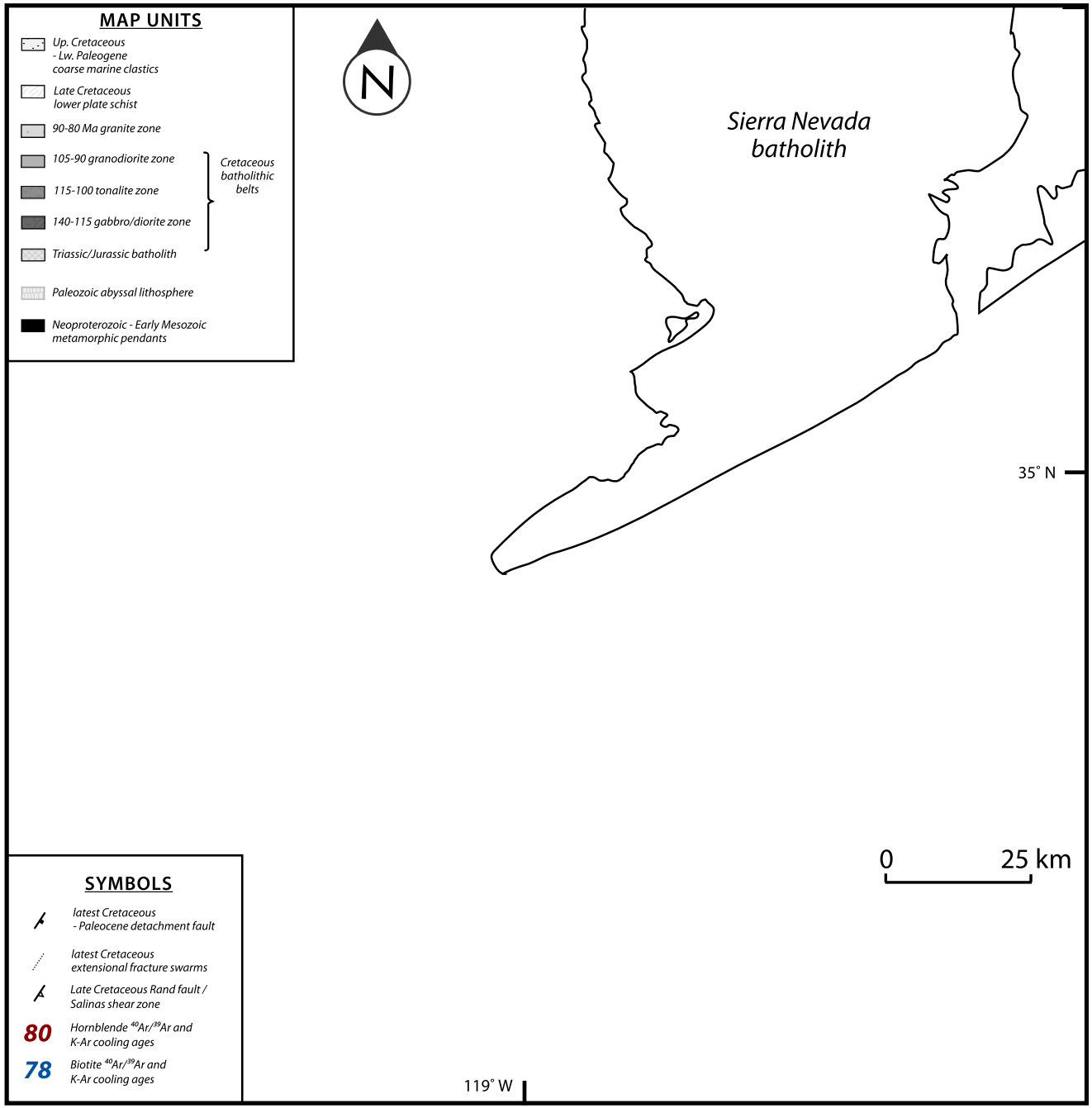
Ca. 100 Ma

Predisrupted state

Disruptions in movie shown relative to the modern outline of the Sierra Nevada batholith

See Figure 12 for references and additional notes.



Movie DR1.
Movie illustrating the timing of fault activity and events surrounding extensional collapse of the southern Sierra Nevada batholith and vicinity.
Red faults = active
Black faults = inactive

Chapman *et al*., 2012

Ca. 95 Ma

Crustal thickening

Onset of subduction of a large igneous massif beneath the southern Sierra Nevada batholith.

Coupling between the shallowly subducting plate and the upper plate leads to contractile deformation in the hanging wall. The proto-Kern Canyon fault begins its life as a east side up reverse fault. San Emigdio and Tehachapi schist protoliths are shed into the trench and buried along the Rand fault.

Movie DR1.
Movie illustrating the timing of fault activity and events surrounding extensional collapse of the southern Sierra Nevada batholith and vicinity.
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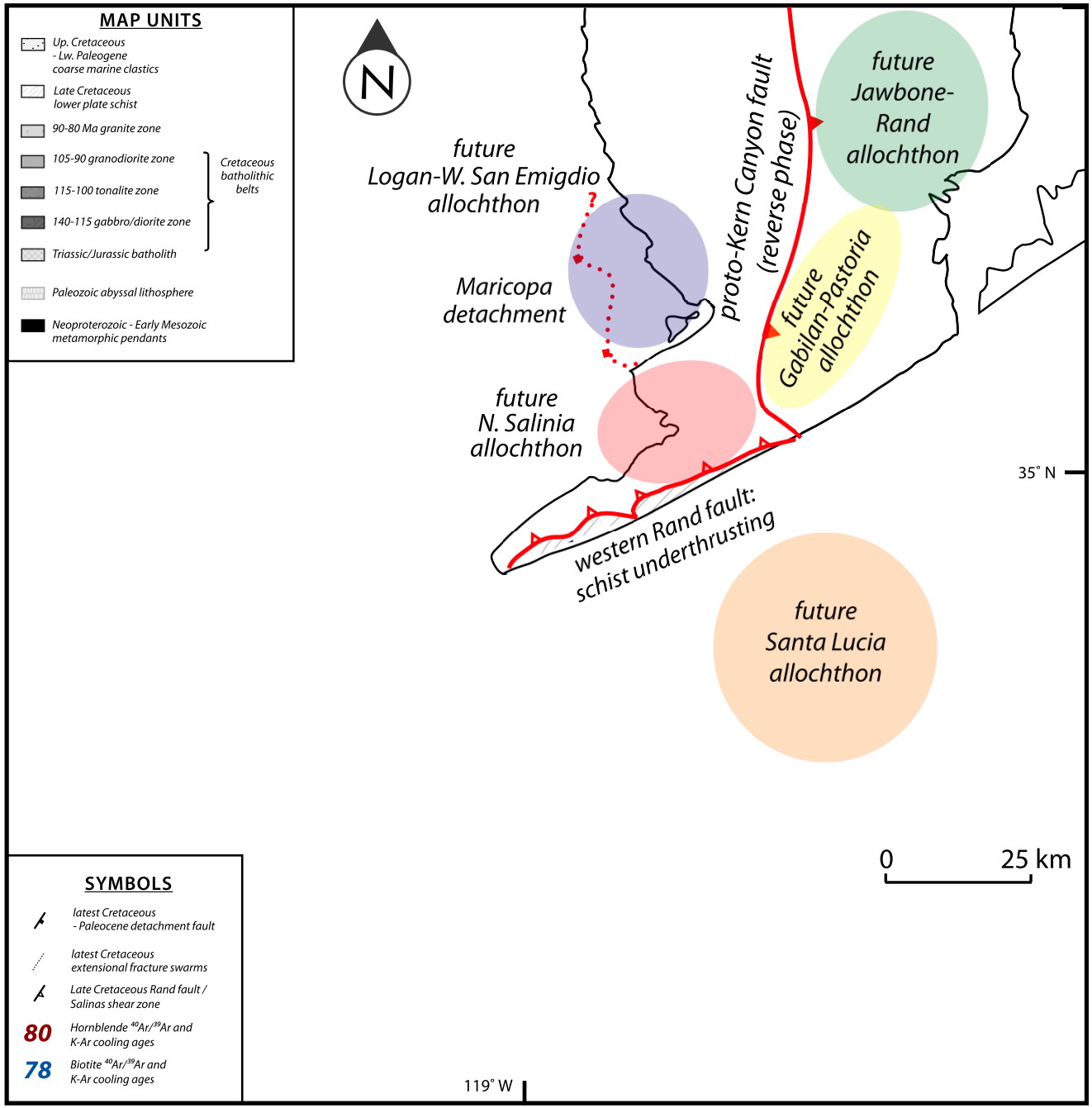
Chapman *et al.*, 2012



Ca. 90 Ma

Extension begins

Gravitational collapse of the overthickened upper plate drives trench-directed (red arrows denote transport direction) flow of San Emigdio and Tehachapi schist. Strain coupling between the schist and upper plate leads to extension and exhumation in the upper plate, and dispersion of western allochthons.

The proto Kern Canyon fault now functions as a dextral strike slip fault and the Rand fault now functions as a low angle normal fault.

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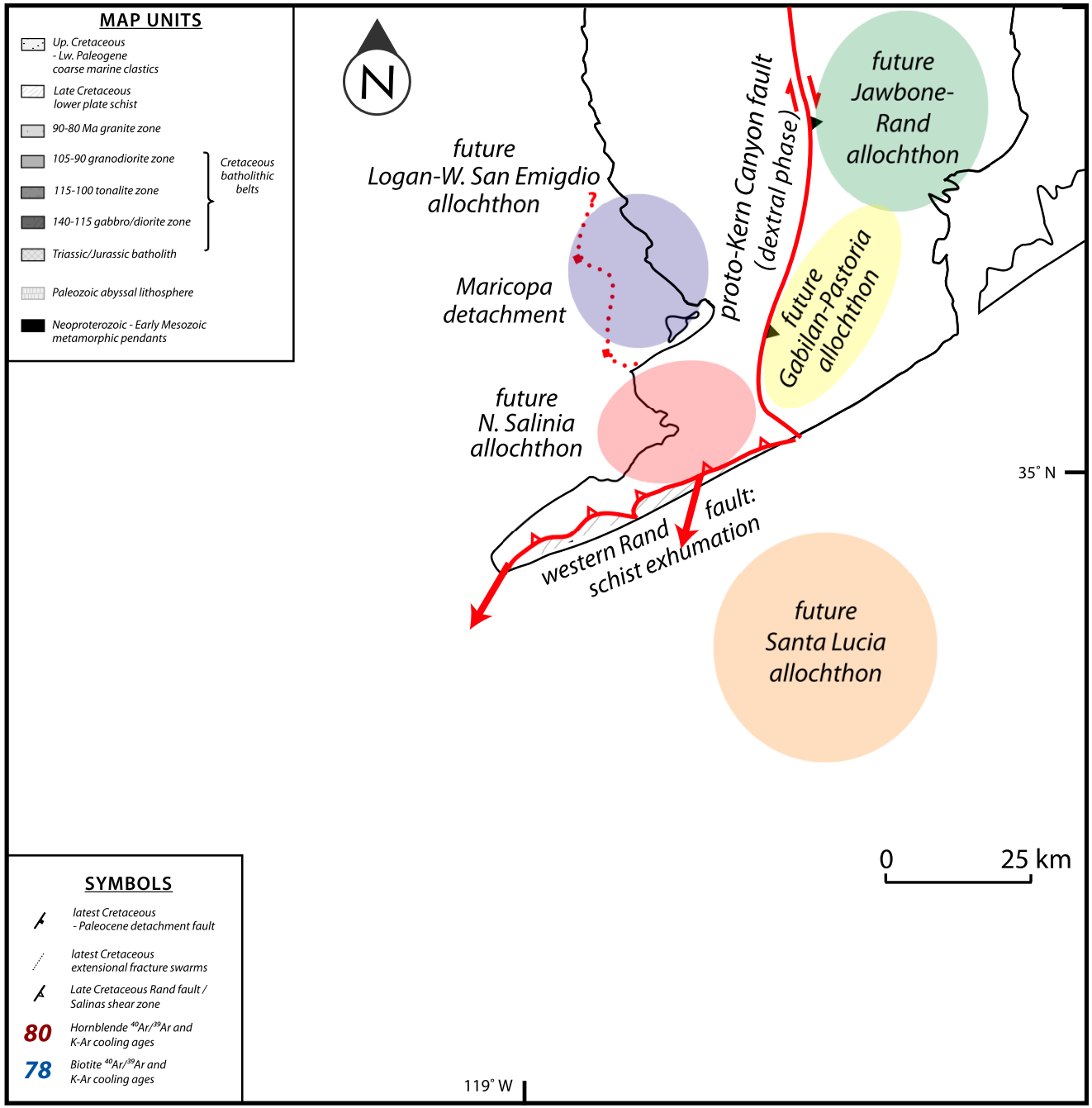
Chapman *et al.*, 2012



Ca. 85 Ma

Continued extension

The onset of gravitational collapse is marked by the detachment of western allochthons (Logan-western San Emigdio and northern Salinia allochthons) along the Maricopa detachment.

The southern Sierra detachment activates and the Kern Canyon – proto - White Wolf fault branches from the dying proto-Kern Canyon fault. Eastern allochthons (Jawbone-Rand, Gabilan-Pastoria, and Santa Lucia) detach from their native sites.

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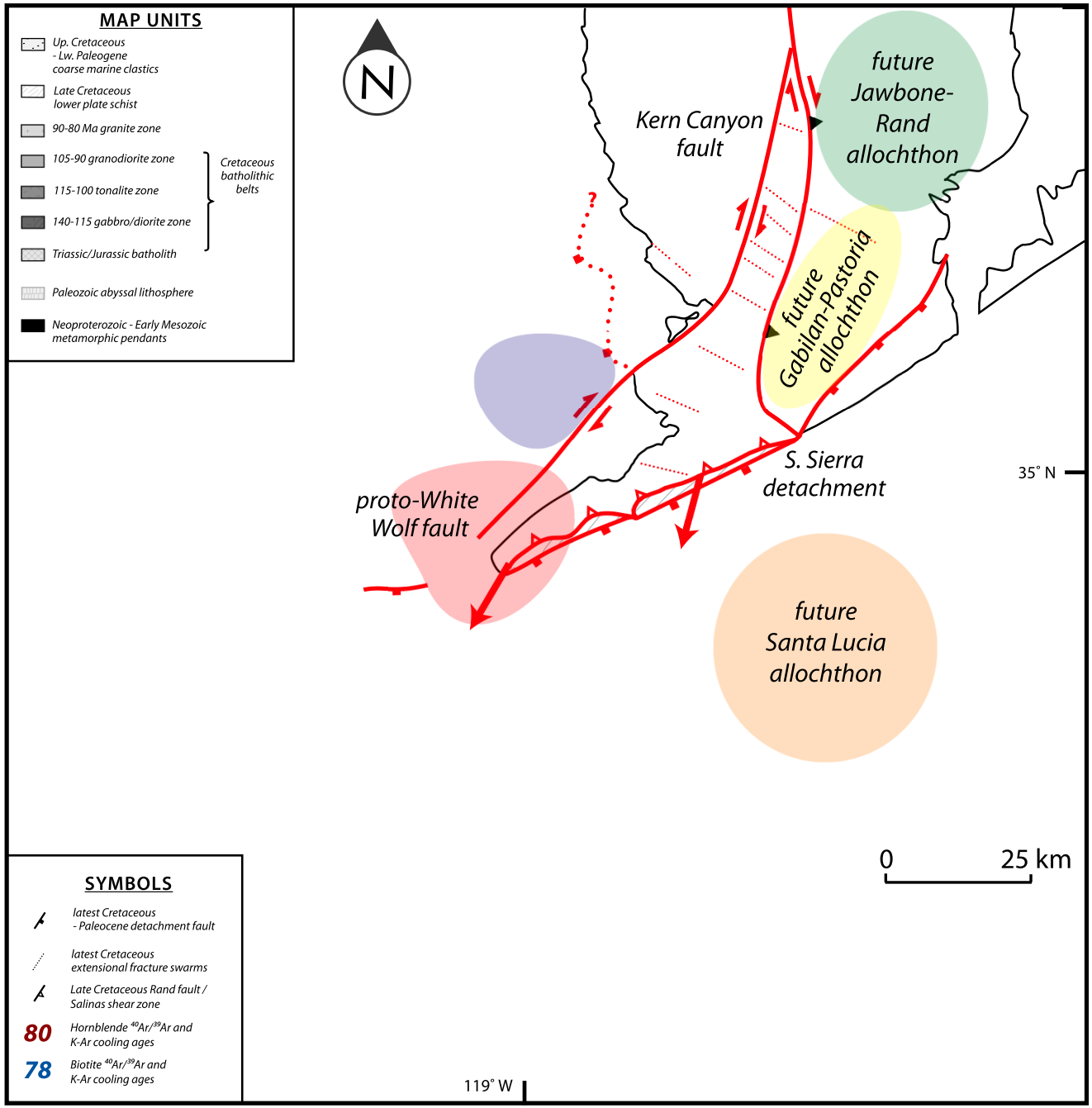
Chapman *et al.*, 2012



Ca. 80 Ma

Continued extension

Gravitational collapse is at its peak. Eastern allochthons continue to disperse southwestward. Western allochthons have come to rest.

Rand schist and the schist of Sierra de Salinas are shed into the trench and buried along the Rand fault and Salinas shear zone.

Fracture swarms open within the extensional corridor during unloading of the southern Sierra autochthon.

Movie DR1.
Movie illustrating the timing of fault activity and events surrounding extensional collapse of the southern Sierra Nevada batholith and vicinity.
Red faults = active
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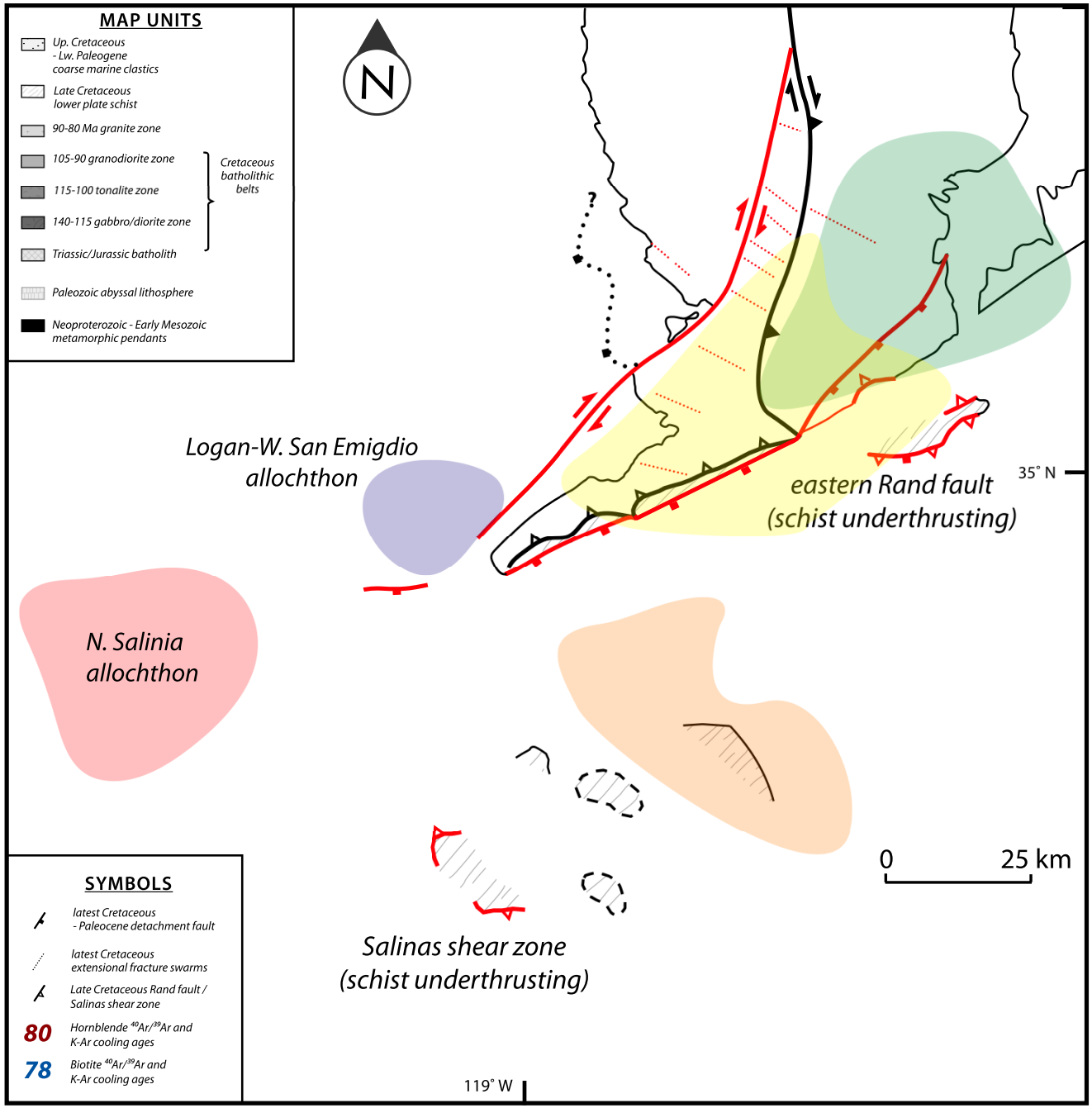
Chapman *et al.*, 2012

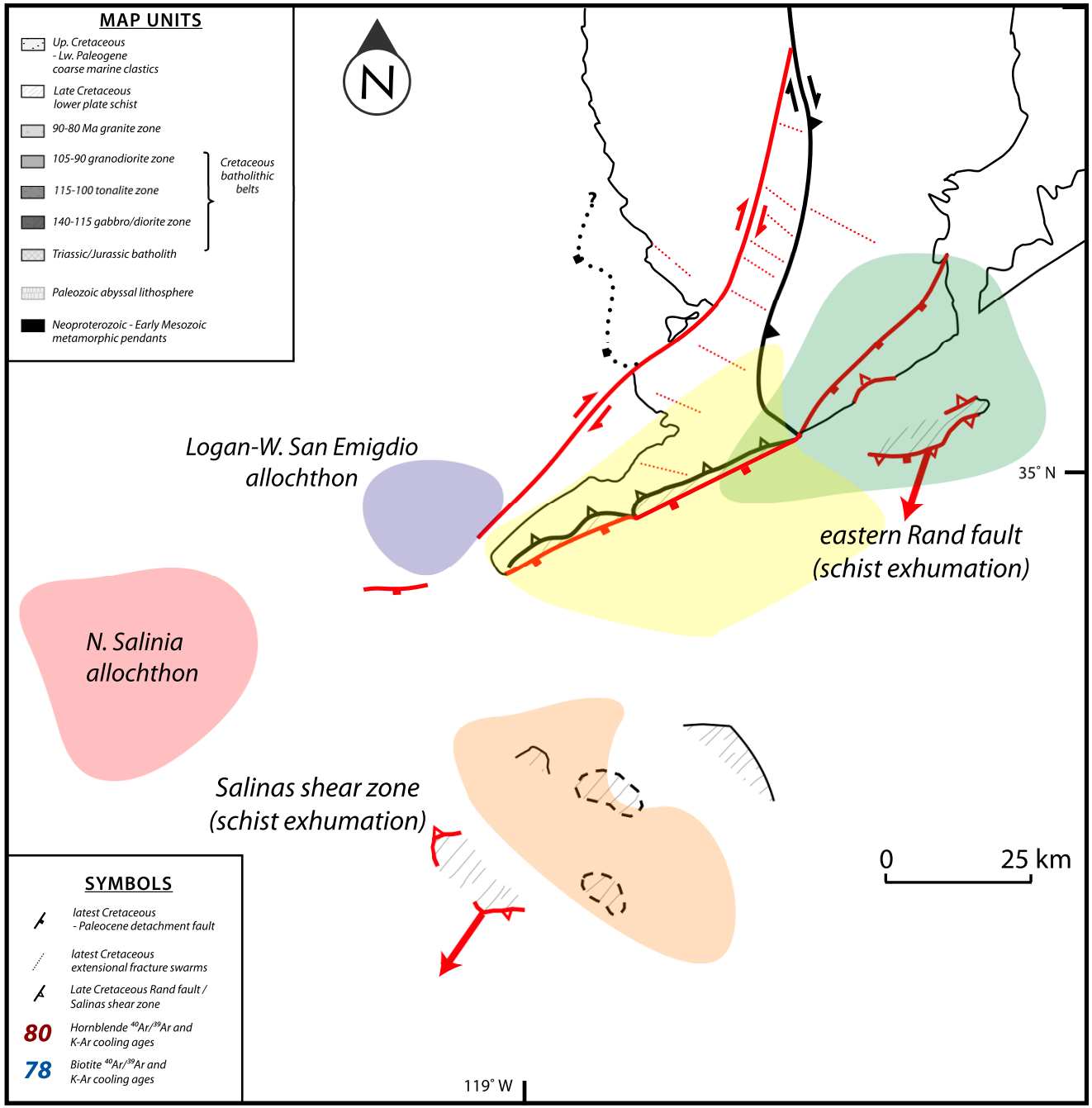


Ca. 75 Ma

Continued extension

Gravitational collapse is at its peak. Eastern allochthons continue to disperse southwestward.

Rand schist and the schist of Sierra de Salinas begin to ascend structurally along the Rand fault and Salinas shear zone with a lower plate to the south-southwest sense of shear.



Movie DR1.
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Red faults = active
Black faults = inactive

Chapman *et al.*, 2012

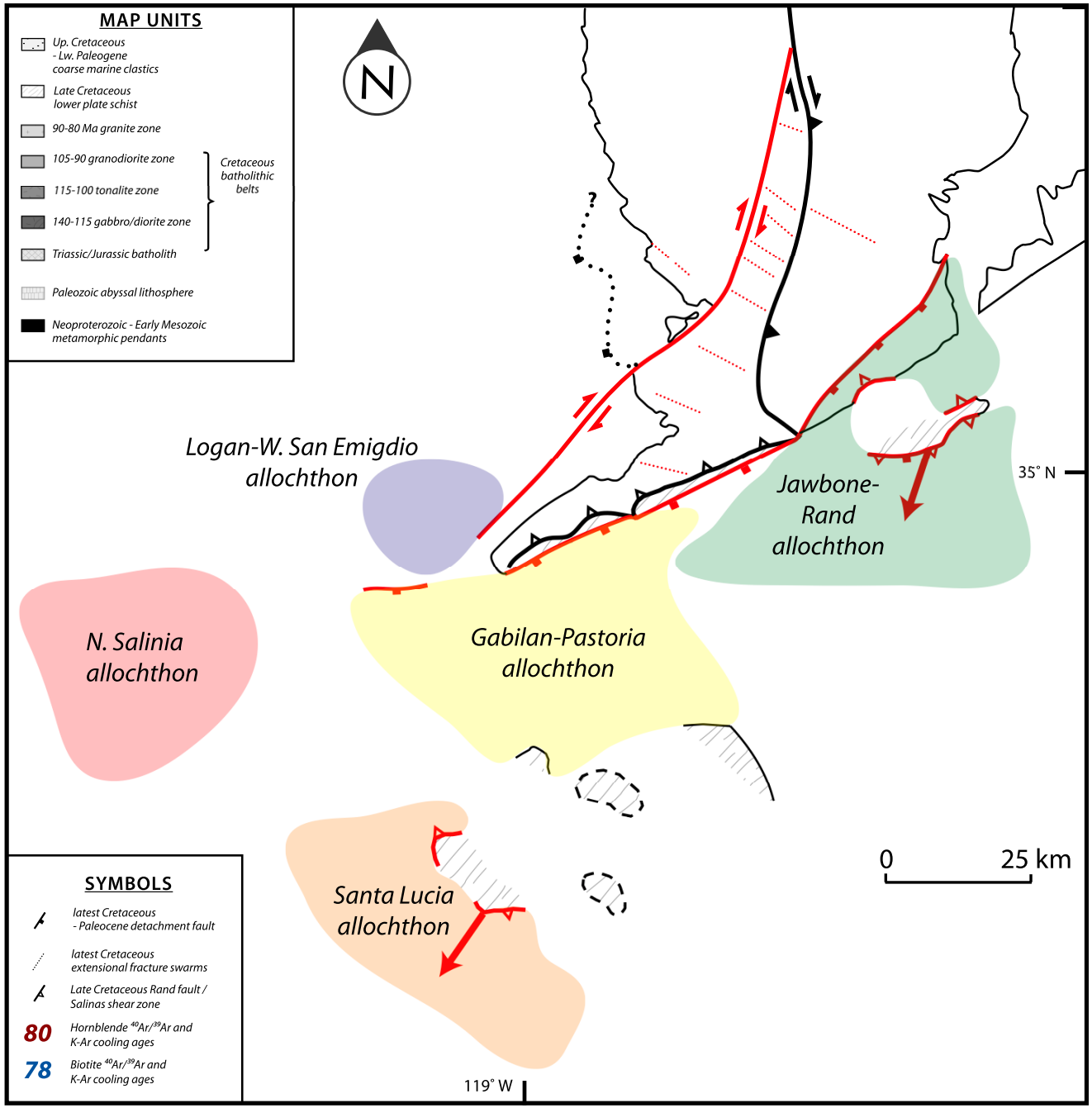
Ca. 70 Ma

Waning extension

Eastern allochthons reach pre-Neogene positions.

Continued cooling and structural ascent of the Rand schist and the schist of Sierra de Salinas.

Displacement ceases along the proto-White Wolf fault and the southern Sierra detachment.



Movie DR1.
Movie illustrating the timing of fault activity and events surrounding extensional collapse of the southern Sierra Nevada batholith and vicinity.
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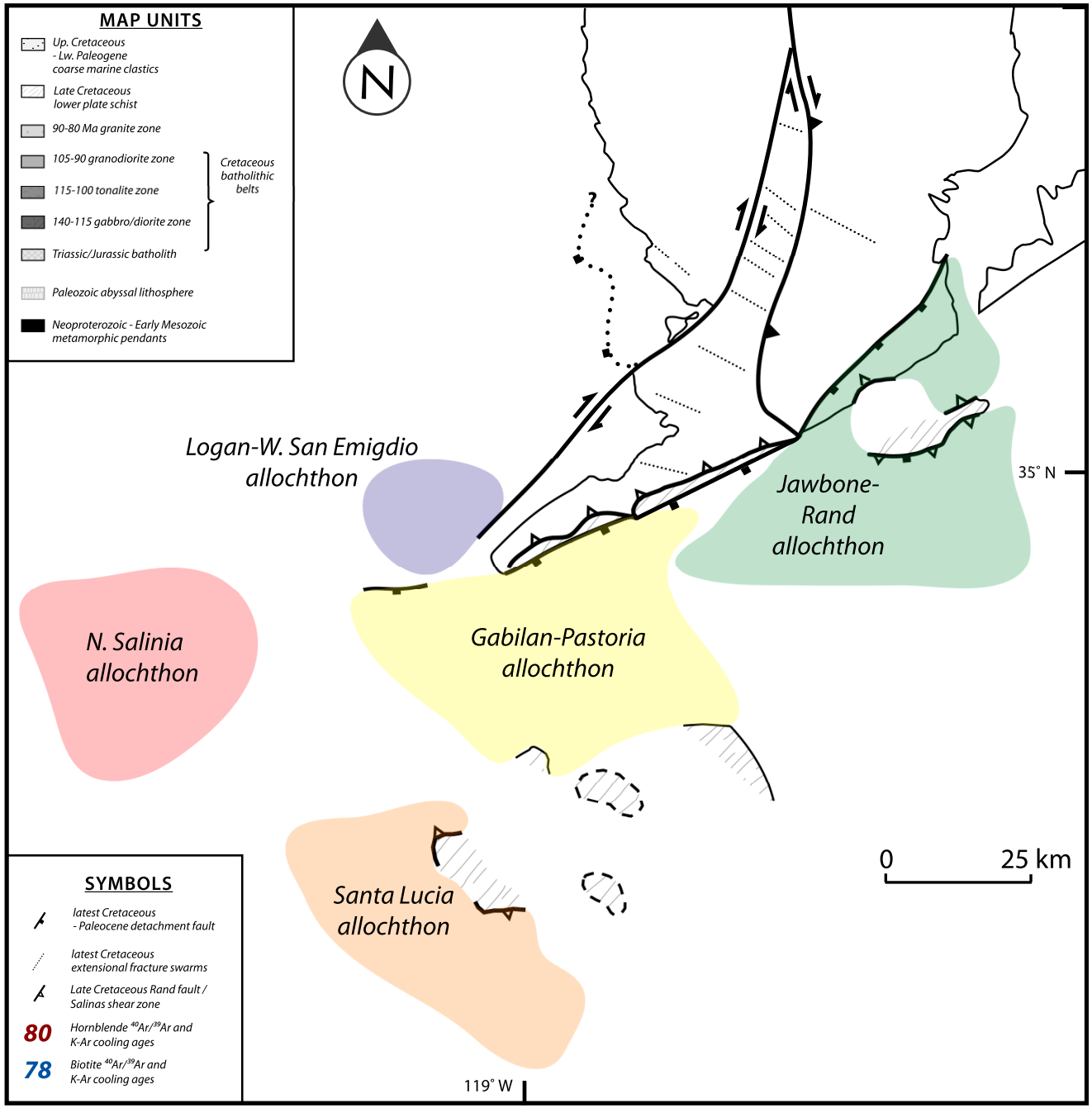
Chapman *et al.*, 2012

Ca. 65 Ma

End of extension



Movie DR1.
Movie illustrating the timing of fault activity and events surrounding extensional collapse of the southern Sierra Nevada batholith and vicinity.
Red faults = active
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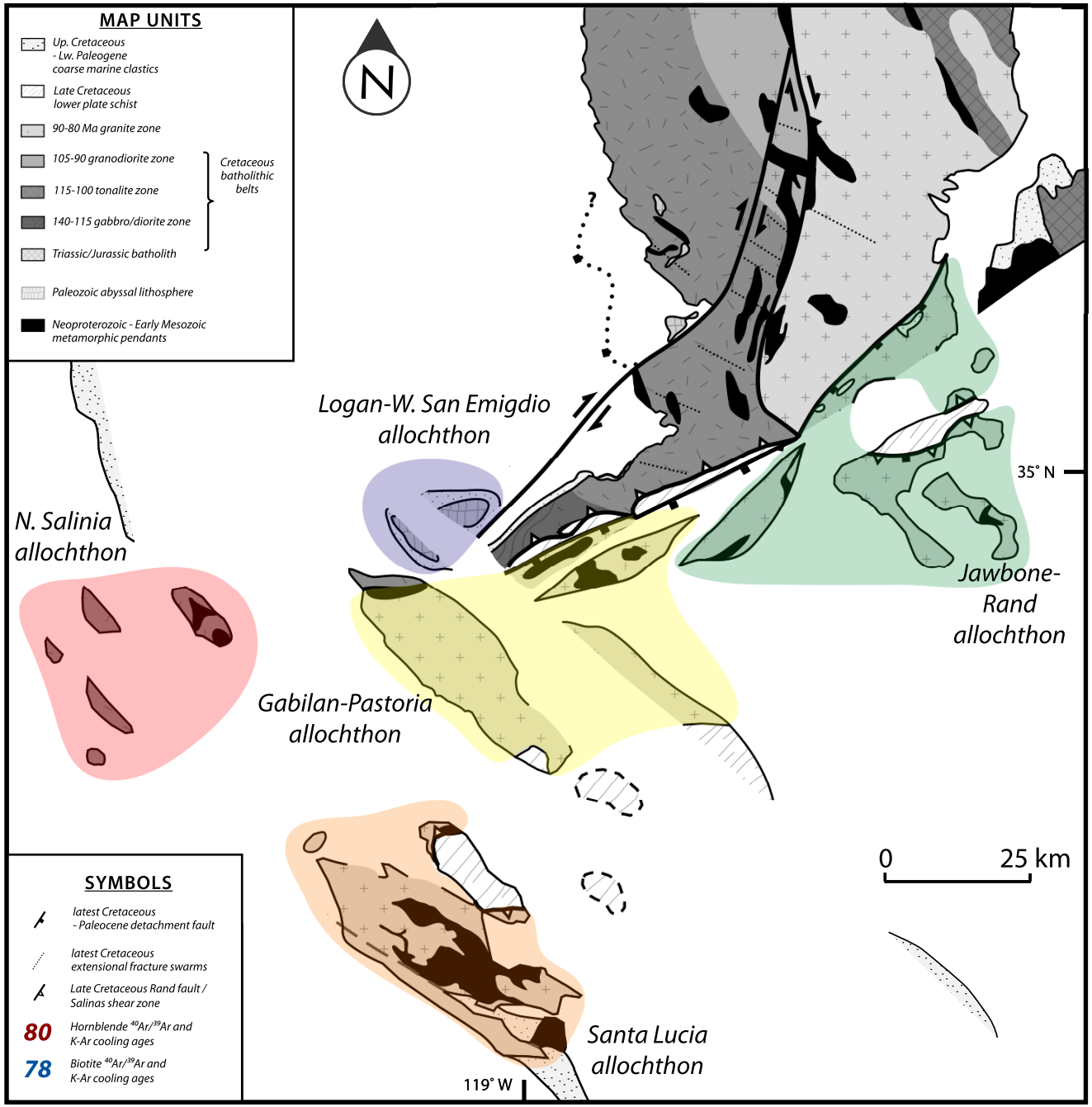
Chapman *et al.*, 2012

Ca. 65 Ma

Post-extensional geology

Figure 12b. Tectonic map of Figure 1 with Pliocene-Quaternary north-south shortening in the San Emigdio Mountains removed, showing allochthonous regions of similar inferred paleogeographic affinity (shaded). See text for discussion.



Movie DR1.

Movie illustrating the timing of fault activity and events surrounding extensional collapse of the southern Sierra Nevada batholith and vicinity.

Red faults = active

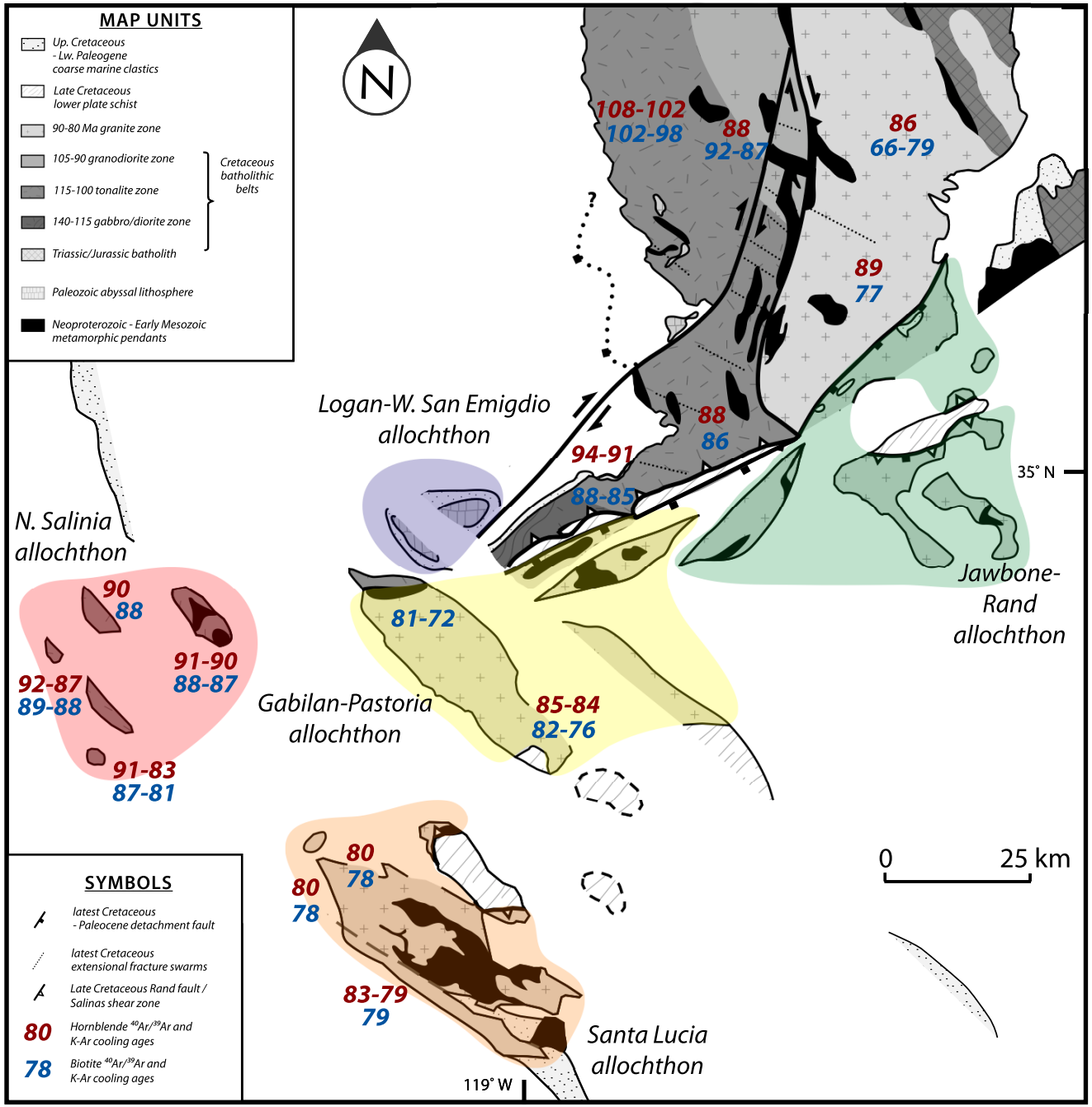
Black faults = inactive

Chapman *et al.*, 2012

Ca. 65 Ma

Cooling ages

Figure 12b. Tectonic map of Figure 1 with Pliocene-Quaternary north-south shortening in the San Emigdio Mountains removed, showing allochthonous regions of similar inferred paleogeographic affinity (shaded). See text for discussion.



Movie DR1.

Movie illustrating the timing of fault activity and events surrounding extensional collapse of the southern Sierra Nevada batholith and vicinity.

Red faults = active

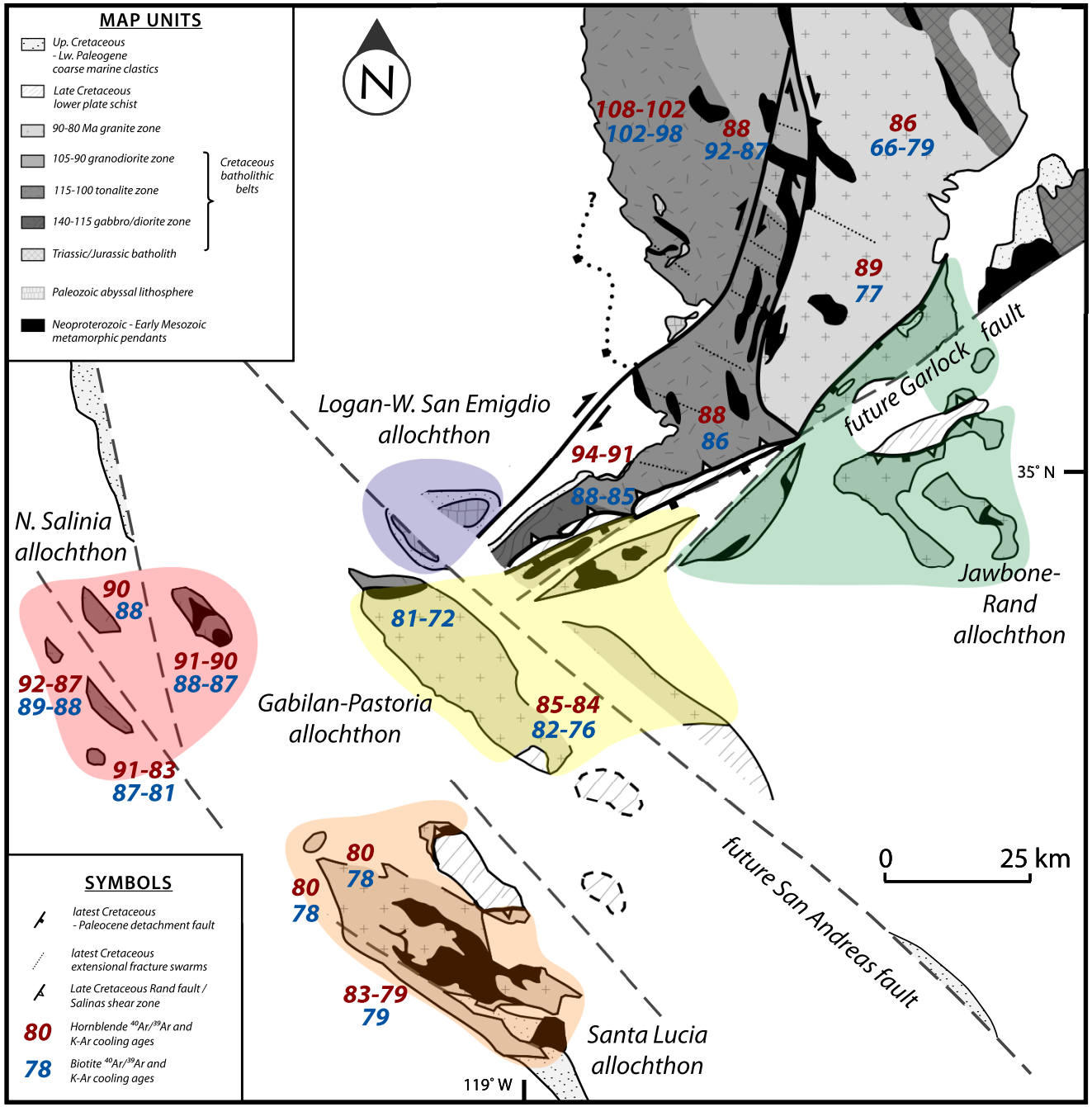
Black faults = inactive

Chapman *et al.*, 2012

Ca. 65 Ma

Neogene faults

Figure 12b. Tectonic map of Figure 1 with Pliocene-Quaternary north-south shortening in the San Emigdio Mountains removed, showing allochthonous regions of similar inferred paleogeographic affinity (shaded). See text for discussion.



Movie DR1.

Movie illustrating the timing of fault activity and events surrounding extensional collapse of the southern Sierra Nevada batholith and vicinity.

Red faults = active

Black faults = inactive

Chapman *et al.*, 2012