

Alamo Impact Breccia: Ring Realm Processes and Products*

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Search and Discovery Article #40494 (2010)

Posted March 12, 2010

*Adapted from an oral presentation at AAPG Annual Convention and Exhibition, Denver, Colorado, USA, June 7-10, 2009.

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Abstract

The Alamo Breccia is a debris bed generated by a marine impact at or near the Late Devonian continental margin of western Euramerica. It occurs in numerous mountain ranges of southern and central Nevada and western Utah. It was recently summarized by Pinto and Warme (2008, GSA Sp. Paper 437, p. 99-137) and Warme et al. (2008, GSA Guidebook 11, p. 215-247). Although the central crater location has not been identified, the widespread impact debris falls into six Realms, each of different character. The Realms are: Ring, Runup, Runoff, and Seismite, which occur progressively onshore across the Devonian carbonate platform; Crater Rim, preserved most likely on an outer-platform ramp; and Runout/Resurge, where Breccia-filled channels are intercalated with deep-water facies west of the platform.

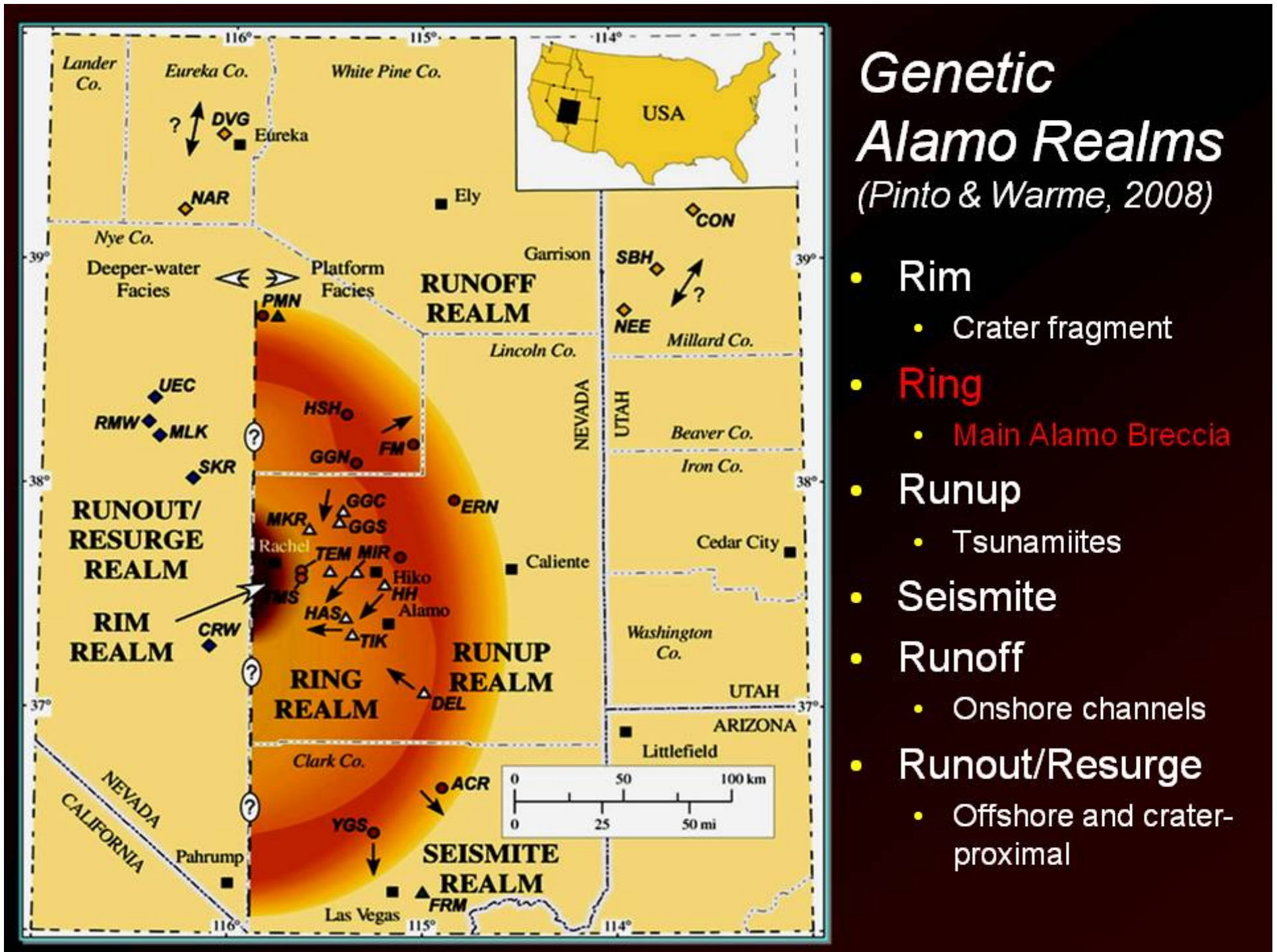
Alamo Breccia in the Ring Realm covers ~25,000 sq km, ranges from ~50-100 m thick, and has a predictable vertical profile upward, termed Units D, C, B, and A. Unit D is a bed-parallel monomict detachment breccia, <1 m thick, created 50-100 m below the contemporary surface of the platform by impact seismic surface waves. Love and Rayleigh waves broke the overlying delaminated interval into segments several hundred meters long, which are the megaclasts of Unit C. They vibrated against one another to create a chaotic breccia of clasts, as much as tens of meters in longest dimension, and a fine-grained matrix, which was mixed with ejecta-curtain debris to form the polymict breccia of Unit B. Units D to B were created within seconds to a few minutes after impact. In contrast, the overlying Unit A is stack of thinning and fining upward normally graded beds. They formed over several hours, or longer, by the uprush and backwash of tsunamis and runoff of condensed moisture from the marine impact. They culminate in a thin layer of carbonate mud, overlain by the next cycle of normal carbonate-platform beds.

Several locations show enigmatic large-scale disruptions of the D to A sequence attributed to mass flowage, and include debris flows that displaced large outsized clasts upward toward the top of the Breccia. The flows may have propagated downslope toward the platform edge, or toward the newly formed crater. More likely, flow of the unconsolidated Breccia Units D to A was initiated during formation of crater-concentric rings and tilt of inter-ring terraces away from the crater in later stages of transient crater evolution.

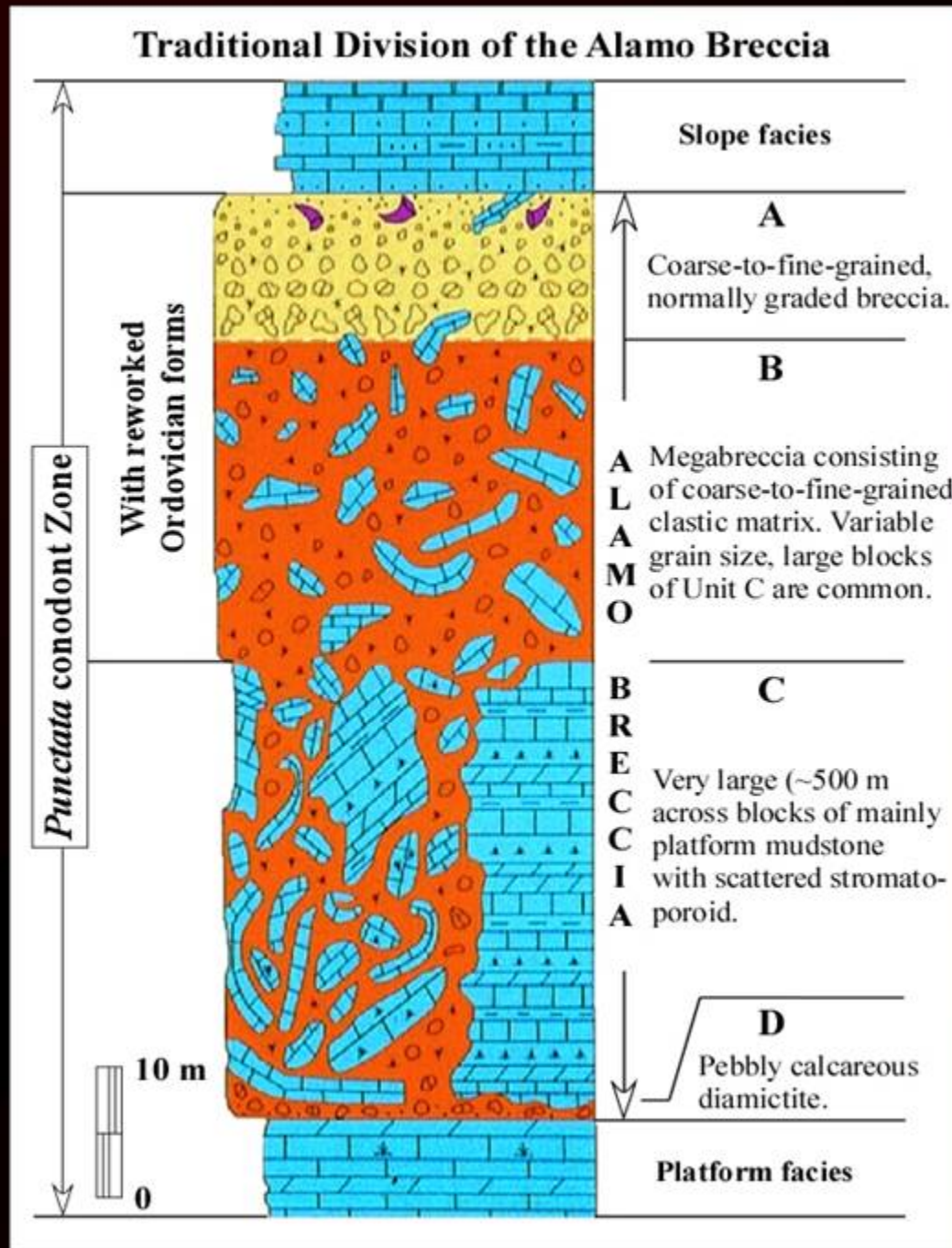
References

Pinto, J.A. and J.E. Warne, 2008, Alamo event, Nevada; crater stratigraphy and impact breccias realms: GSA Special Paper 437, p. 99-137.

Warne, J.E., J.R. Morrow, and C.A. Sandberg, 2008, Devonian carbonate platform of eastern Nevada; facies, surfaces, cycles, sequences, reefs, and cataclysmic Alamo impact breccias: GSA Field Guide, v. 11, p. 215-247.



Slide 4. Study area and genetic Alamo realms.



C

D

Slide 7. Traditional stratigraphic division of the Alamo Breccia.

DISINTEGRATING CLAST



Slide 16. Disintegrating clast within Alamo Breccia.

Ring Adjustment Example 1: Evacuation Structure (Hiko Range South)



R - Post-event Reef

A - Unit A Breccia

B - Unit B Breccia

C - Megaclast

D - Detachment Breccia

F - Megaclast Finger (Broken)

L - Lapillistone Clasts

