Modern boundary is a normal fault.
Diamond Peak Frm (Mississippian)
Clasts are the deep water cherts from the west, not the carbonates seen to east.
Note how far west we see shelf rocks
Overlap of shelf and basin suggests thrusting...

Here we see deep water (basin domain) overlying the shelf rocks… however, consider this quote from Cashman et al. 2011: “However, the age of folds and faults attributed to the Antler orogeny are not well constrained—the deformed rocks commonly range from Ordovician to Devonian in age, but no strata overlying these deformed rocks are older than Pennsylvanian. Based on these relationships, the deformation is permissibly much younger than the Late Devonian–Early Mississippian Antler orogeny.”
Add in Mississippian foredeep sediments and you get a picture of the Antler orogeny.
We’re going to investigate this from the continent outward, so first the sediments on the shelf…
Figure 3. Partly restored paleogeographic map, Nevada and western Utah, showing representative positions of the carbonate–shelf margin through the Devonian; see Figure 1 for conodont biochronology. Position of punctata Zone margin is prior to eastward shift (Fig. 6) produced by the Alamo Impact and formation of the Alamo Breccia, indicated in figure. Apparent juxtaposition of carbonate–shelf margin positions in northern Nevada is largely due to Antler orogenic compression and overthrusting. Approximate position of western edge of continental crust is indicated by Sr (87Sr/86Sr) = 0.706. Tristate basin and Tooele arch are broad, persistent Devonian structural features (Sandberg et al., 1989; Poole et al., 1992). Positions of other Devonian intrashelf basins, including depositional sites of Middle Devonian Woodpecker Limestone (Brick, 1996) and Upper Devonian–Mississippian Pilot Shale (Sandberg et al., 1989, 2003), are omitted for simplicity. Abbreviations: RMTS—Roberts Mountains thrust system; STS—Sevier thrust system; WF—Wells fault. Major Cenozoic strike-slip faults and time–rock transect line (Fig. 4) are also shown. Data from Johnson et al. (1989) and Sandberg et al. (1989, 2002).
arrows are turbidity current directions; note reversal in Upper Devonian. FB is their interpretation of forebulge initiation...

Figure 4. Northeast to southwest, Devonian time-rock transect across central and eastern Nevada (transect line shown in Fig. 3), showing carbonate-shelf, continental slope, and toe lithostratigraphic units and relative lateral shifts in shelf margin through time. Main phases or events in shelf-margin development (Table 1) are delineated: vertical blue lines denote eustatic changes; vertical red lines denote tectonic changes. Transgressive-regressive (T-R) cycles Ia–Iff (Johnson et al., 1985, 1991; Johnson and Sandberg, 1989), main intervals of turbidity current and debris-flow deposition (arrows), proto-Antler forebulge initiation (FB), and timing of Alamo Impact Event are indicated. Silty dolostone and siltstone of the yellow slope-forming member (YSF), which forms the basal unit of the Guilmette Formation and Devils Gate Limestone, constitute a widespread marker lithology distributed throughout western North America (Sandberg et al., 1989, 1997, 2002). The YSF is herein correlated with debris-shelf-margin development (Table 1) are delineated: vertical blue lines denote eustatic changes; vertical red lines denote tectonic changes. Transgressive-regressive (T-R) cycles Ia–Iff (Johnson et al., 1985, 1991; Johnson and Sandberg, 1989), main intervals of turbidity current and debris-flow deposition (arrows), proto-Antler forebulge initiation (FB), and timing of Alamo Impact Event are indicated. Silty dolostone and siltstone of the yellow slope-forming member (YSF), which forms the basal unit of the Guilmette Formation and Devils Gate Limestone, constitute a widespread marker lithology distributed throughout western North America (Sandberg et al., 1989, 1997, 2002). The YSF is herein correlated with debris-shelf-margin development (Table 1) are delineated: vertical blue lines denote eustatic changes; vertical red lines denote tectonic changes. Transgressive-regressive (T-R) cycles Ia–Iff (Johnson et al., 1985, 1991; Johnson and Sandberg, 1989), main intervals of turbidity current and debris-flow deposition (arrows), proto-Antler forebulge initiation (FB), and timing of Alamo Impact Event are indicated. Silty dolostone and siltstone of the yellow slope-forming member (YSF), which forms the basal unit of the Guilmette Formation and Devils Gate Limestone, constitute a widespread marker lithology distributed throughout western North America (Sandberg et al., 1989, 1997, 2002). The YSF is herein correlated with debris-shelf-margin development (Table 1) are delineated: vertical blue lines denote eustatic changes; vertical red lines denote tectonic changes. Transgressive-regressive (T-R) cycles Ia–Iff (Johnson et al., 1985, 1991; Johnson and Sandberg, 1989), main intervals of turbidity current and debris-flow deposition (arrows), proto-Antler forebulge initiation (FB), and timing of Alamo Impact Event are indicated. Silty dolostone and siltstone of the yellow slope-forming member (YSF), which forms the basal unit of the Guilmette Formation and Devils Gate Limestone, constitute a widespread marker lithology distributed throughout western North America (Sandberg et al., 1989, 1997, 2002). The YSF is herein correlated with debris-shelf-margin development (Table 1) are delineated: vertical blue lines denote eustatic changes; vertical red lines denote tectonic changes. Transgressive-regressive (T-R) cycles Ia–Iff (Johnson et al., 1985, 1991; Johnson and Sandberg, 1989), main intervals of turbidity current and debris-flow deposition (arrows), proto-Antler forebulge initiation (FB), and timing of Alamo Impact Event are indicated. Silty dolostone and siltstone of the yellow slope-forming member (YSF), which forms the basal unit of the Guilmette Formation and Devils Gate Limestone, constitute a widespread marker lithology distributed throughout western North America (Sandberg et al., 1989, 1997, 2002). The YSF is herein correlated with...
Recall our differential equation for plates:

\[ D \frac{d^4w}{dx^4} + P \frac{d^2w}{dx^2} + (\rho_a - \rho_f)gw = q_a(x) \]

If we drop the end load (P), then a solution by inspection is

\[ w = e^{x/\alpha} \left( c_1 \cos \frac{x}{\alpha} + c_2 \sin \frac{x}{\alpha} \right) + e^{-x/\alpha} \left( c_3 \cos \frac{x}{\alpha} + c_4 \sin \frac{x}{\alpha} \right) \]

Where \( \alpha \) is the flexural parameter:

\[ \alpha = \left( \frac{4D}{g(\rho_a - \rho_w)} \right)^{1/4} \]

This sinusoidal solution lets you examine extreme cases: big lambda is isostasy, small is rigidity.
\[ w = e^{x/\alpha} \left( c_1 \cos \frac{x}{\alpha} + c_2 \sin \frac{x}{\alpha} \right) + e^{-x/\alpha} \left( c_3 \cos \frac{x}{\alpha} + c_4 \sin \frac{x}{\alpha} \right) \]

Where \( \alpha \) is the flexural parameter:

\[ \alpha = \left( \frac{4D}{g(\rho_s - \rho_w)} \right)^{1/4} \]

By inspection, for \( x > 0 \), \( c_1 \) and \( c_2 \) must be zero.

With the load \( V_0 \) at \( x = 0 \), slope should be zero, so \( c_3 = c_4 \)

\[ w = w_0 e^{-x/\alpha} \left( \cos \frac{x}{\alpha} + \sin \frac{x}{\alpha} \right) \quad \text{where} \quad w_0 = \frac{V_0 \alpha^3}{8D} \]

This sinusoidal solution lets you examine extreme cases: big lambda is isostasy, small is rigidity.
\[ \alpha = \left( \frac{4D}{g(\rho_a - \rho_w)} \right)^{1/4} \]

\[ w = w_0 e^{-x/\alpha} \left( \cos \frac{x}{\alpha} + \sin \frac{x}{\alpha} \right) \]

Consider places where \( w = 0 \); these are termed nodes. They are where \( \cos(x/\alpha) = -\sin(x/\alpha) \), or \( x = \alpha(3\pi/4 + n\pi) \).

This sinusoidal solution lets you examine extreme cases: big lambda is isostasy, small is rigidity.
This sinusoidal solution lets you examine extreme cases: big lambda is isostasy, small is rigidity.
This sinusoidal solution lets you examine extreme cases: big lambda is isostasy, small is rigidity.
Note carbonate type/clast size scale below each section
middle Upper Devonian

Giles & Dickinson, SEPM SP 52, 1995
Fig. 8.—Cross section A to A' displaying Sequence 3 (Lower Pa. expansa to Upper Pa. marginifera conformable zone) foreland strata.
uppermost Upper Devonian

Giles & Dickinson, SEPM SP 52, 1995
**Sequence 8 Lower Gn. typicus**

West

- Thrusted Roberts Mountains allochthon

- Diamond Range

- Foreland basin

- Ward Mountain

- Needle Range

- Forebulge

- Tintic Mountains

East

- Roberts Mountains allochthon

- Dake Canyon Shale

- Lower Joana Limestone

- Upper Joana Limestone

- Upper Joana Limestone

- Tintic Limestone

Giles & Dickinson, SEPM SP 52, 1995

**Middle Lower Mississippian**
lower Upper Mississippian

Post-tectonic Phase

West

Roberts Mountains
allochthon

o400m

800m

1200m

1800m

2200m

2400m

FIG 14

Cross section A to A displaying post-tectonic strata Lower to Upper Mississippian lower correlation line is base of Upper Gn typicus conodont zone and upper correlation line is near top of Chesterian stage but basal Limestone part of the overlap assemblage is also Chesterian in age see text

Ages of biostratigraphic markers based on conodont ammonoid brachiopod foram and coral data derived from Poole and Sandberg 1991

Note change of scale from Figures 6 13

Giles & Dickinson, SEPM SP 52, 1995
Post-tectonic Phase

Upper Mississippian

West
Roberts Mountains allochthon

Diamond Range
Overlap Assemblage

Confusion and Needle ranges

A
A

East
Tintic Mountains and Star Range

FIG 14
Cross section A to A displaying post-tectonic strata Lower to Upper Mississippian lower correlation line is base of Upper Gn typicus conodont zone and upper correlation line is near top of Chesterian stage but basal Elly Limestone part of the overlap assemblage is also Chesterian in age see text

Ages of biostratigraphic markers based on conodont, ammonoid, brachiopod, and foram and coral data derived from Poole and Sandberg 1991

Note change of scale from Figures 6 13

Biostratigraphic markers

U.Ch Upper Chester
L.Ch Lower Chester
U.M Upper Meramec
L.M Lower Meramec
U.O Upper Osage
Seems odd to have forebulge jump so dramatically--how does this happen? Is the flexural interpretation wrong? [Yeah, probably...the earlier forebulge quite plausibly is poor stratigraphy]. Even if older Diamond Range forebulge an artifact, why might the eastern one get stuck? Load not advancing?
Seems that the forebulge isn't moving smoothly east, right?
c. 356 Ma

(Mississippian)

P. H. Cashman & Sturmer, P.3, 2021
This is the first appearance of sediment (according to these authors) from the Antler allochthon.
c. 336 Ma

C2
(Late Meramecian)

Key for stages

Stratigraphic units
- Lower middle
- Middle
- Upper middle
- Upper

Depositional environments
- Shelf fan, fluvial to deltaic: shelf delta
- Shelf
- Slope
- Margin
- Marine
- Anoxinic marine

Structural features
- Fault
- Fracture
- Vein
- Joint
- Ductile deformation
- Shear zone
- Breccia

Paleocurrent data
- Base of section
- Extents of facies analysis
- Fossiliferous beds

Sedimentological data
- Reference data
- Source to paleo-cruise data
- Point
- Core

Cashman & Sturmer, P^3, 2021
c. 333 Ma

Early Chesterian

Cashman & Sturmer, P33, 2021
c. 325 Ma
P.H. Cashman 2006

1991 nODULES
2006 of HEMIPELAGIC

Giles, occurring
siltstone,
formation

P.H. Cashman & Sturmer, P^3, 2021

1996 TIPPIPAH FAULT,

The Ketner Fault, in the southeastern part of Nevada, was a southerly dipping reverse fault that continued to slide throughout most of the Missourian.

The Ketner Fault was parallel to another slip plane, the Lahontan Fault, that was on the same block but more westerly.

This fault was formed after a compressional event where the plateau was tilted southeastward.

The transition of older rocks being thrust eastward over younger rocks was relative.

At one time, the mountain block was part of the basement of the modern plateau.

The Lahontan Mountain Block, which formed the current western margin of the plateau, is characterized by its thrust sheets.

The younger rocks are on the eastern side of the deformed blocks of the mountain belt.

The entire mountain belt was formed between the in situ subduction of an oceanic plate and the subduction of the Colorado Plateau as it was pushed northwestward.

The resulting mountain belt is a series of anticlines and synclines.

The map above shows the lateral translation of the mountain belt, which moved from west to east.

The sedimentary rock of the mountain belt was deposited in deepening basins.

The age of the mountain belt is between 540 and 520 million years ago, at the end of the Paleozoic era.

The mountain belt is characterized by its thrust sheets, which are layers of sedimentary rock that have been folded and thrust over one another.

The mountain belt is bounded on the east by the Colorado River, which separates it from the plateau.

Although the mountain belt is largely composed of sedimentary rock, it is also characterized by its large structures, which are formed by the folding and thrusting of the sedimentary rock layers.

The mountain belt is also characterized by its fault systems, which were formed by the movement of the mountain block relative to the rest of the plateau.

The fault systems are characterized by their throw, which is the vertical displacement of the hanging wall relative to the footwall.

The fault systems are also characterized by their slip, which is the horizontal movement of the hanging wall relative to the footwall.

The fault systems are also characterized by their strike, which is the orientation of the fault plane.

The fault systems are also characterized by their dip, which is the angle of the fault plane relative to the horizontal.

The fault systems are also characterized by their throw, which is the vertical displacement of the hanging wall relative to the footwall.

The fault systems are also characterized by their slip, which is the horizontal movement of the hanging wall relative to the footwall.

The fault systems are also characterized by their strike, which is the orientation of the fault plane.

The fault systems are also characterized by their dip, which is the angle of the fault plane relative to the horizontal. cashman & sturmer, p^3, 2021
This is about the height of the Ancestral Rockies.
Other evidence of what happened? Mississippian shelf in SE CA subsided rapidly and stabilized (kind of like what we saw in Ancestral Rockies). This incidentally suggests there was Antler material to the west...also would make a geo history diagram than would be quite abbreviated.
Now look at the upper plate... So how extensive is this event (or events?). Some similarities to stuff in Canada, though note that Canadian allochton is attenuated continental crust while no evidence of such material in Nevada.
Figure 6  Geotectonic features of the Antler orogen (Late Devonian–Early Mississippian), the Ancestral Rocky Mountains province (Pennsylvanian–Early Permian), and the Sonoma orogen (Late Permian–Early Triassic) of the North American Cordillera (allochthons of Antler and Sonoma age are combined, but note the uncertain continuity of tectonic trends along the trans-Idaho discontinuity of Figure 5). See text for discussion of Kootenay structural arc (KA) and remnants of Paleozoic arc assemblages in Quesnellia (Qu) and Stikinia (St). Key active faults: RMT, Devonian-Mississippian Roberts Mountains thrust; GCT, Permian-Triassic Golconda thrust; CCT, Permian-Triassic California-Coahuila transform. Gondwanan Mexico restored (after Dickinson & Lawton 2001a) to position before mid-Mesozoic opening of the Gulf of Mexico. Tintina and De-CS-FW-QC fault systems are Cenozoic structures. See Figure 5 for geographic legend.

Dickinson, Earth Plan Sci Rev., 2004

OK, so what is this event?
Roberts Mountains allochthon and Harmony Formation provenance and origin options

Option I: western equivalent (Roberts et al., 1958; Poole et al., 1992)

Option IIA: exotic peri-Gondwana (south) (Wright & Wyld, 2006)

Option IIB: exotic Baltica (north) (Colpron & Nelson, 2009)

Option III: northwest Laurentia (Suczek, 1977)

Figure 3.

Contrasting tectonic models proposed to explain the source and tectonic transport of the Roberts Mountains allochthon and Harmony Formation, shown in Early Devonian time. Exotic terranes include the Alexander, Klamath, and Northern Sierran terranes. AX: Alexander Terrane; YR: Yreka Terrane; NS: Northern Sierra Terrane; RMA: Roberts Mountains allochthon (different locations of RMA are as visualized in different tectonic models and are color coded by model); PRA: Peace River Arch; SRA: Salmon River Arch. Map is after Colpron and Nelson (2009). Option I, western equivalent (Poole et al., 1992; Roberts et al., 1958); option IIA, exotic peri-Gondwana (southern transport) (Wright & Wyld, 2006); option IIB, exotic Baltica (northern transport) (Colpron & Nelson, 2009); option III, northwestern Laurentia (Gehrels, Dickinson, Riley, et al., 2000; Suczek, 1977).

Where might the allocation have come from?
Figure 4. Tectonostratigraphic diagram of units of the Roberts Mountains allochthon (RMA) in selected north–central Nevada mountain ranges, showing locations of detrital zircon samples. Units are shown in their physical, structurally superimposed, order. Most units are internally disrupted with multiple imbricate thrusts not shown on this chart. Units are color coded for geologic period as indicated on left margin of chart.
Lower Harmony Formation, very limited exposures. Looks very Laurentian. Mutual & Caddy Canyon in north–central UT,
Figure 9. (a) Hf isotope data and (b) U–Pb ages for Harmony A samples and selected western Laurentian passive margin strata, showing the similarities between the U–Pb ages and Hf isotope analyses of the Harmony A and these passive margin strata. Data from the upper Neoproterozoic Mutual Formation and Caddy Canyon Quartzite are from Gehrels and Pecha (2014). Colored age bars that correspond to Laurentian basement terrane ages are superimposed over the U–Pb ages on the normalized probability plots. The ages are from references cited in Figure 3. Colored Hf isotope range areas that correspond to the same Laurentian terranes are shown on the (upper) Hf evolution diagram (Grenville: Bickford et al., 2010; Mueller et al., 2008; Granite–rhyolite province: Goodge & Vervoort, 2006; Mueller et al., 2008; Yavapai–Mazatzal: Holm et al., 2013; Archaean: Rohr et al., 2008; Rohr et al., 2010; and Idaho: Gaschnig et al., 2013). Diagrams and symbols are as in Figure 9.
Figure 10. (a) Hf isotope data and (b) U-Pb ages for Harmony B samples and select Laurentian passive margin strata, showing the similarities between the U-Pb ages and Hf isotope analyses of the Harmony B and these passive margin strata. Colored age bars that correspond to Peace River Arch region and Swift Current anorogenic province basement terrane ages are superimposed over the U-Pb ages on the normalized probability plots. Data from the Horsethief Creek Group and the Hamill Group are from Gehrels and Pecha (2014). U-Pb analyses of the Addy Quartzite are from Linde et al. (2014b). Hf-isotope analyses of the Addy Quartzite are Linde’s unpublished work. Diagrams and symbols are as in Figure 9.
Figure 10. (a) Hf isotope data and (b) U–Pb ages for Harmony B samples and select Laurentian passive margin strata, showing the similarities between the U–Pb ages and Hf isotope analyses of the Harmony B and these passive margin strata. Colored age bars that correspond to Peace River Arch region and Swift Current orogenic province basement terrane ages are superimposed over the U–Pb ages on the normalized probability plots. Data from the Horsethief Creek Group and the Hamill Group are from Gehrels and Pecha (2014). U–Pb analyses of the Addy Quartzite are from Linde et al. (2014b). Hf–isotope analyses of the Addy Quartzite are Linde’s unpublished work. Diagrams and symbols are as in Figure.
So there are some differences relative to what we usually think of the miogeocline in NV sampling: no 1.4 Ga, no Mazatzal. 500 Ma in Vinini interesting... Note bottom four are Ordovician, which (as we shall see) is markedly different in miogeocline from older and younger sediments...
So there are some differences relative to what we usually think of the miogeoclinal in NV sampling: no 1.4 Ga, no Mazatzal. 1.9, 2.1 Ga peak is absent in miogeoclinal...
have ages similar to the U-Pb ages of zircons in the RMA rocks sampled (Figs. 7 and 8). The RMA strata also show similar Hf isotope ratios to the Valmy Formation (Gehrels and Pecha, 2014) and to the Eureka Quartzite sandstones (Table 2). These RMA strata also show similar Hf isotope ratios to the Devonian Los Pozos Formation and Lower Viniini Formation (Gehrels and Pecha, 2014) (Fig. 8).

Detrital zircon U-Pb geochronology and Hf isotope geochemistry of the Roberts Mountains allochthon.

Red lines in Gehrels and Pecha are TIMS dates. Overall, do we see these peaks at any time in W NAM? New plot is all but Ordovician from Tr–Neoproter. seds. Is the 2.1 Ga there? How is the 1.4 missing? Look in more detail...
What looks closest? So there are some differences relative to what we usually think of the miogeocline in NV sampling: no 1.4 Ga, no Mazatzal
Unclear how many of the same samples are in this Ordovician reference, but this is best match. The uniformity of Ordovician ss’s along margin suggests strong longshore transport.
Linde et al seem to want to make RMA off Peace River arch (but their maps still show this thing just getting sediment from the far north). We will return to this as we explore the Sonoman and younger exotic terranes. But prompts question: is RMA transported from north, or were just sediments moved that way??
We’ve focused on Nevada, and pointed out relationships with northern Canada, but what of the middle in Idaho?
Devonian strata here look to have some similarities to the north but also the ~400 Ma zircons point to some volcanic source...
Was there an arc somewhere?

Detrital Zircon Age (Ma)

Linde et al., Geosphere, 2016

Devonian detrital zircons

A

B

C

D

E

F

G

Beranek et al., Lithosphere, 2016

Now look at the upper plate... So how extensive is this event (or events?). Some similarities to stuff in Canada, though note that Canadian allochthon is attenuated continental crust while no evidence of such material in Nevada.
Chapman et al. (2015) and Saleeby and Dunne (2015), we herein use the term Snow Lake terrane to refer to this parautochthonous or possibly allochthonous terrane instead. Snow Lake terrane strata consist of quartzite, quartzofeldspathic schist, carbonates, and calc-silicate layers interpreted as multiply deformed and metamorphosed Neoproterozoic to Ordovician shallow-marine shelf deposits (Lahren and Schweickert, 1989; Grasse et al., 2001; Memeti et al., 2010; Chapman et al., 2015). These strata are unconformably overlain by infolded Jurassic marine metasedimentary strata (Memeti et al., 2010, 2012). At least one pre-Jurassic deformation episode has been identified in Snow Lake terrane pendants (Lahren and Schweickert, 1989; Memeti et al., 2010, 2012). Detrital zircon ages from nine Snow Lake terrane samples are similar to detrital zircon age distributions of autochthonous Neoproterozoic to Ordovician SW Laurentian passive-margin strata (Grasse et al., 2001; Memeti et al., 2010). Snow Lake terrane detrital zircon age distributions show peaks with varied relative proportions at ca. 1000–1200, 1450, and 1750 Ma, with a spread of Archean ages. Two samples from the May Lake pendant show a unique distribution with a single major peak at ca. 1800 Ma and scattered Archean and ca. 700 Ma ages. This ca. 1800 Ma–dominated detrital zircon age distribution is similar to other Peace River Arch–derived Ordovician sandstone across western Laurentia (Gehrels and Dickinson, 1995; Memeti et al., 2010).

The timing, tectonic setting, and structural mechanisms of Snow Lake terrane emplacement are uncertain. Lahren and Schweickert (1989) proposed that the Snow Lake terrane represented a block of the Neoproterozoic to Cambrian Mojave facies stratigraphy displaced up to 400 km northward from apparently similar Neoproterozoic to Cambrian strata in the Mojave Desert along the cryptic Mojave–Snow Lake fault of inferred Cretaceous age (Grasse et al., 2001; Wyld and Wright, 2001). However, Jurassic strata that overlie Snow Lake terrane strata are part of the widespread Sierran marine overlap sequence and differ significantly from Triassic to Jurassic terrestrial strata that overlie the Neoproterozoic to Paleozoic Mojave facies shelf strata in both depositional setting and detrital zircon provenance (Saleeby et al., 1978; Saleeby and Busby, 1993; Memeti et al., 2010, 2012; Chapman et al., 2015; Paterson et al., 2017). Maximum depositional ages of these unconformably overlying Jurassic marine strata indicate Early Jurassic exhumation of the Snow Lake terrane (Memeti et al., 2010, 2012).
Figure 6. Schematic maps of western North America showing interpreted provenance links and paleo-geography for Cordilleran margin during early Paleozoic time. Cratonal provinces and miogeoclinal strata are as shown in Figure 1. Darker gray pattern represents proposed distribution of off-shelf assemblages such as Roberts Mountains allochthon, whereas horizontal ruled pattern outboard of miogeoclinal represents convergent margin assemblages such as Yreka terrane. The inverted V pattern represents possible trace of a magmatic arc outboard of Cordilleran margin. West-facing arc may have existed along margin during much or all of early Paleozoic time, or east-facing arc may have approached the margin during Devonian time. Black arrows represent interpreted dispersal patterns of sand in offshore settings, with numbers that are keyed to provenance links listed in Table 1. Gray arrows reflect general transport of sand that accumulated within miogeoclinal strata (Gehrels, this volume). Provenance of detritus in Kootenay terrane is from Smith and Gehrels (1991). Provenance of detritus in eugeoclinal strata of Mexico is from Gehrels and Stewart (1998). PRA— Peace River arch, TCA— Trans-continental arch, KT— Kootenay terrane, BRT— Black Rock terrane, TT— Trinity terrane, YT— Yreka terrane, RMA— Roberts Mountains allochthon, NST— northern Sierra terrane.

Figure 5. Relative age-probability curves for Paleozoic strata of Cordilleran miogeocline (Gehrels, this volume) and lower Paleozoic strata of Roberts Mountains allochthon (Gehrels et al., this volume, Chapter 1), Shoo Fly Complex (Harding et al., this volume), and Yreka terrane (Wallin et al., this volume). Ages of Trinity terrane intrusive rocks are from Wallin et al. (1995). B.C.— British Columbia. Numbers in boxes refer to provenance links listed in Table 1.

Gehrels et al., GSA SP 347, 133-150, 2000
The Eureka Quartzite is also derived from the Peace River Arch and transported via longshore current along the western Laurentian margin. (C) Late Silurian time. The Elder Sandstone is shed from the Peace River Arch region. (D) Middle Ordovician time. The lower Vinini Formation is derived from the central craton and Transcontinental Arch; the Valmy Formation is derived from the Peace River Arch. (B) Middle Ordovician time. The upper Vinini and Valmy formations are shed from the Peace River Arch into an oceanic basin. (E) Late Devonian time. Subduction has initiated along much of the western margin of Laurentia, moving the RMA strata onto the craton. (F) Early Mississippian time. The Antler orogeny has uplifted the RMA strata into a highland on the western Laurentian margin.

No Late Cambrian interpretation

2000 interpretation

Gehrels et al., GSA SP 347, 133-150, 2000

Late(?), Cambrian
Early Middle Ordovician

2016 interpretation

Linde et al., Geosphere, 2016

Middle Ordovician
Late Silurian

early Late Ordovician
Silurian-Devonian
So does the detrital zircon population, which everybody seems to think shows a strong Peace River Arch source, require tectonic motion, or could it be entirely sediment transport...