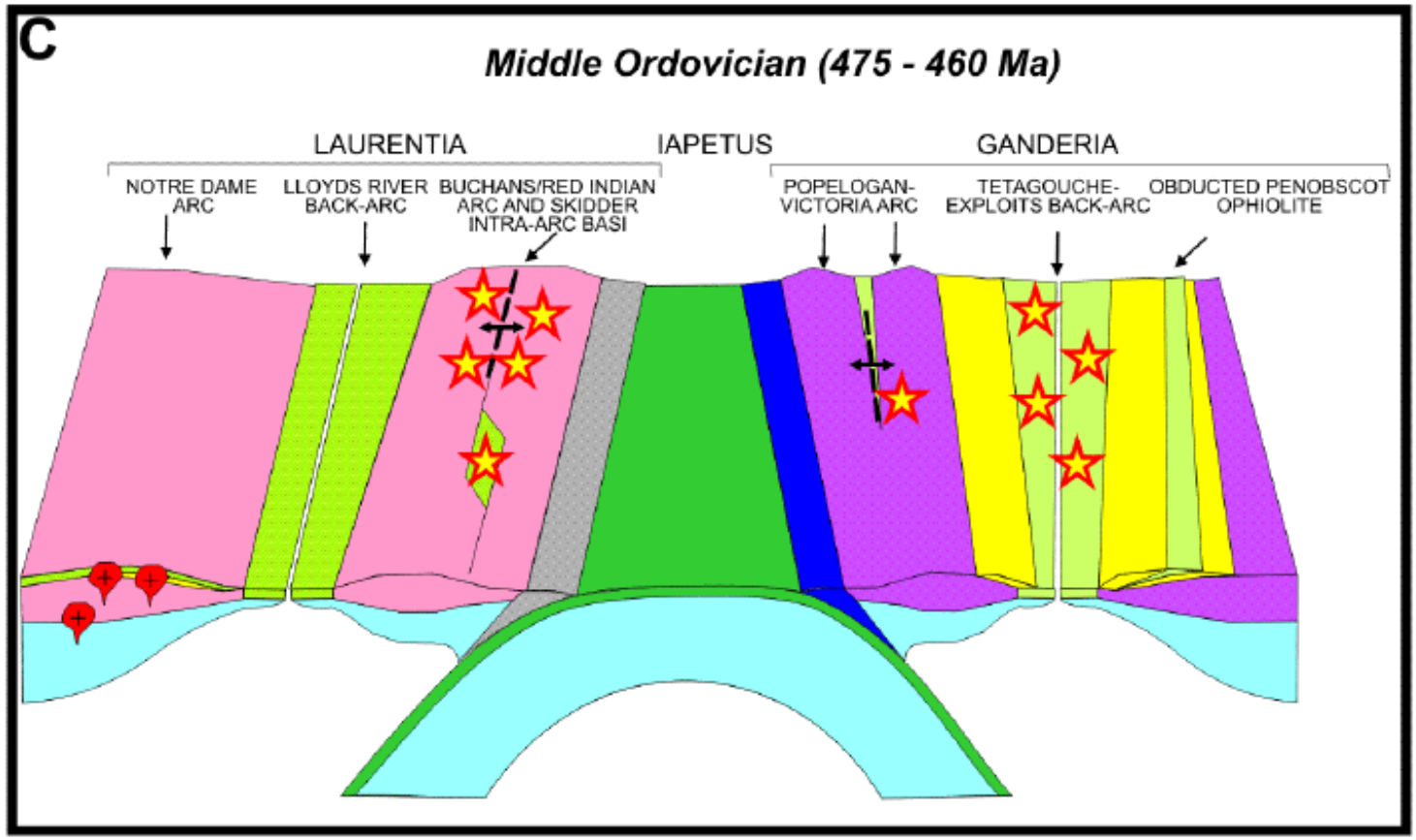
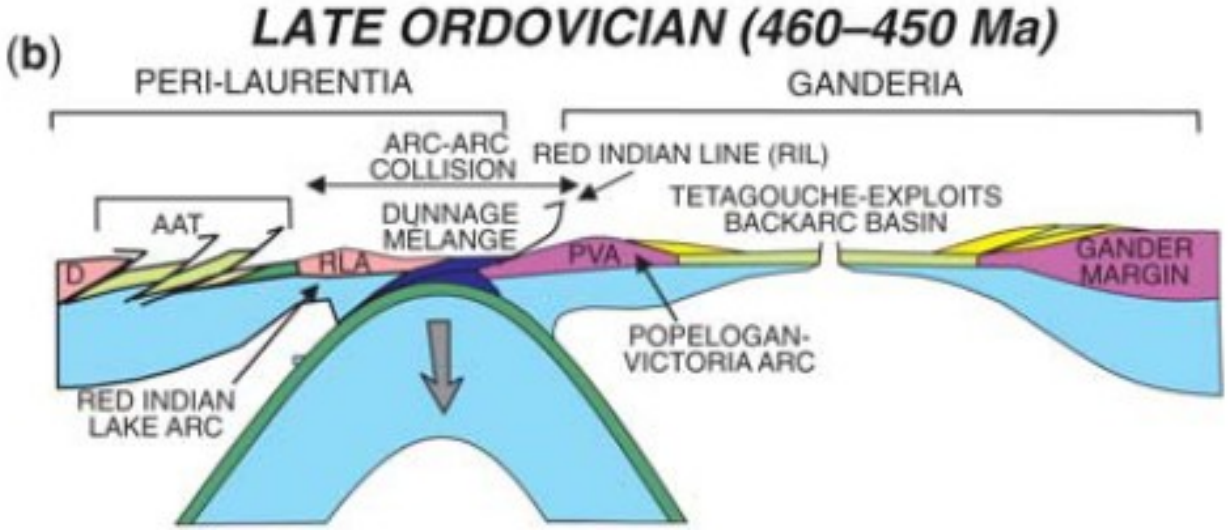
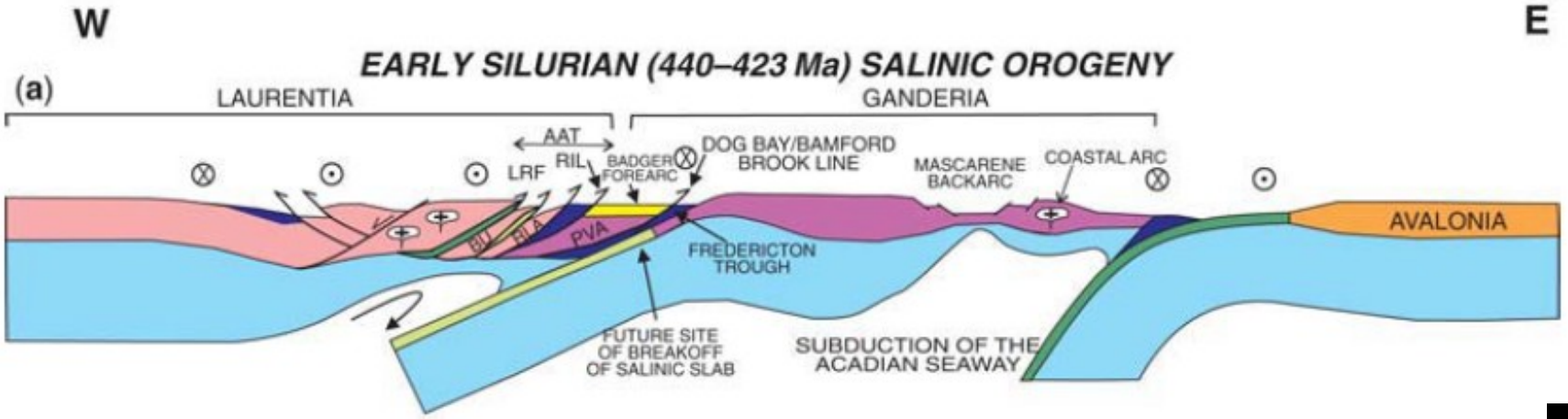


Figure 14. Schematic Middle Ordovician development of the Victoria Arc and backarc on the Penobscot Arc basement. A1–A2 are phases of arc development, and R1–R3 are phases of arc rifting. R1—rifting of Victoria Arc from the Ganderian margin and opening of a wideExploits-Tetagouche backarc basin (e.g., van Staal, 1994; Valverde-Vaquero et al., 2006b); A1, R2, and R3—widespread sporadic arc and rift related mafi c to bimodal magmatism above Penobscot basement;

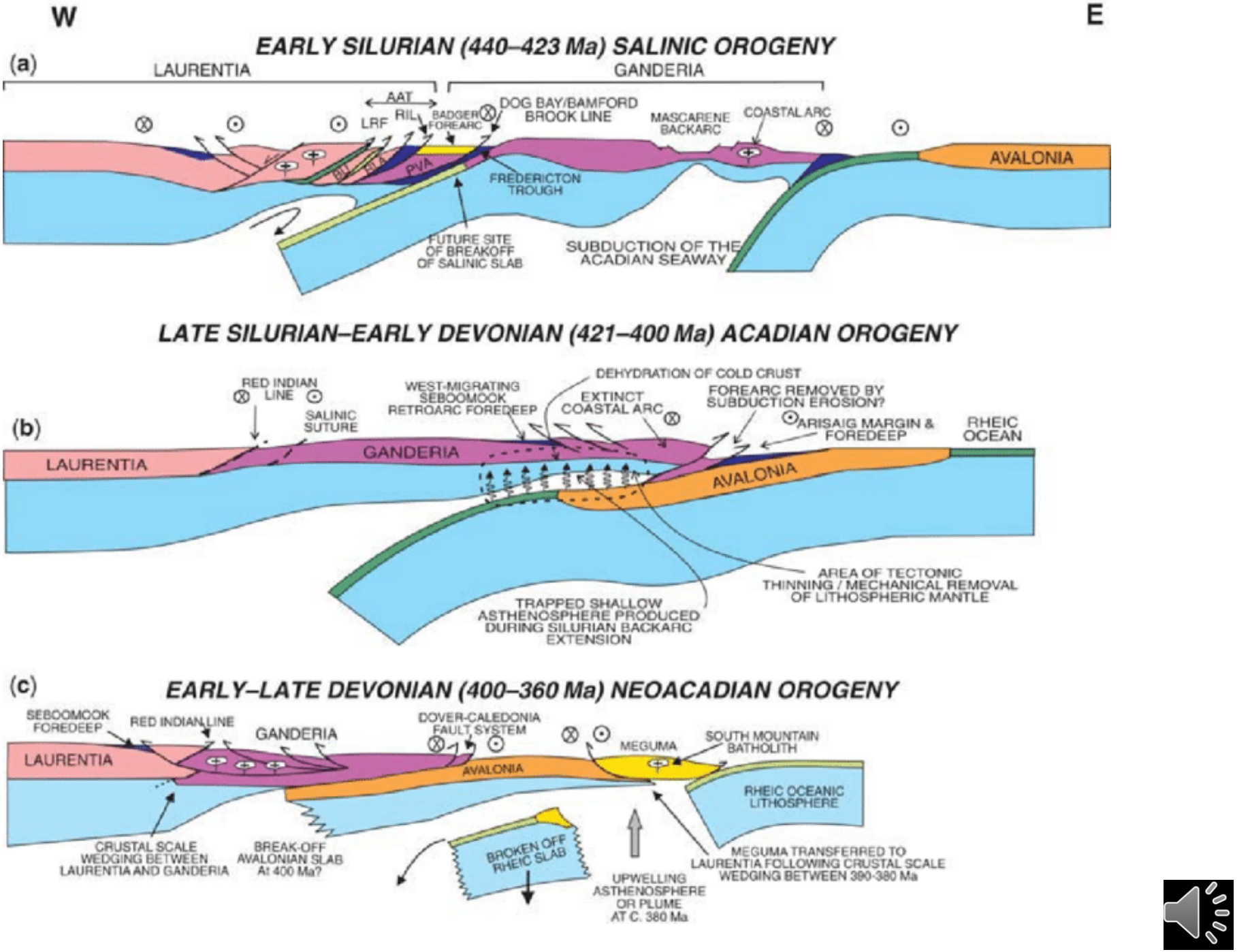

C
Middle Ordovician (475 - 460 Ma)
LAURENTIA
IAPETUS
GANDERIA
NOTRE DAME ARC
LLOYDS RIVER BACK-ARC
BUCHANS/RED INDIAN ARC AND SKIDDER INTRA-ARC BASI
POPELOGAN-VICTORIA ARC
TETAGOUCHE-EXPLOITS BACK-ARC
OBDUCTED PENOBSCOT OPHIOLITE

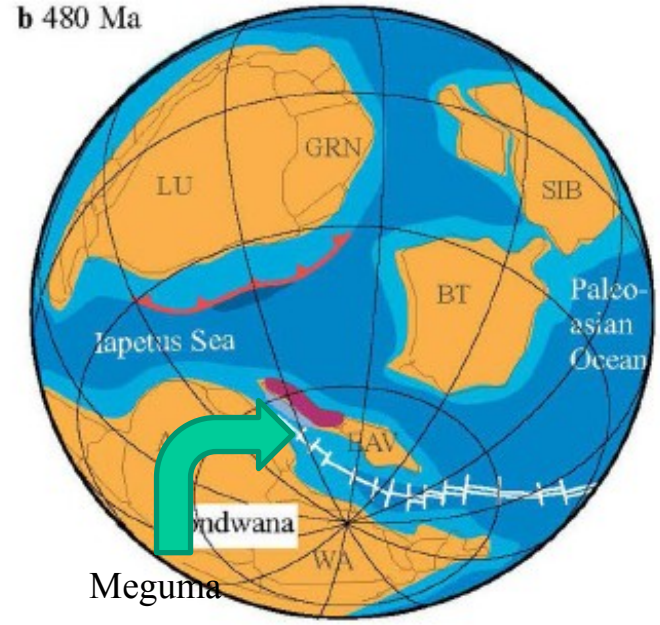

(b)
LATE ORDOVICIAN (460–450 Ma)
PERI-LAURENTIA
GANDERIA
ARC-ARC COLLISION
RED INDIAN LINE (RIL)
AAT
DUNNAGE MELANGE
TETAGOUCHE-EXPLOITS BACKARC BASIN
D
RLA
PVA
GANDER MARGIN
POPELOGAN-VICTORIA ARC
RED INDIAN LAKE ARC


W
E
(a)
EARLY SILURIAN (440–423 Ma) SALINIC OROGENY
LAURENTIA
GANDERIA
AAT
RIL
LRF
BADGER FOREARC
DOG BAY/BAMFORD BROOK LINE
MASCARENE BACKARC
COASTAL ARC
AVALONIA
PVA
FREDERICTON TROUGH
FUTURE SITE OF BREAKOFF OF SALINIC SLAB
SUBDUCTION OF THE ACADIAN SEAWAY

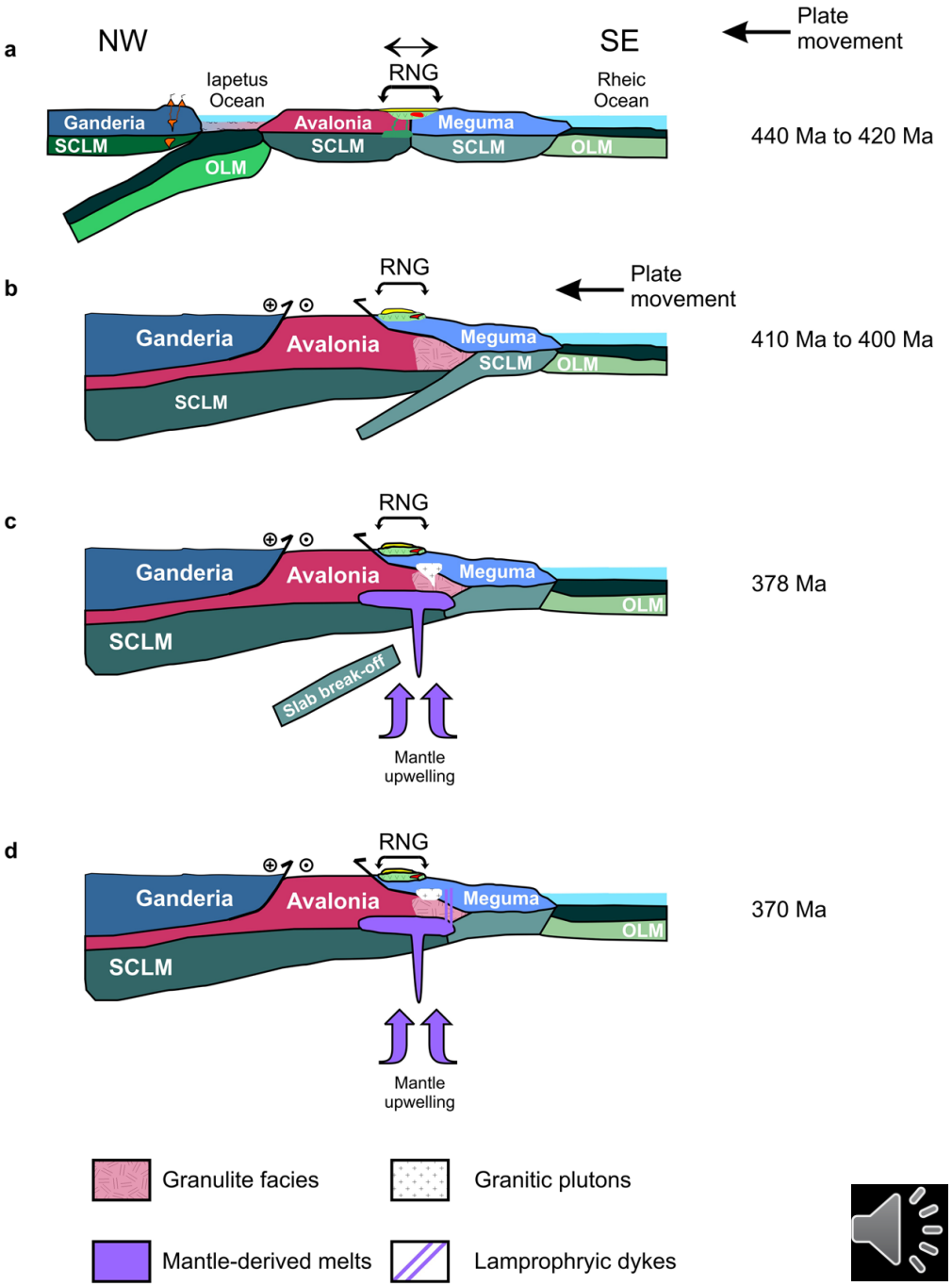
Terány skupiny IV a V

Terány Gander, Avalon a Meguma byly původně součástí **Gondwany**. Terán **Gander** se oddělil od Gondwany na konci **neoproterozoika**, **avalonský** terán v **kambriu**. **Avalonie** se vyvinula jako vulkanický oblouk na okraji Gondwany a je tvořena především **neoproterozoickými magmatickými horninami** kontinentálního okraje a **fosiliferními kambrickými sedimenty**. Má jinou přesilurskou historii než terán Gander a obzvláště odlišnou kambrickou trilobitovou faunu. Terán **Meguma** je tvořen hlavně **flyšoidnímim metasedimenty** kambria a ordoviku a ordovickými až devonskými **mělkovodními sedimenty** a bimodálními riftovými **vulkaknity**. Existují 2 modely vztahu teránů Meguma a Avalonie, podle jedné teorie to byly 2 oddělené terány, podle druhé Meguma byla součástí Avalonie.
Ganderia kolidovala s **Laurentii** během **salinické** fáze v siluru, **Avalonie a Meguma** potom během **akadských** fází. V karbonu potom došlo během **alleghanské** orogeneze ke kolizi **Laurentie** a **Gondwany**.


W
E
EARLY SILURIAN (440–423 Ma) SALINIC OROGENY
(a)
LAURENTIA
GANDERIA
AAT
RIL
LRF
BADGER FOREARC
DOG BAY/BAMFORD BROOK LINE
MASCARENE BACKARC
COASTAL ARC
AVALONIA
FREDERICTON TROUGH
FUTURE SITE OF BREAKOFF OF SALINIC SLAB
SUBDUCTION OF THE ACADIAN SEAWAY
LATE SILURIAN–EARLY DEVONIAN (421–400 Ma) ACADIAN OROGENY
(b)
RED INDIAN LINE
SALINIC SUTURE
WEST-MIGRATING SEBOOMOOK RETROARC FOREDEEP
DEHYDRATION OF COLD CRUST
EXTINCT COASTAL ARC
FOREARC REMOVED BY SUBDUCTION EROSION?
ARISAIG MARGIN & FOREDEEP
RHEIC OCEAN
LAURENTIA
GANDERIA
AVALONIA
AREA OF TECTONIC THINNING / MECHANICAL REMOVAL OF LITHOSPHERIC MANTLE
TRAPPED SHALLOW ASTHENOSPHERE PRODUCED DURING SILURIAN BACKARC EXTENSION
(c)
EARLY–LATE DEVONIAN (400–360 Ma) NEOACADIAN OROGENY
SEBOOMOOK FOREDEEP
RED INDIAN LINE
GANDERIA
DOVER-CALEDONIA FAULT SYSTEM
MEGUMA
SOUTH MOUNTAIN BATHOLITH
LAURENTIA
AVALONIA
RHEIC OCEANIC LITHOSPHERE
CRUSTAL SCALE WEDGING BETWEEN LAURENTIA AND GANDERIA
BREAK-OFF AVALONIAN SLAB At 400 Ma?
BROKEN OFF RHEIC SLAB
UPWELLING ASTHENOSPHERE OR PLUME AT C. 380 Ma
MEGUMA TRANSFERRED TO LAURENTIA FOLLOWING CRUSTAL SCALE WEDGING BETWEEN 390-380 Ma


b 480 Ma
LU
GRN
SIB
BT
Paleo-
asian
Ocean
Iapetus Sea
HAV
ndwana
WA
Meguma


Ganderia terrane
Avalonia terrane
Meguma terrane
Shallow shelf
Ocean
Land mass
Subduction zone
spreading center


a
NW
SE
Plate movement
Iapetus Ocean
RNG
Rheic Ocean
Ganderia
Avalonia
Meguma
SCLM
SCLM
SCLM
OLM
OLM
440 Ma to 420 Ma
b
RNG
Plate movement
Ganderia
Avalonia
Meguma
SCLM
SCLM
OLM
410 Ma to 400 Ma
c
RNG
Ganderia
Avalonia
Meguma
SCLM
OLM
Slab break-off
Mantle upwelling
378 Ma
d
RNG
Ganderia
Avalonia
Meguma
SCLM
OLM
Mantle upwelling
370 Ma
Granulite facies
Granitic plutons
Mantle-derived melts
Lamprophryic dykes

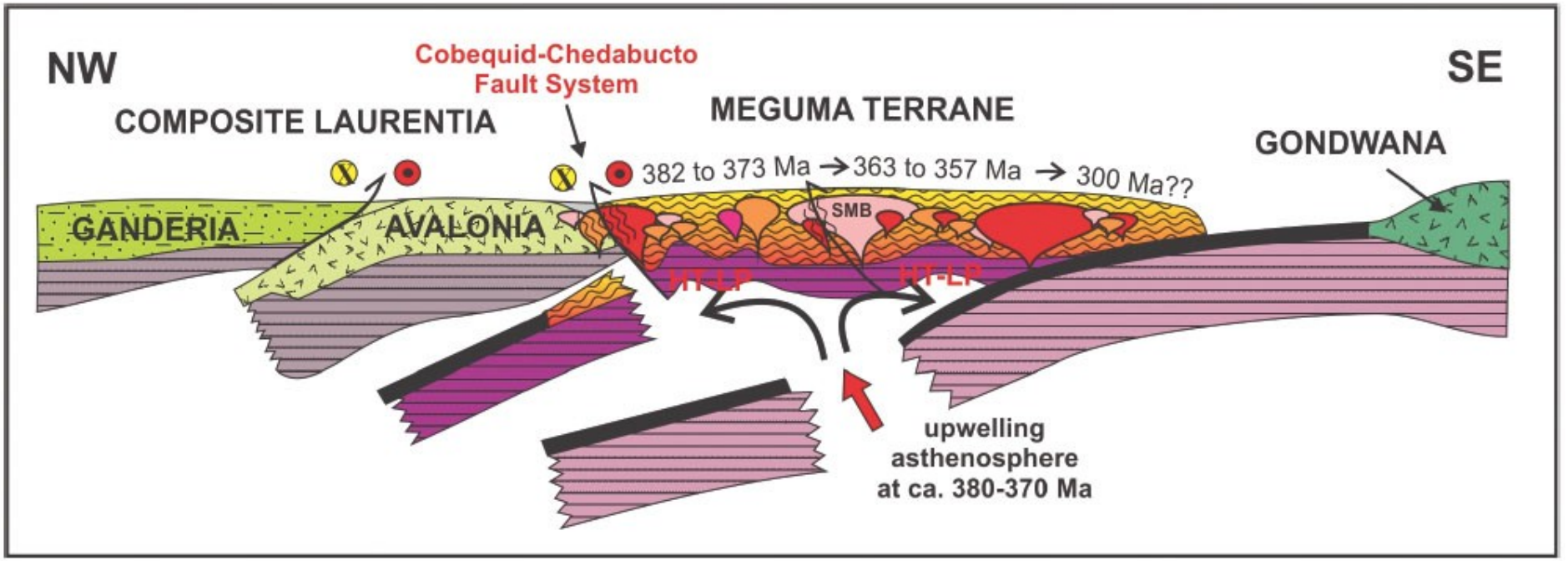
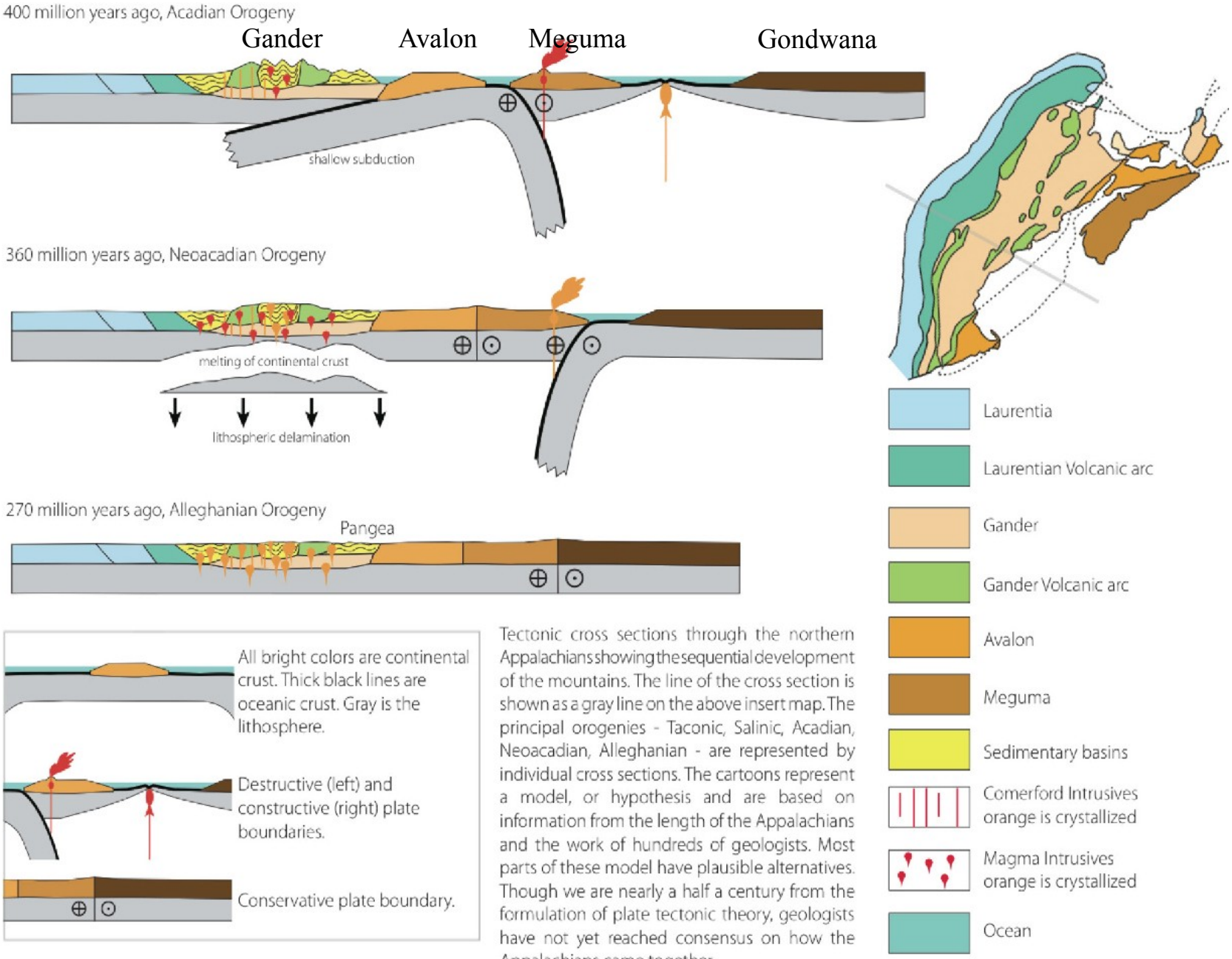
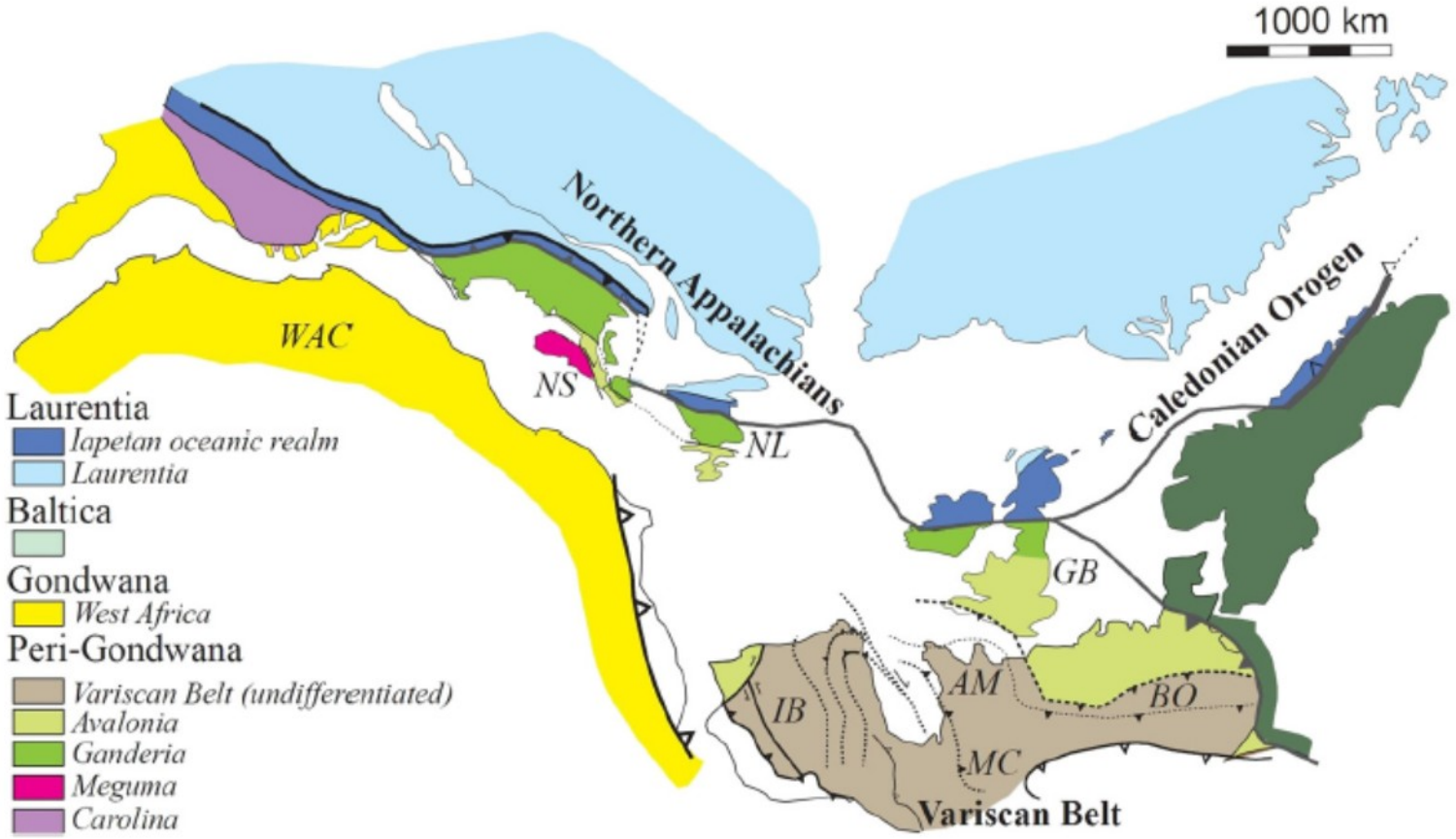


Figure 3. A tectonic model for the Neoacadian orogeny and related pluton emplacement (after Moran et al. 2007). Pluton emplacement in Meguma terrane may have been related to subduction of the Rheic Ocean lithosphere outboard of Meguma, likely combined with slab-breakoff which also caused high-temperature/low-pressure (HT-LP) metamorphism.

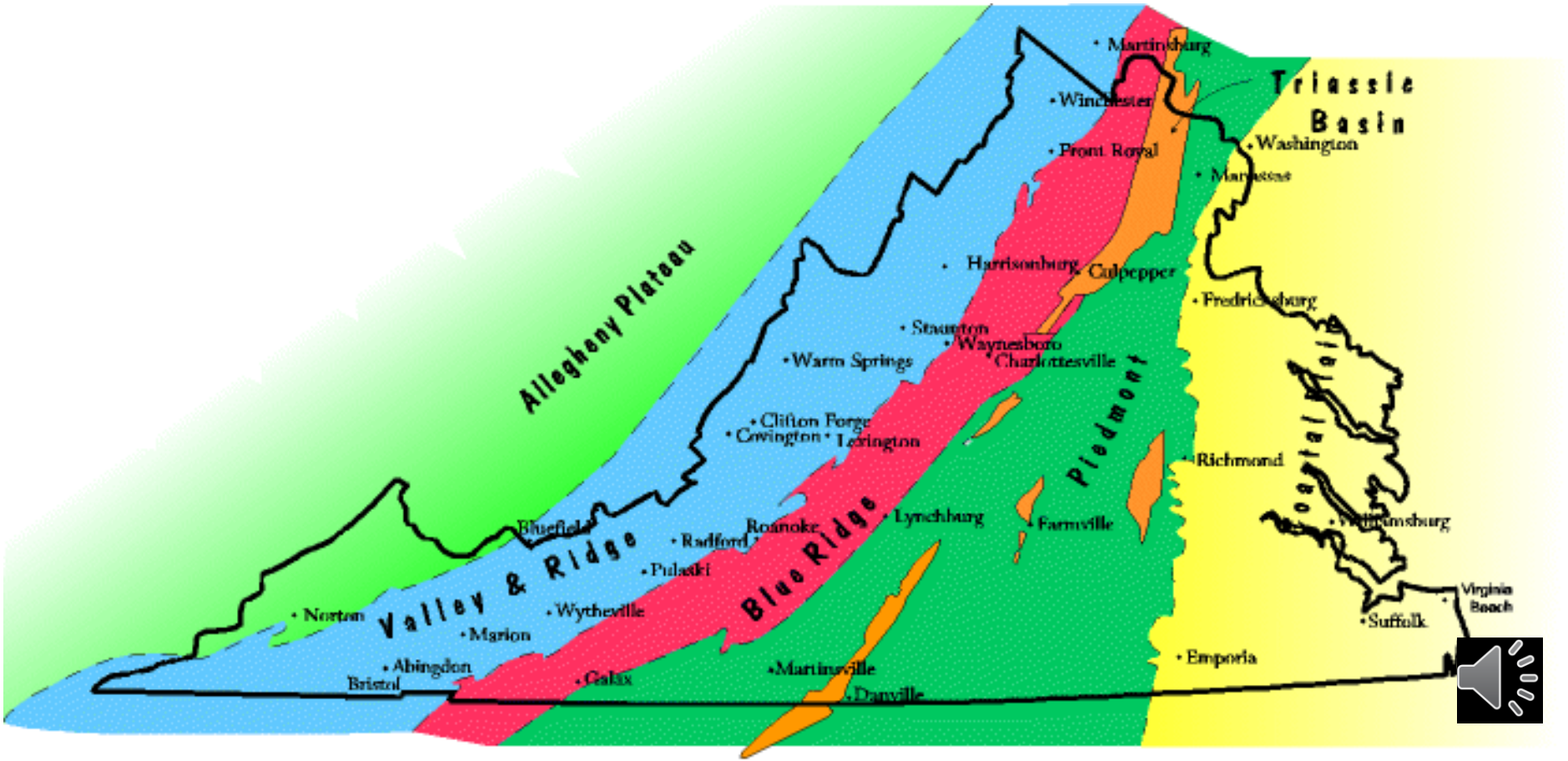


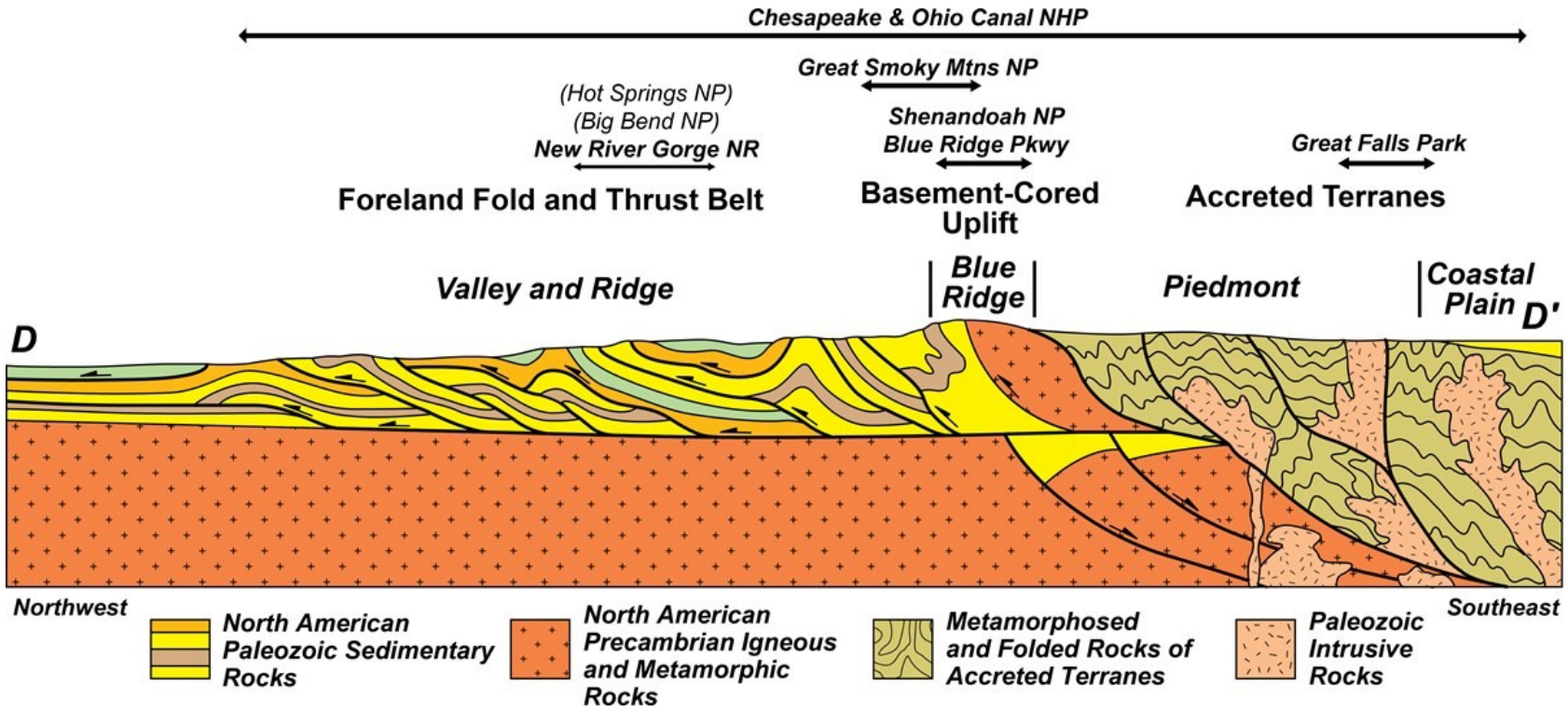
Tectonic cross sections through the northern Appalachians showing the sequential development of the mountains. The line of the cross section is shown as a gray line on the above insert map. The principal orogenies - Taconic, Salinic, Acadian, Neoacadian, Alleghanian - are represented by individual cross sections. The cartoons represent a model, or hypothesis and are based on information from the length of the Appalachians and the work of hundreds of geologists. Most parts of these model have plausible alternatives. Though we are nearly a half a century from the formulation of plate tectonic theory, geologists have not yet reached consensus on how the Appalachians came together.


1000 km
Northern Appalachians
Caledonian Orogen
WAC
NS
NL
GB
IB
AM
BO
MC
Variscan Belt
Laurentia
Iapetan oceanic realm
Laurentia
Baltica
Gondwana
West Africa
Peri-Gondwana
Variscan Belt (undifferentiated)
Avalonia
Ganderia
Meguma
Carolina

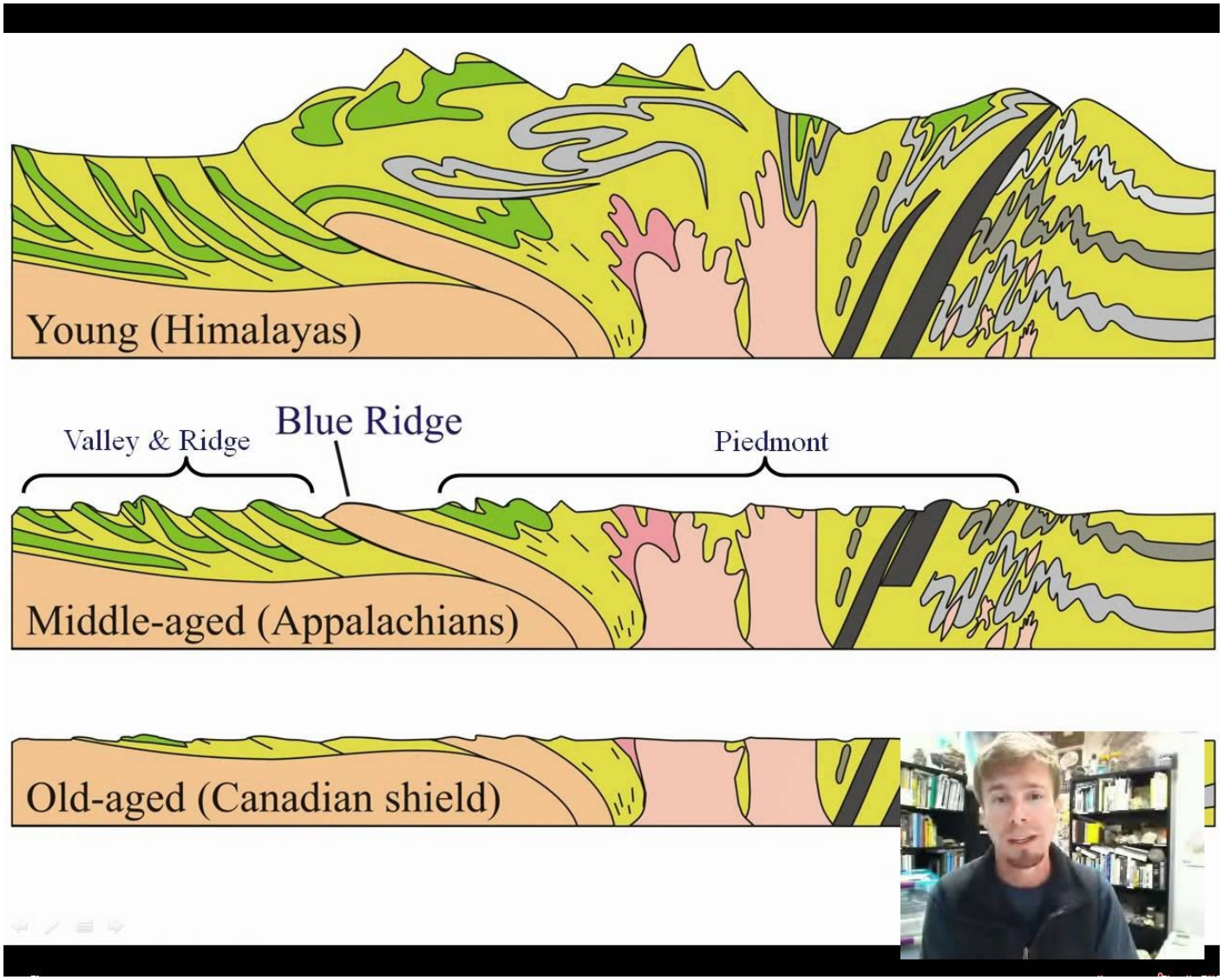
Jižní část Apalačí

Tektonicky modifikované okraje Laurentie zahrnují na západě provincii **Valley and Ridge** tvořenou spodnopaleozoickými sedimenty okraje Laurentie a na východě provincii **Blue Ridge** tvořenou především krystalinikem (mettamorfity, granitiody) a méně sedimenty



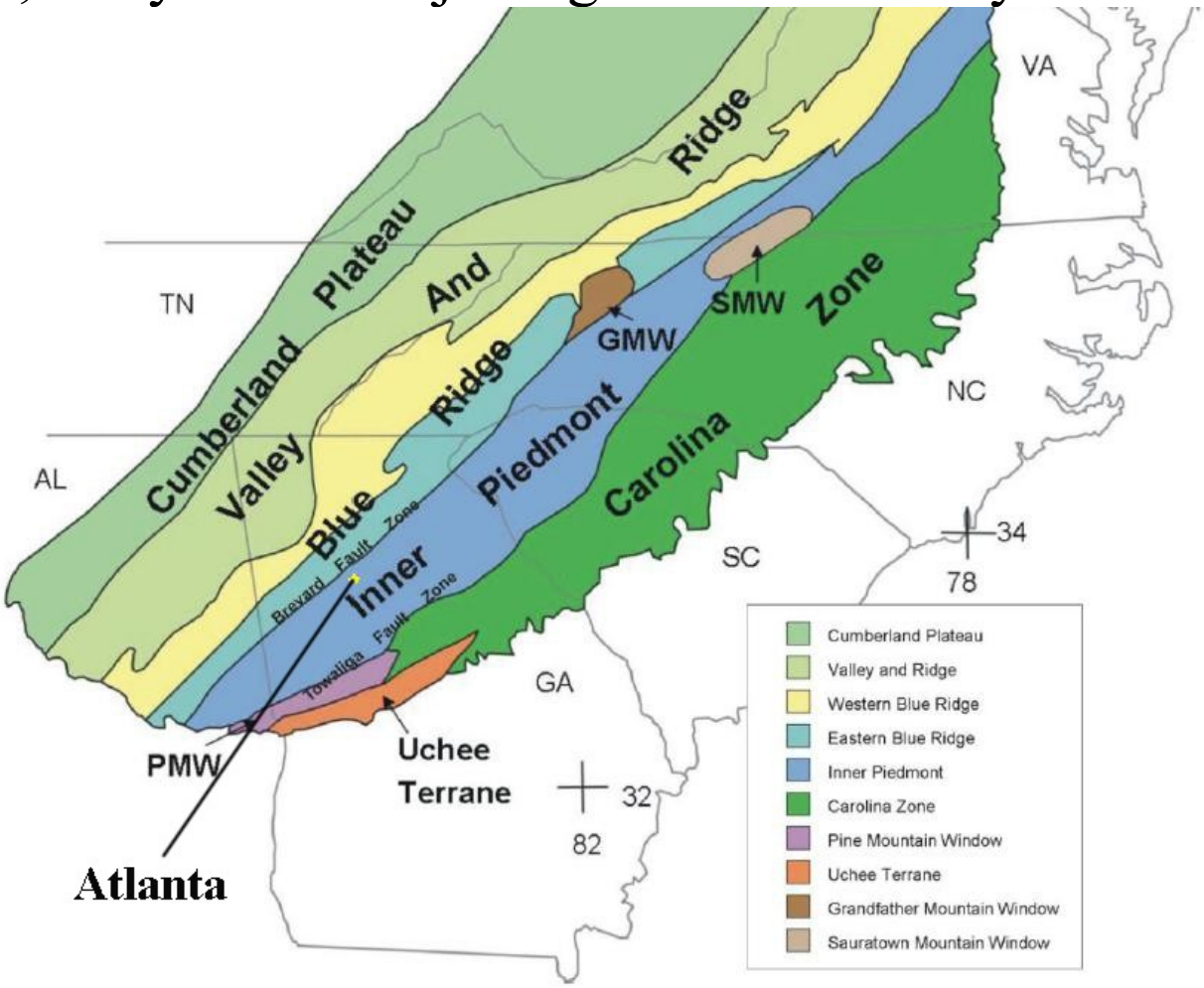

Chesapeake & Ohio Canal NHP
Great Smoky Mtns NP
(Hot Springs NP)
(Big Bend NP)
New River Gorge NR
Shenandoah NP
Blue Ridge Pkwy
Great Falls Park
Foreland Fold and Thrust Belt
Basement-Cored Uplift
Accreted Terranes
Valley and Ridge
Blue Ridge
Piedmont
Coastal Plain
D
D'
Northwest
Southeast
North American Paleozoic Sedimentary Rocks
North American Precambrian Igneous and Metamorphic Rocks
Metamorphosed and Folded Rocks of Accreted Terranes
Paleozoic Intrusive Rocks

The central Blue Ridge (BR) recorded burial depths of 33 km (9.8 kb, pyx granulite) during the Taconian orogeny (480 450 Ma); the Inner Piedmont (IP) 23 km (7.1 kb, sill II) during the Acadian Neoacadian orogeny (407 350 Ma);

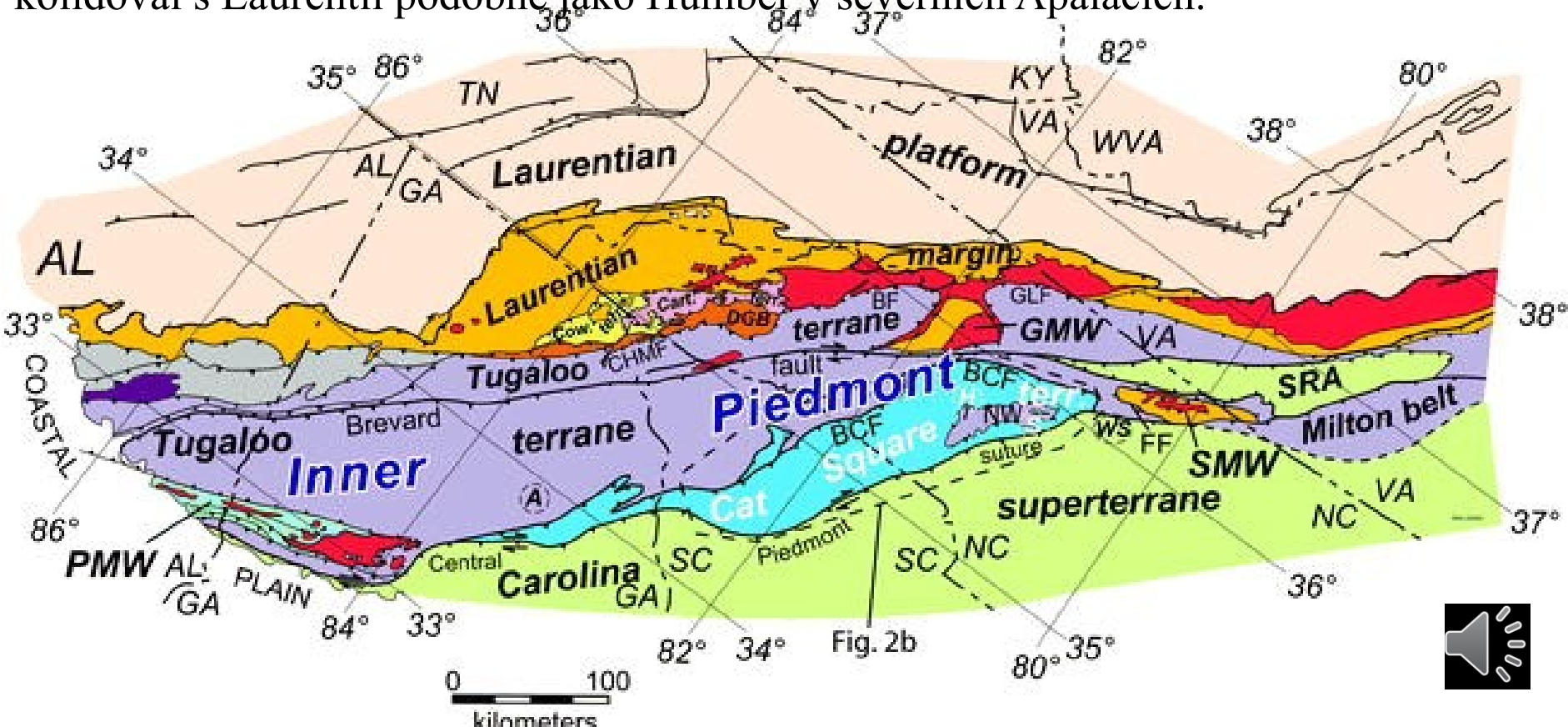


Terány II a III

Terány II a III jsou v jižní části Apalačí tvořeny perilaurentský superteránem (zónou) **Piedmont** a superteránem (zónou) **Carolina** vzniklým v blízkosti jihoamerické části Gonwany. Carolina je někdy řazena mezi perigondwanské terány, je to ale složený vulkanický oblouk, který neobsahuje fragment Gondwany.



Zóna(superterán) **Piedmont** je tvořena **perilaurentským** teránem **Tugaloo** a teránem **Cat Square**, jehož sedimenty obsahují jak laurentské tak perigodwanské zirkony.Piedmont je oddělen od zóny **Blue Ridge** zlomem **Brevard**. **Tugaloo** zahrnuje riftovaný **fragment Laurentie** a je tvořen metamorfovanými sedimenty a vulkanity. Zahrmuje i horniny **vulkanického oblouku Dadevill** a možná i dalších vulkanických opblouků. **Cat Square** terán reprezentuje silurodevonské akreční prizma před blížící se Carolinou. Během **takonské** orogeneze v ordoviku Tugaloo kolidoval s Laurentii podobně jako Humber v severních Apalačích.



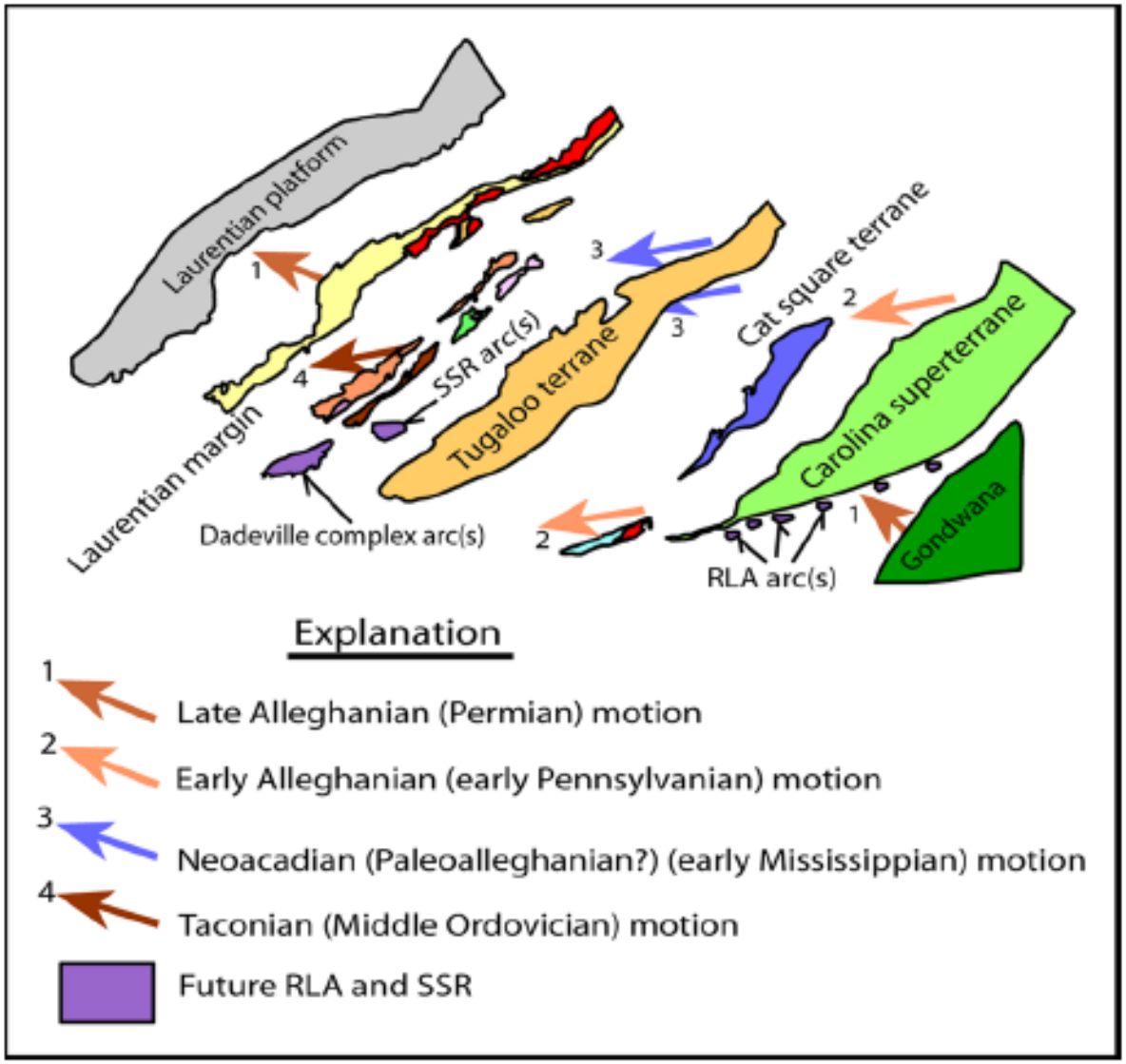
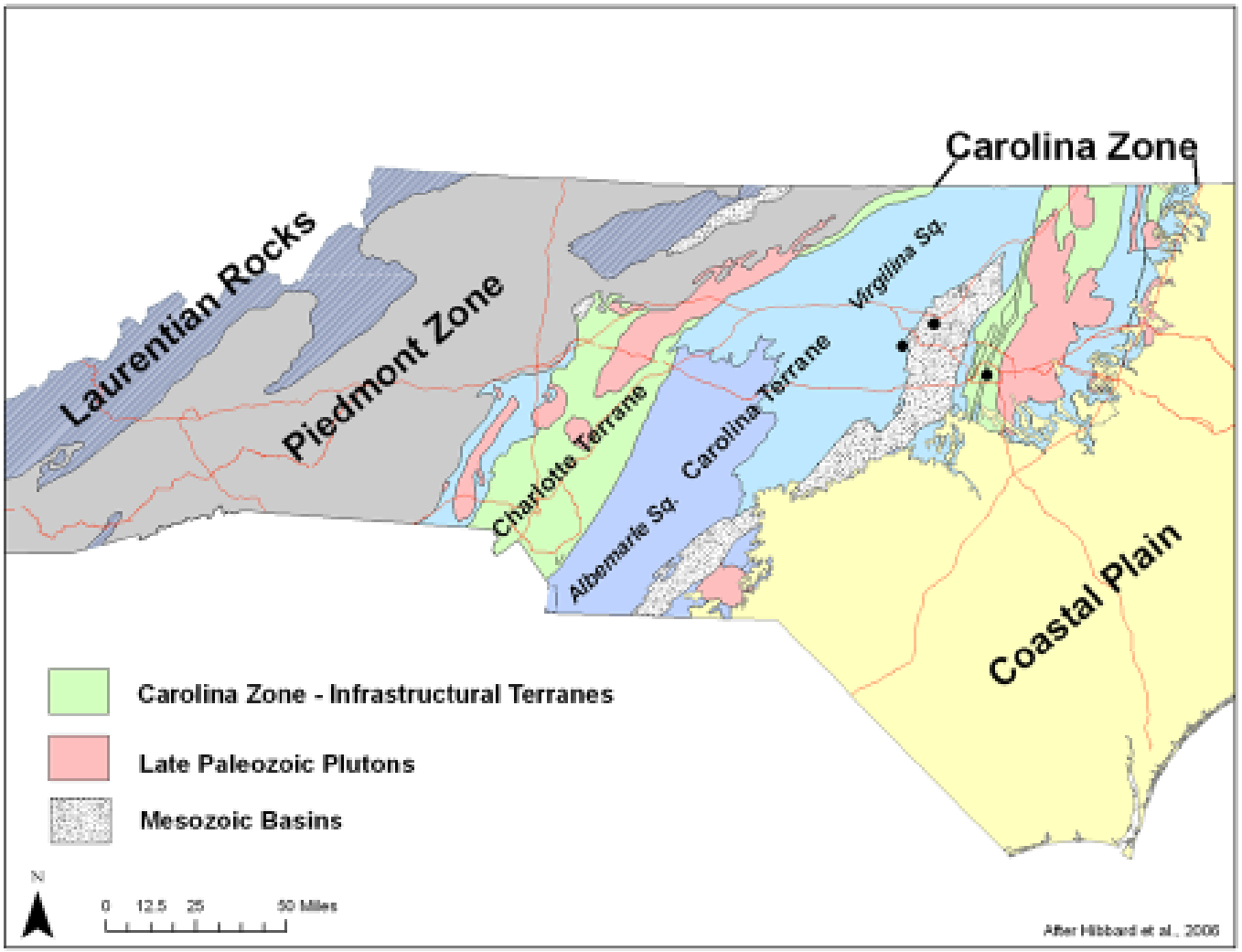
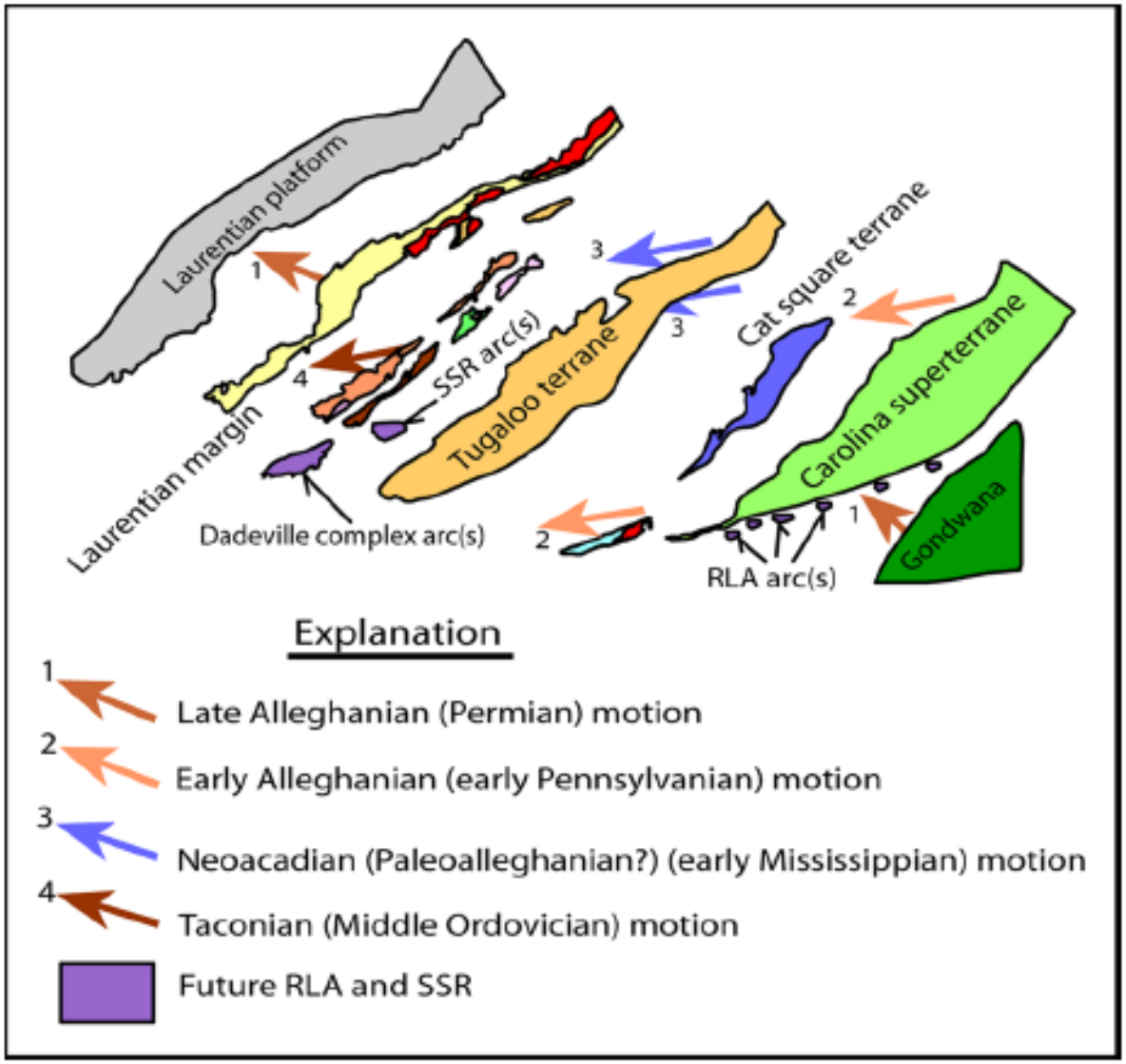


Fig. 15 Retrodeformed tectonostratigraphic terranes in the southern Appalachians with arrows indicating broad kinematics of assembly. Arrows shown are color-coded to show accretion timing (after Hatcher et al. 2007). Included are approximate positions of both the RLA and the SSR prior to thrusting of the SSR onto Tugaloo terrane and the RLA on the Carolina terrane due to terrane collision during final assembly of Pangea

Zóna(superterán) **Carolina** zahrnuje terán **Carolina**, složený vulkanický oblouk, který se vytvořil poblíž jihoamerické části Gondwany a vulkanický oblouk **Charlotte** a **další vulkanické oblouky**, které byly do stavby zóny začleněny na počátku paleozoika. Na konci devonu a ve spodním karbonu kolidovala superterán Carolina se superteránem Piedmont, který byl začleněn do stavby Laurentie během **takonské** fáze.





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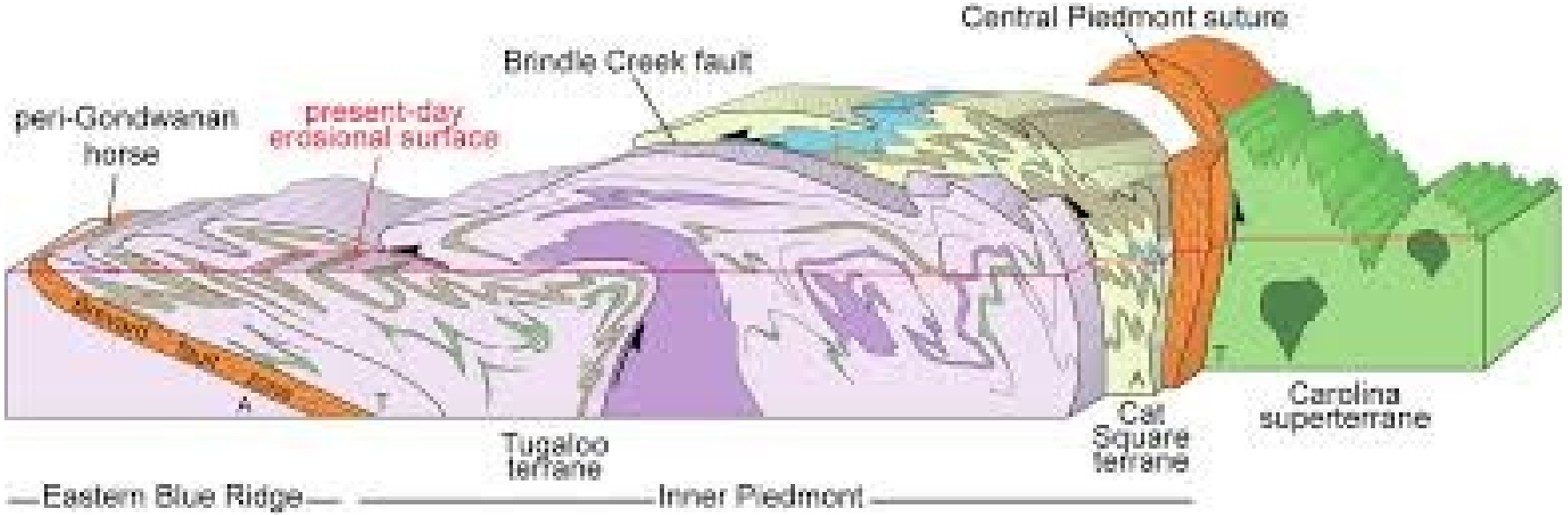
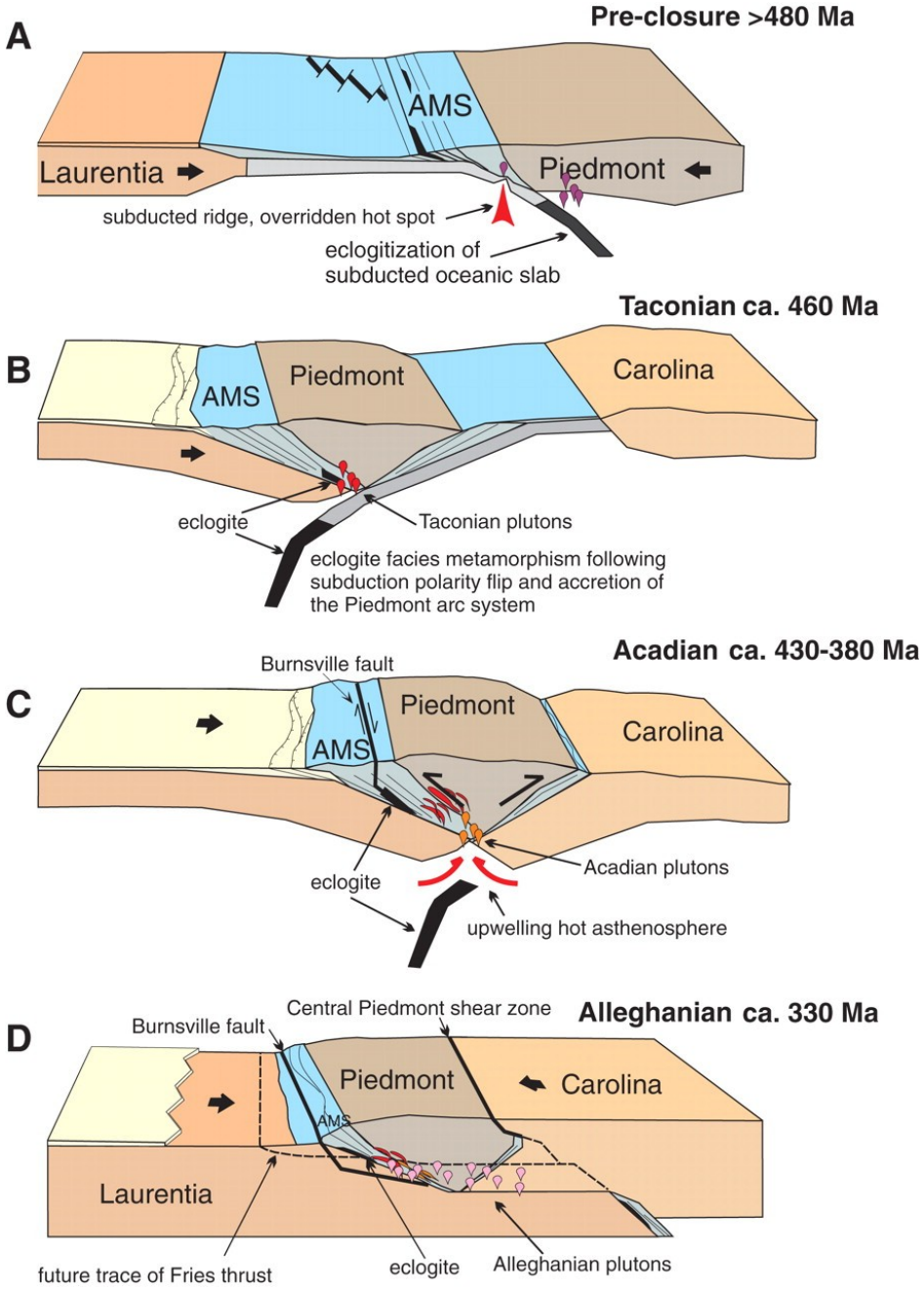
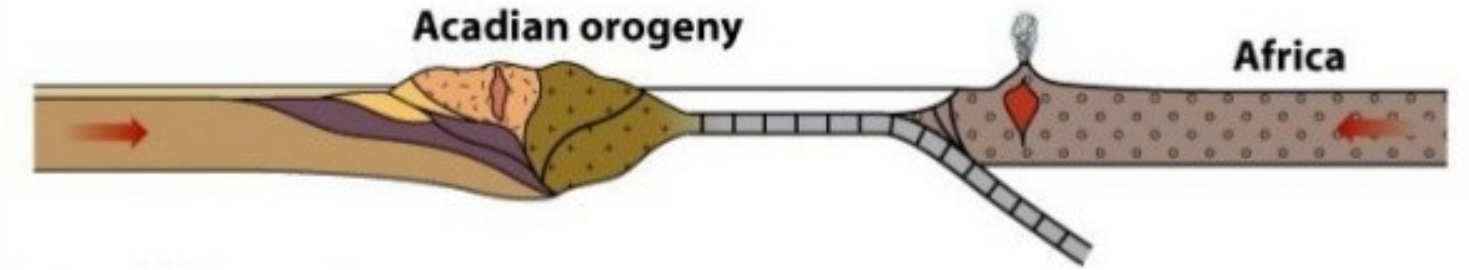

Central Piedmont suture
Brindle Creek fault
peri-Gondwanan horse
present-day erosional surface
A
T
Tugaloo terrane
Cat Square terrane
Carolina superterrane
Eastern Blue Ridge
Inner Piedmont

Souhern Appalachians



Case Study - Appalachians

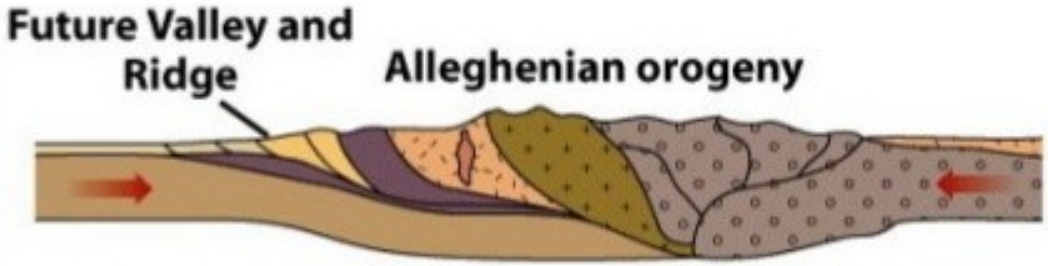
E-dipping subduction continued to close the ocean.



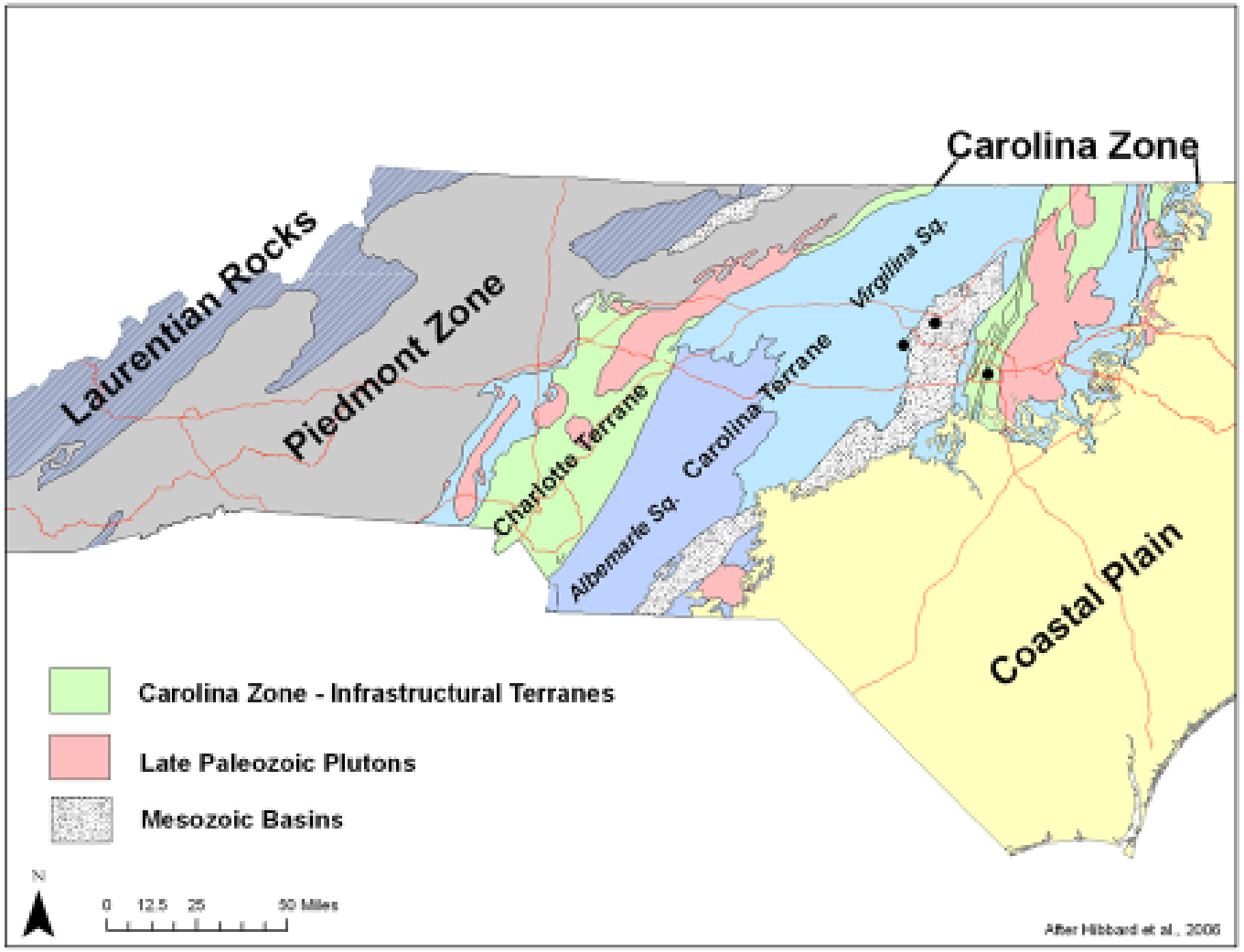
Alleghenian orogeny (~270 Ma): Africa collided w/ N.A.

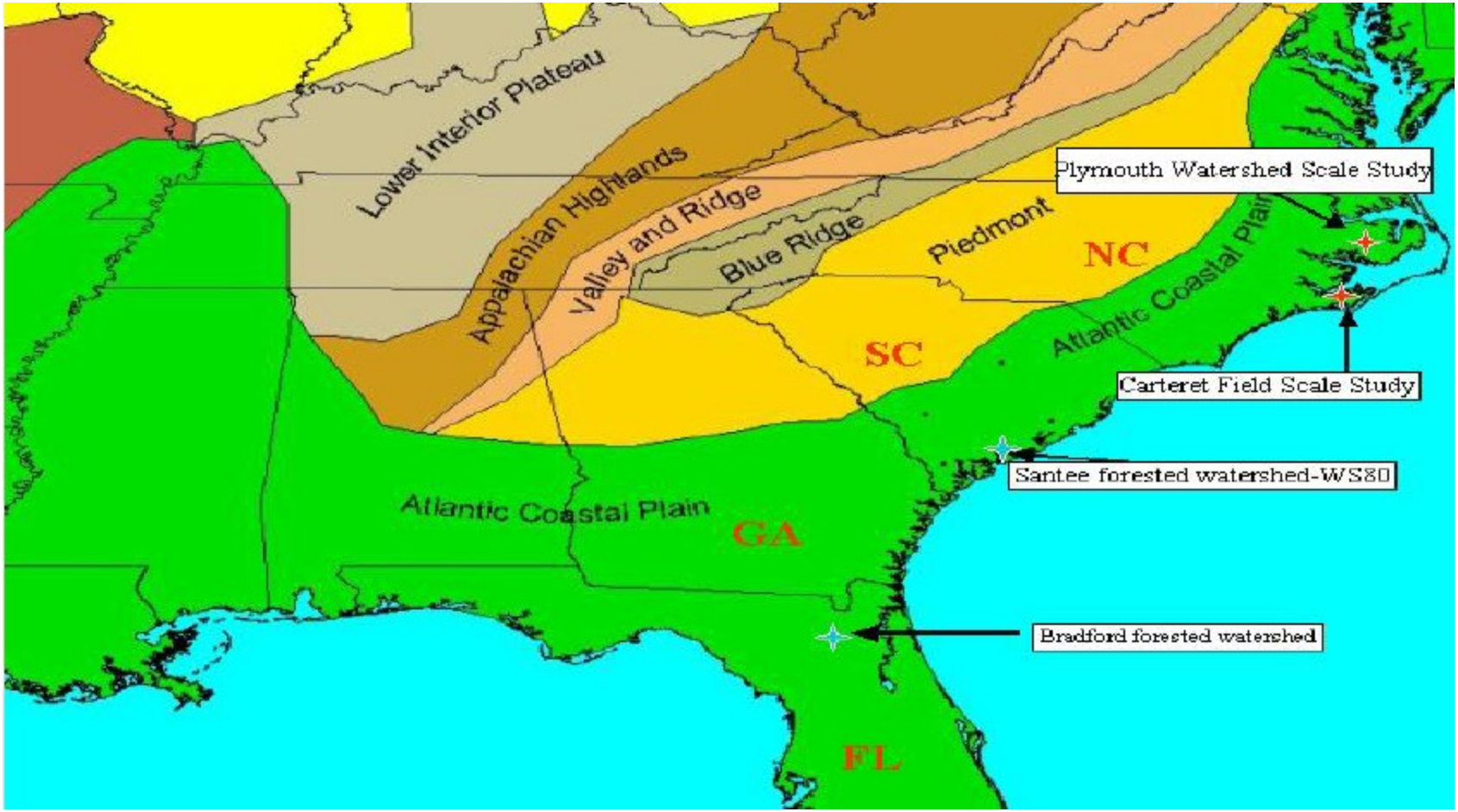
Created huge fold & thrust belt

Assembled supercontinent of Pangaea.



Atlantic coastal plain – z velké části tvořená terány Gondwany překrytými mladšími mezozoickými a terciérními sedimenty. Probíhá zde sutura Suwanee, detekovaná geofyzikálně. Odděluje Gondwanu of zóny Carolina




Lower Interior Plateau
Appalachian Highlands
Valley and Ridge
Blue Ridge
Piedmont
NC
SC
GA
FL
Atlantic Coastal Plain
Atlantic Coastal Plain
Plymouth Watershed Scale Study
Carteret Field Scale Study
Santee forested watershed-WS80
Bradford forested watershed

Sutura **Suwanee** oddělující zónu **Carolina** od **africké části Gondwany**, která po otevření Atlantiku zůstala součásti Severní Ameriky.

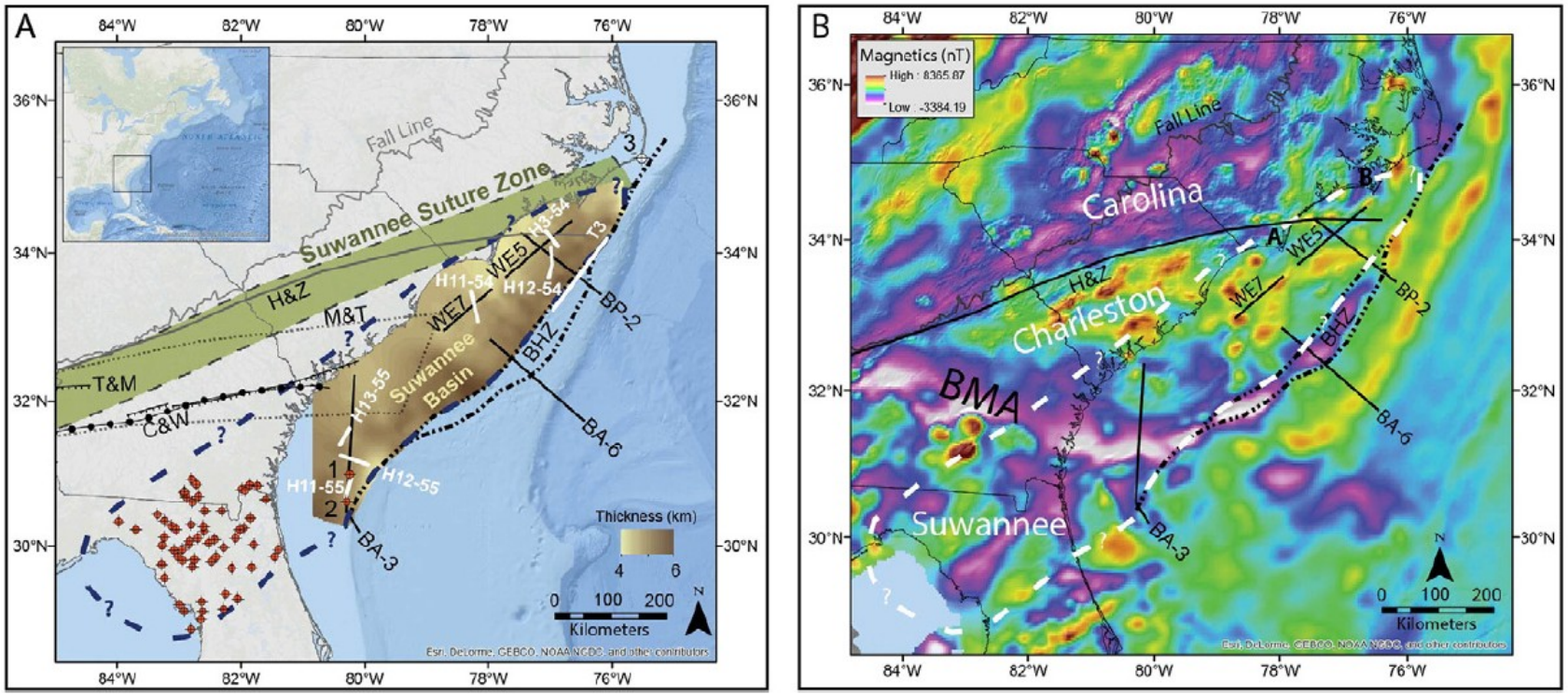


Fig. 1. (A)Map of southeastern North America illustrating revised extent of Suwannee basin (navy dashed line), re-defined location of Suwannee suture zone, previously interpreted positions of suture, and location of data referred to in text. Isochore (brown) indicates mappable extent and thickness (4–6 km) of Suwannee basin rocks. Seismic reflection profile locations (BA-3, BA-6,WE-007-7 (WE7),WE-007-5(WE5), and BP-2) shownas black lines; refraction surveys (Hersey et al., 1959 (H) and Trehu et al., 1989 (T)) shown aswhite lines. Abbreviations for previous suture interpretations: C&W(Chowns andWilliams, 1983); T&M(Tauvers andMuehlberger, 1987);M&T (Thomas, 2010;Mueller et al., 2014); H&Z (Higgins and Zietz, 1983) Onshorewells penetrating Suwannee basin strata in northern Florida and southern Georgia shown by redwell symbols. Offshorewells 1 (Transco 1005-1) and 2 (COST GE-1) tie to profile BA-3.Well 3 (Hatteras Light No.1) encountered granitic basement,marking the northeastern extent of identifiable Suwannee basin strata. Fall linemarkswestern boundary of coastal plain sediments. BHZ (dot-dashed line) offshore identifies “Basement Hinge Zone” (modified after Hutchinson et al., 1995). (B) Magnetic anomaly map (EMAG2, 2009) of southeastern North America and previously interpreted exotic terranes (Carolina, Charleston, and Suwannee). Locations of seismic reflection profiles (black) illustrated offshore aswell as the revised extent of the Suwannee basin highlighted inwhite dashed line. Abbreviations: A - Cape Fear; B - Cape Lookout . BMA - BrunswickMagnetic Anomaly. H&Z - Carolina–Mississippi fault (Higgins and Zietz, 1983) is a dextral strike slip fault separating the Carolina Terrane and Charleston terrane previously interpreted to be the location of the Alleghanian suture.

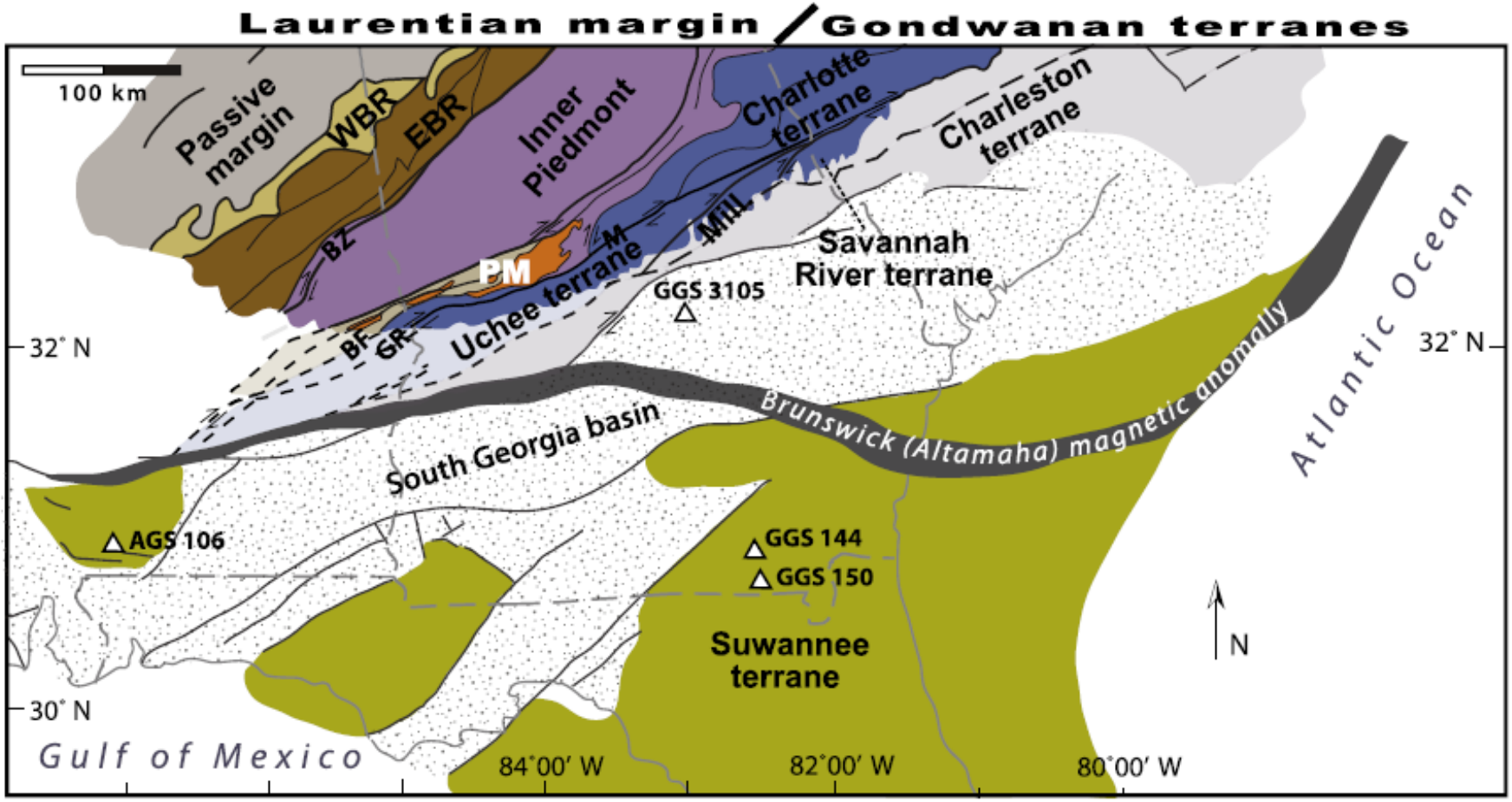
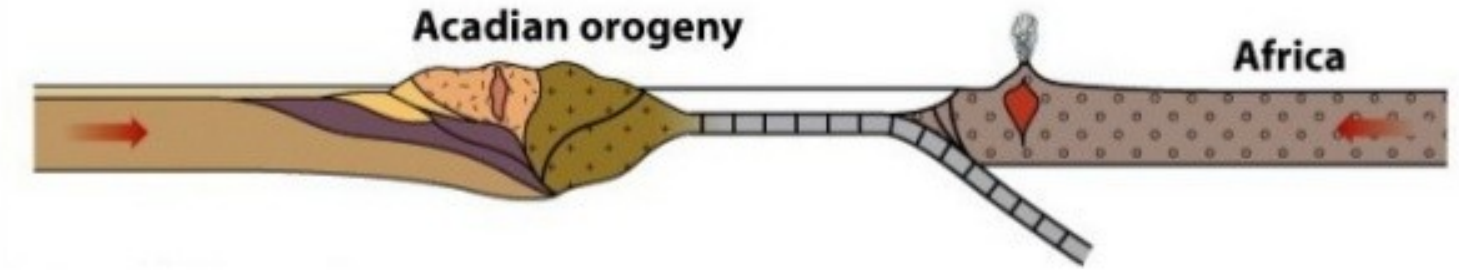


Fig. 2. Schematic depiction of themajor terranes and structureswithin and adjacent to the Suwannee suture zone in the southern Appalachians compiled fromHeatherington andMueller (1999) and Steltenpohl et al. (2008); and our interpretations. Also shown are the Brunswick (Altamaha)magnetic anomaly (a Paleozoic orMesozoic feature that does notmark the suture) and the Mesozoic South Georgia basin. Abbreviations: PM, Pine Mountain block; EBR, eastern Blue Ridge; WBR, western Blue Ridge; BZ, Brevard zone; Mill, Milledgeville terrane; BF, Barlett's Ferry shear zone; GR, Goat Rock shear zone; andM, Modoc shear zone. The Charleston-Savannah River terrane boundary remains poorly defined and is not included on themap.

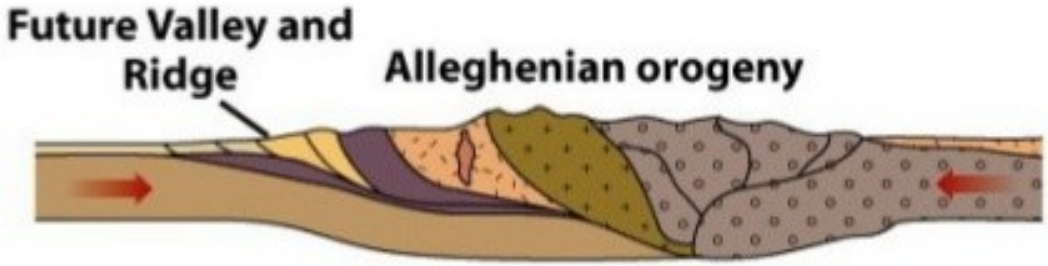
Case Study - Appalachians

E-dipping subduction continued to close the ocean.

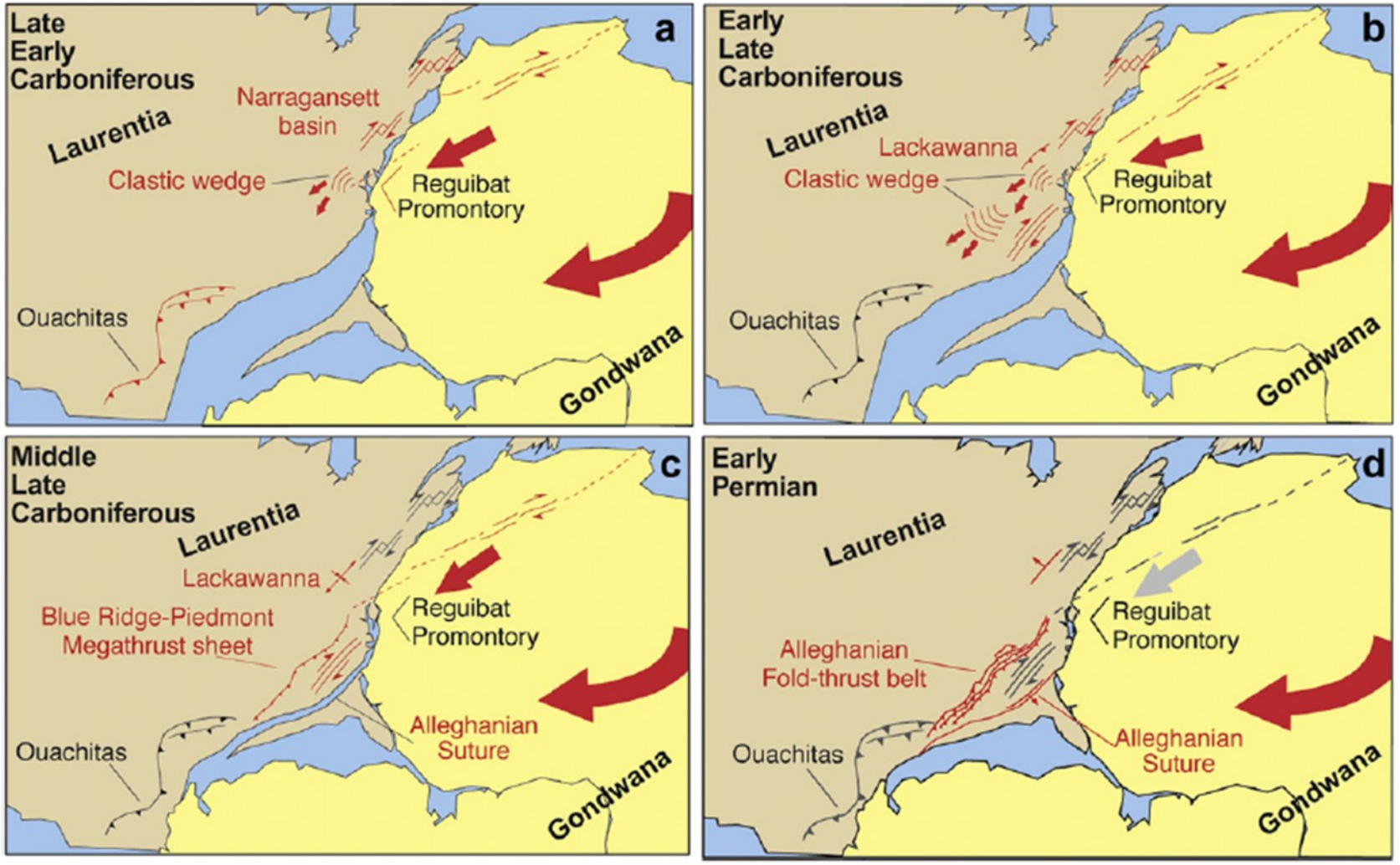


Alleghenian orogeny (~270 Ma): Africa collided w/ N.A.

- Created huge fold & thrust belt
- Assembled supercontinent of Pangaea.

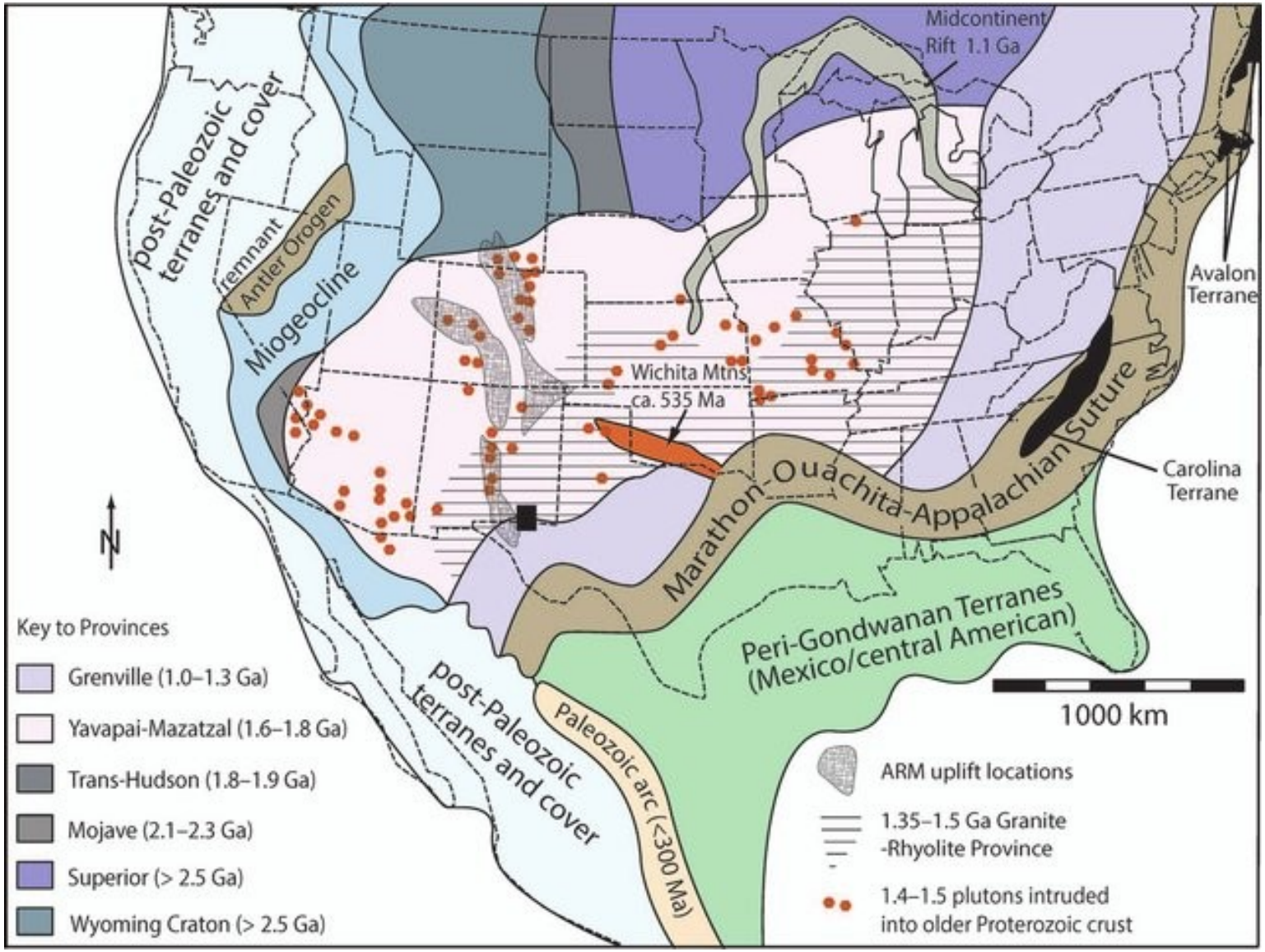


Alleghanian orogeny



Pásmo Quatchita-Marathon – alleghanská fáze, kolize s jihoamerickou části Gondwany

Orogeneze Quachita-Marathon zahrnovala kolizi **Gondwany** a jižního okraje Severní Ameriky. Během **alleghanské** orogeneze v období mezi 325 až 260 Ma se uzavřel **Rheický** oceán a **laurentská** deska subdukovala pod na sever se sunoucí **jihoamerický** kontinentální oblouk.


Midcontinent Rift 1.1 Ga
post-Paleozoic terranes and cover
remnant Antler Orogen
Miogeocline
Wichita Mtns ca. 535 Ma
Avalon Terrane
Carolina Terrane
Marathon-Ouachita-Appalachian Suture
Peri-Gondwanan Terranes (Mexico/central American)
post-Paleozoic terranes and cover
Paleozoic arc (<300 Ma)
1000 km
N
Key to Provinces
Grenville (1.0–1.3 Ga)
Yavapai-Mazatzal (1.6–1.8 Ga)
Trans-Hudson (1.8–1.9 Ga)
Mojave (2.1–2.3 Ga)
Superior (> 2.5 Ga)
Wyoming Craton (> 2.5 Ga)
ARM uplift locations
1.35–1.5 Ga Granite -Rhyolite Province
1.4–1.5 plutons intruded into older Proterozoic crust

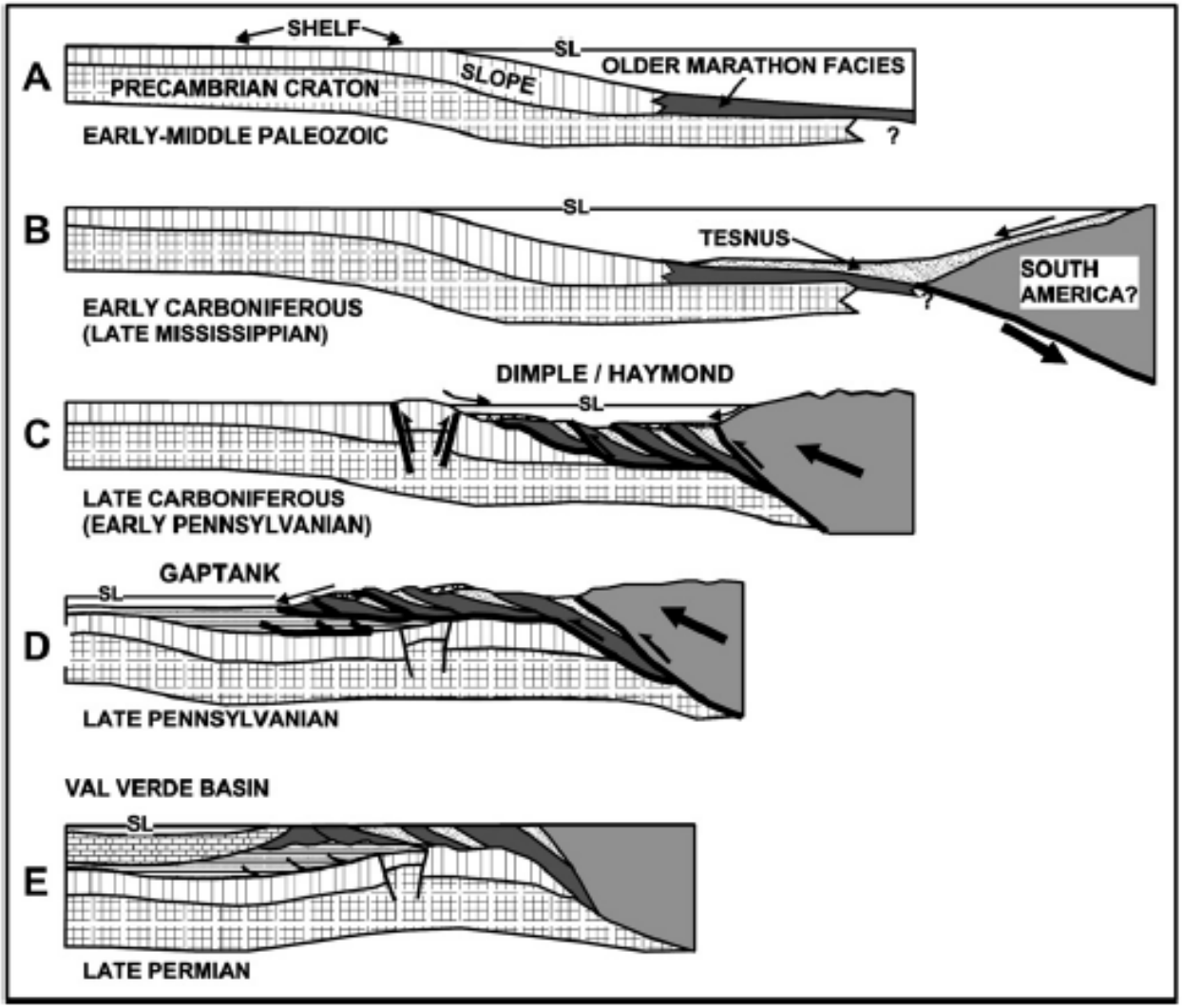
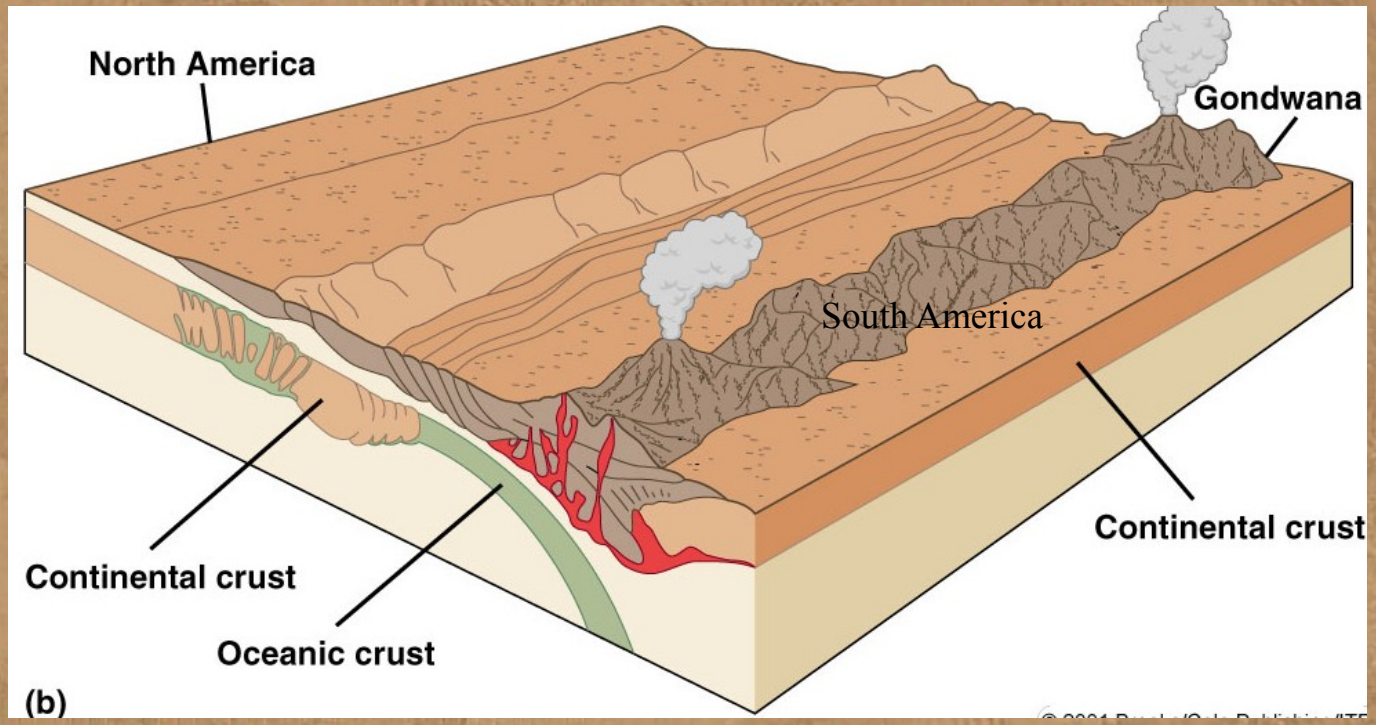


Fig. 9. Schematic diagram showing stages of the evolution of the Marathon thrust belt.

Ouachita Mobile Belt

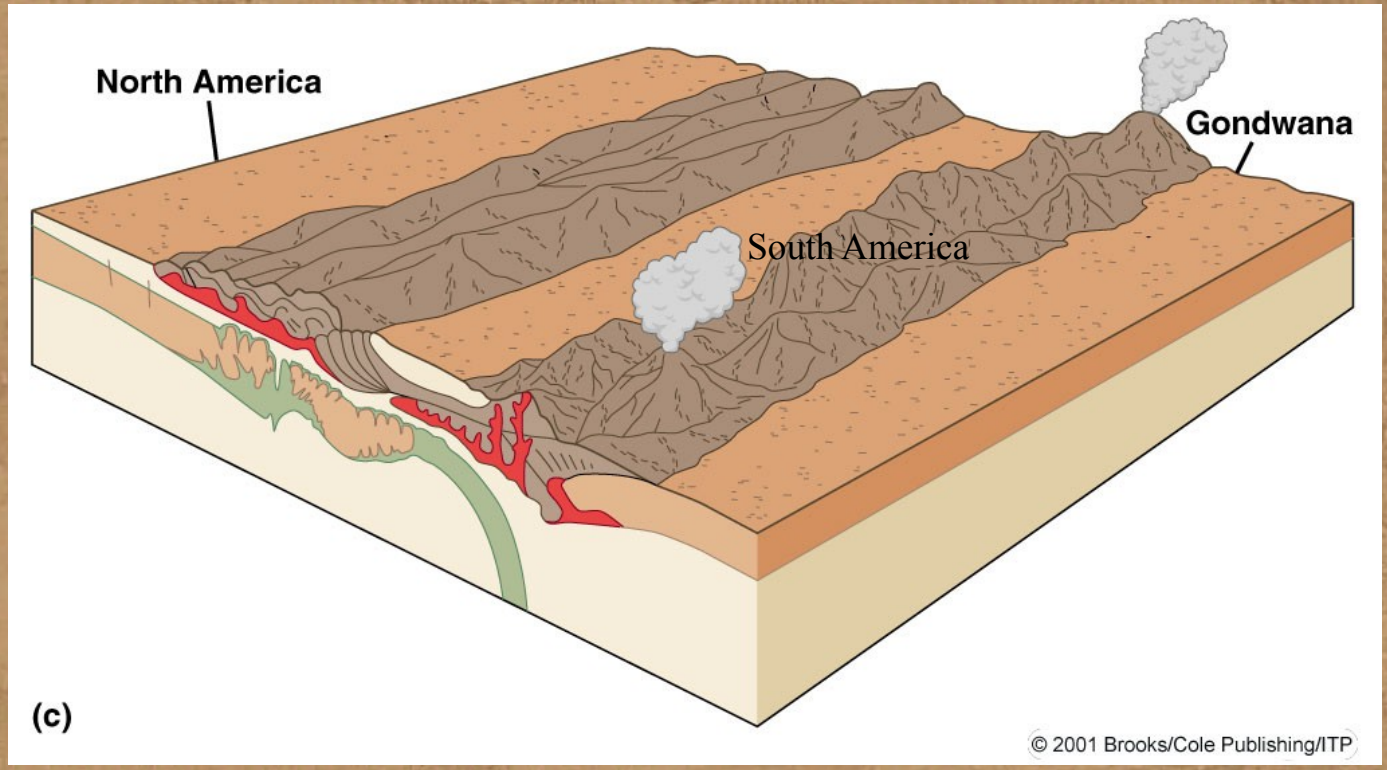
- Incipient continental collision between



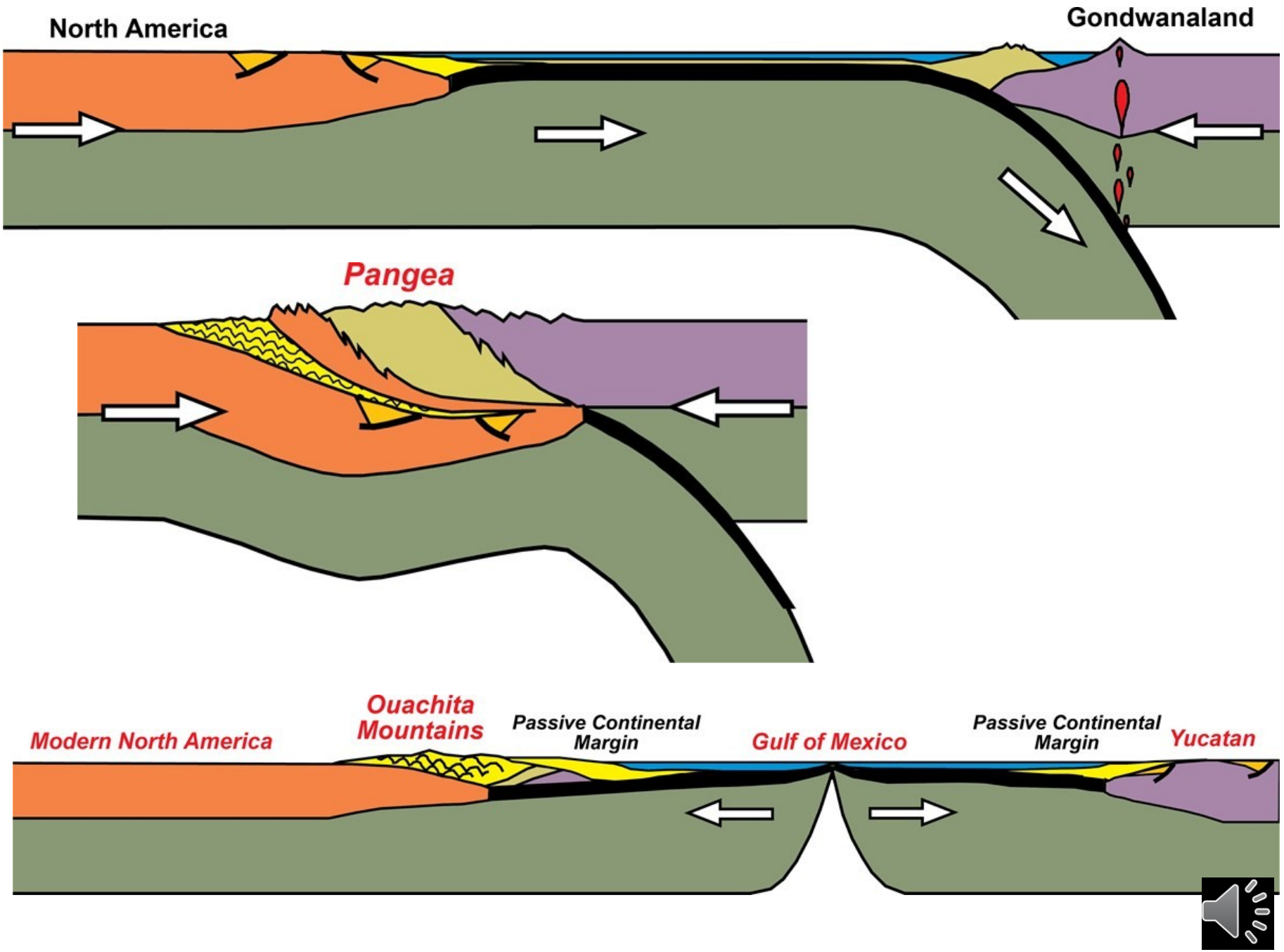
North America and Gondwana began during the Mississippian to Pennsylvanian

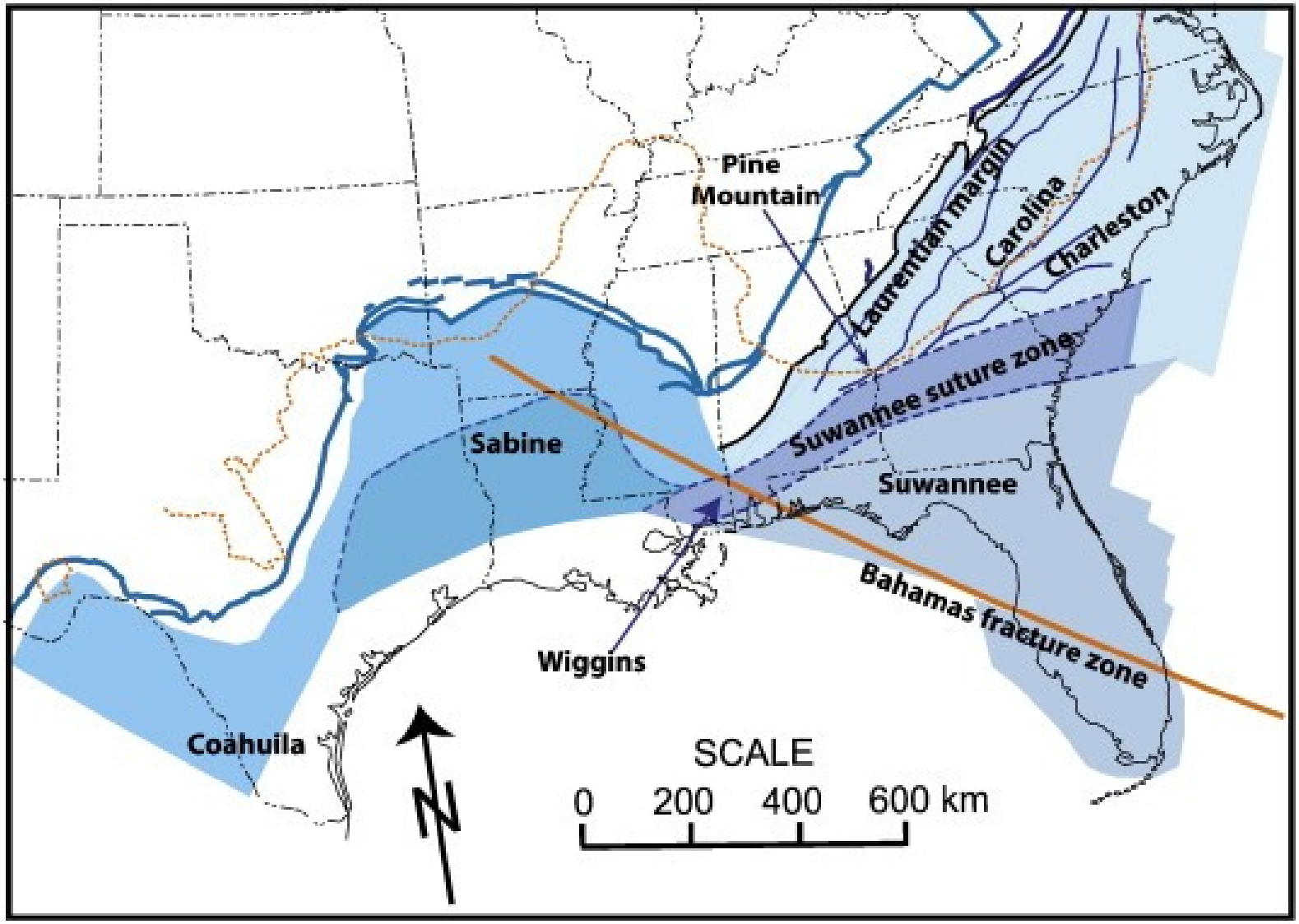
Ouachita Mobile Belt

- Continental collision continued during the



Pennsylvanian Period


North America
Gondwanaland
Pangea
Modern North America
Ouachita Mountains
Passive Continental Margin
Gulf of Mexico
Passive Continental Margin
Yucatan


Pine
Mountain
Laurentian margin
Carolina
Charleston
Suwannee suture zone
Sabine
Suwannee
Bahamas fracture zone
Wiggins
Coahuila
N
SCALE
0 200 400 600 km

Orogeneze Quachita-Marathon reaktivovala starší zlomové struktury v předpolí, kde se vytvořily v Texasu a Novém Mexiku významné **permské pánve** s důležitými ložisky **nafty a plynu**

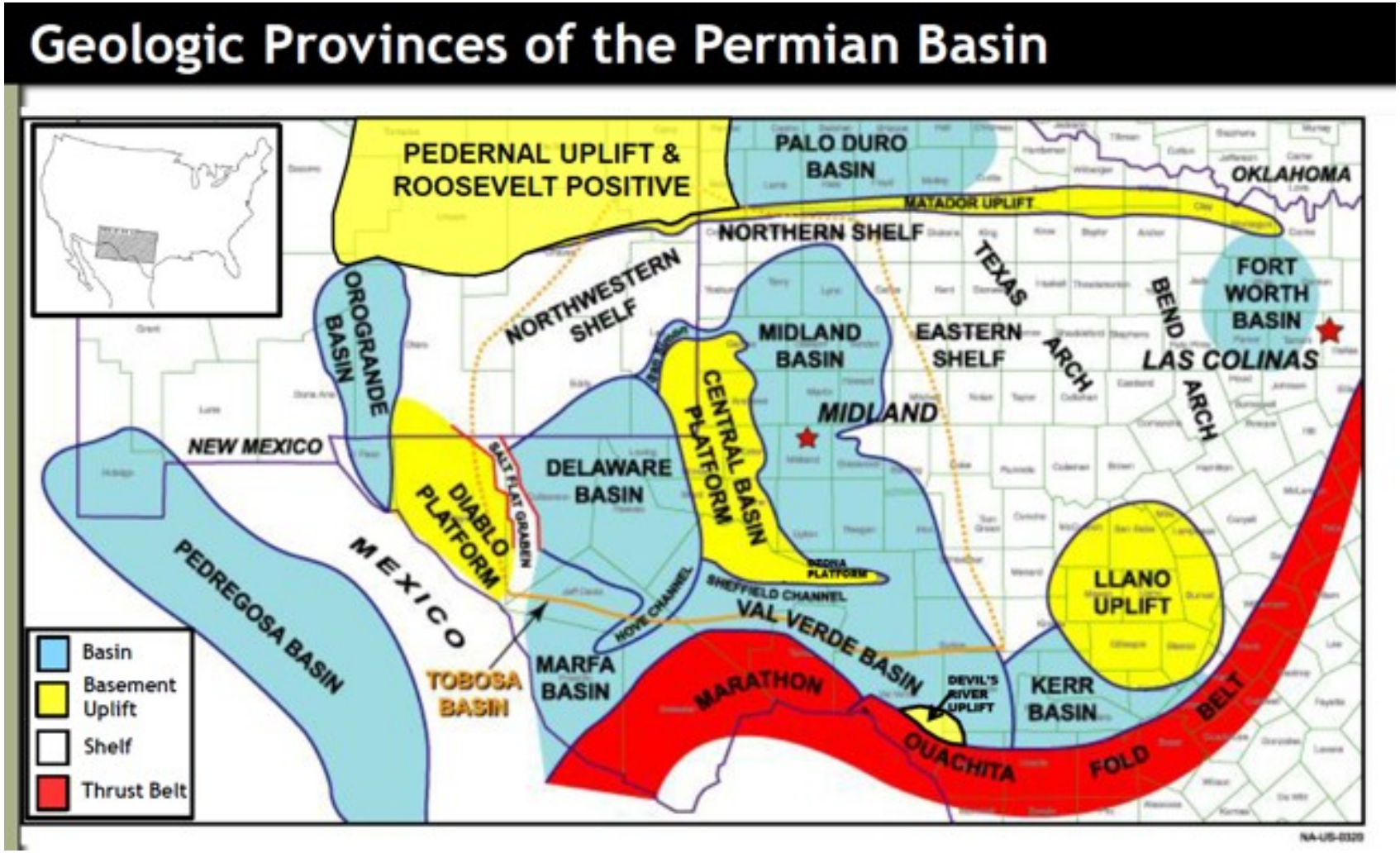


Fig. 1. The Permian Basin and its tectonic setting, after Pioneer Natural Resources.