Correlation of Exhumation Peaks from Onshore, Low-Temperature (LTT), Thermochronological Ages with Five Tectonic Events affecting the Conjugate Rifted Margins of Northwestern Africa and Eastern North America

Geraldine Tijerina and Omar Zavala

Department of Earth and Atmospheric Sciences, University of Houston

ABSTRACT

A variety of LTT data that includes apatite fission-track data (AFT), zircon fission-track data (ZFT), and helium data (A–Th/He) were compiled from published literature and used to distinguish differing mechanisms of uplift and exhumation that have affected the conjugate margins of eastern North America and northwestern Africa. A total of 551 LTT samples were compiled on the North American margin and a total of 598 LTT samples were compiled from its northwestern Africa conjugate margin. UPbToolbox software, developed by Saylor and Sundell (2016), was used to generate histograms, and the natural neighbor interpolation tool in ArcMap was used to generate interpolated surfaces. Analysis of the LTT data distinguishes four exuhamation events that affected both conjugate margins: (1) Paleozoic orogeny: the North American margin reveals exhumation events that accompanied the Taconic orogeny during the Devonian (398–359 Ma), and the terminal, Alleghanian orogeny during the Pennsylvanian (325–260 Ma). The most complex orogenic area, northwestern Africa, includes superimposed, deformation with exhumation pulses of the Anti-Atlas Mountains (325–300 Ma), the Alleghanian orogeny (325–260 Ma), Mesozoic rift inversions (145-100 Ma) and the Betic-Rif orogeny (23–13 Ma). (2) Mesozoic, Atlantic rifting: exhumation peaks related to rifting are present on both the northwestern African margin (236–199 Ma) and on the eastern North American margin (199 Ma). (3) Spreading rate acceleration events: Pulses of post-rift, passive margin exhumation on the northwest Africa margin can be correlated to these spreading events at: 190-170 (spreading rate at 0.8 cm/yr), 170–154 Ma (at 1.7 cm/yr), and 154-150 (at 2.8 cm/yr). (4) Hotspot effects: Exhumation related to the Great Meteor hotspot is present from 125–100 Ma in

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New England, USA; and (5) Post-rifting, isostatic uplift: LTT ages in New England spanning from 199-66 Ma reflect a major pulse of isostatic exhumation for which mechanisms 3 and 4 overlap and may also influence.