Frederick, B.C., Blum, M.D., Snedden, J.W., and Fillon, R.H., 2020, Early Mesozoic synrift Eagle Mills Formation and coeval siliciclastic sources, sinks, and sediment routing, northern Gulf of Mexico basin: GSA Bulletin, https://doi.org/10.1130/B35493.1.

Data Repository

Table DR1. Kolmogorov-Smirnov (K-S) P-value results assessed as a first pass to examine whether samples were not statistically distinguishable from parent populations with the same distribution (Gehrels, 2012; Saylor and Sundell, 2016). K-S test statistics were calculated using Microsoft Excel macros from the Arizona LaserChron's collection of online analytical tools (see https://sites.google.com/a/laserchron.org/laserchron).

Table DR2. Kolmogorov-Smirnov (K-S) D-value results assessed as a first pass to examine whether samples were not statistically distinguishable from parent populations with the same distribution (Gehrels, 2012; Saylor and Sundell, 2016). K-S test statistics were calculated using Microsoft Excel macros from the Arizona LaserChron's collection of online analytical tools (see https://sites.google.com/a/laserchron.org/laserchron).

Table DR3. The youngest distribution of DZ U-Pb ages within a sample were also interpreted to define the maximum depositional age (MDA) of that sample (Gehrels, 2014). MDAs that approximate true depositional age can prove problematic in pre-salt GoM samples. Cawood et al. (2012) suggested that DZ U-Pb samples dominated by older U-Pb ages may reflect underlying amagmatic basement history.

Figure DR1. Location of the Gulf Coast Magnetic Anomaly (purple line) on magnetic anomaly map of the study area, southern USA. Well name abbreviations defined in Table 1. DZ—detrital zircon.

Figure DR2. Map above shows regional basement crustal sources and the position of Laurentia, Gondwana, and Yucatán/Maya blocks in Pangea (based upon Pindell and Kennan, 2009; Lawver et al., 2014). Red box highlights regional source lithologies shown in the inset below. Basement ages are non-unique with historical geological constraint providing relative reconstruction of continental source terranes. Lithologies constrained by the prior works of Clift et al. (2018), Lawton et al. (2016), Fildani et al. (2016), Dickinson and Gehrels (2009a), Cordani et al. (2009), Cardona et al. (2010), and Gehrels et al. (2011). Am-Wich—Amarillo-Witchita Uplift.

Figure DR3. (A) Contribution of different source terrane populations to the composite detrital zircon (DZ) U-Pb record of the Eagle Mills Formation and associated coeval units (N = 16, n = 3154) collected during this study (USA). (B) Normalized kernel density estimate (KDE) plots for the composite DZ U-Pb record of the west, central, and eastern Gulf of Mexico (GoM), respectively, including published Late Triassic El Alamar River/Potosi Fan DZ samples (CH06-01, LB06-1, RC06-1, SM06-1) from Barboza-Gudiño et al. (2010).

Figure DR4. Trends in cumulative detrital zircon (DZ) age distributions west to east across the northern Gulf of Mexico, USA. Well name abbreviations defined in Table 1.

Figure DR5. Trends in cumulative detrital (DZ) zircon age distributions north to south across the northern Gulf of Mexico, USA. Well name abbreviations defined in Table 1.

Figure DR6. Detrital zircon (DZ) mix results with Alico Land Development Co. "daughter" mixture of tributary "parent" components of PC Crapps (47.6%), Hernasco (44.9%), St Regis (2.4%), and JT Stalvey (5.1%). Kernel density estimate (KDE) curves to explain South Florida Basin (USA) facies and paleodrainage. Resultant mean cross correlation indicates an excellent 0.961 resultant model fit. PDPs—Probability Density Plots; CDFs—Cumulative Distribution Functions.

Figure DR7. Detrital zircon (DZ) mix results with MacDonnell B3 "daughter" mixture of tributary "parent" components of Amoco Stumberg (66.6%), Crossett Lumber (11.4%), Superior McManus (7.7%), LV Ray (1.4%), GD Royston (5%), Poison Springs (3.3%), SM06-1 (3%), and RC06-31 (1.7%). Kernel density estimate (KDE) curves to identify paleodrainage relationships between regional wells. Resultant good mean cross correlation coefficient model fit of 0.825. PDPs—Probability Density Plots; CDFs—Cumulative Distribution Functions.

Figure DR8. Detrital zircon (DZ) mix results of Potosi Fan "daughter" mixtures (RC06-31 and CH06-1) of tributary "parent" components. Kernel density estimate (KDE) curves identify paleodrainage relationships between regional wells. El Alamar paleoriver sample LB06-1 identified by Barboza-Gudiño et al. (2010) with >70% Permian–Triassic DZ age distribution implies significant secondary influx from proximal East Mexico Arc magmatic sources. Resultant good mean cross correlation coefficient model fit of 0.805 ± 0.003. PDPs—Probability Density Plots; CDFs—Cumulative Distribution Functions.

Figure DR9. Detrital zircon (DZ) mix results for St Regis Paper Co sample (daughter) with PC Crapps, JT Stalvey, Cecil Pate, and Rizer 1 samples as parent modeling inputs. The DZmix modeling algorithm quantifies source mixing proportions through a combination of inverse Monte Carlo modeling and optimized forward modeling (Sundell and Saylor, 2017). PDPs—Probability Density Plots; CDFs—Cumulative Distribution Functions.

Figure DR10. Detrital zircon (DZ) mix results for Crossett Lumber E1 sample (daughter) with Poison Springs 1, GD Royston, and McGee Unit samples as parent modeling inputs. The DZmix modeling algorithm quantifies source mixing proportions through a combination of inverse Monte Carlo modeling and optimized forward modeling (Sundell and Saylor, 2017). PDPs—Probability Density Plots; CDFs—Cumulative Distribution Functions.

Figure DR11. Detrital zircon (DZ) mix results for GD Royston sample (daughter) with Poison Springs 1, Crossett Lumber E1, and McGee Unit samples as parent modeling inputs. The DZmix modeling algorithm quantifies source mixing proportions through a combination of inverse Monte Carlo modeling and optimized forward modeling (Sundell and Saylor, 2017). PDPs—Probability Density Plots; CDFs—Cumulative Distribution Functions.

Figure DR12. Detrital zircon (DZ) mix results for McGee Unit sample (daughter) with Poison Springs 1, Crossett Lumber E1, and GD Royston samples as parent modeling inputs. The DZmix modeling algorithm quantifies source mixing proportions through a combination of inverse Monte Carlo modeling and optimized forward modeling (Sundell and Saylor, 2017). PDPs—Probability Density Plots; CDFs—Cumulative Distribution Functions.

REFERENCES CITED

Cawood, P.A., Hawkesworth, C.J., and Dhuime, B., 2012, Detrital zircon record and tectonic setting: Geology, v. 40, p. 875–878, https://doi.org/10.1130/G32945.1.

Clift, P.D., Heinrich, P., Dunn, D., Jacobus, A., and Blusztajn, J., 2018, The Sabine block, Gulf of Mexico: Promontory on the North American margin?: Geology, v. 46, p. 15–18, https://doi.org/10.1130/G39592.1.

Dickinson, W.R., and Gehrels, G.E., 2009a, U-Pb ages of detrital zircons in Jurassic eolian and associated sandstones of the Colorado plateau: Evidence for transcontinental dispersal and intraregional recycling of sediment: Geological Society of America Bulletin, v. 121, p. 408–433, https://doi.org/10.1130/B26406.1.

Fildani, A., McKay, M.P., Stockli, D., Clark, J., Dykstra, M.L., Stockli, L., and Hessler, A.M., 2016, The ancestral Mississippi drainage archived in the late Wisconsin Mississippi deep-sea fan: Geology, v. 44, p. 479–482, https://doi.org/10.1130/G37657.1.

Gehrels, G.E., 2012, Detrital Zircon U-Pb Geochronology : Current Methods and New Opportunities, in Tectonics of Sedimentary Basins: Recent Advances, John Wiley and Sons, 2012, p. 45–62, https://doi.org/10.1002/9781444347166.ch2.

Gehrels, G., 2014, Detrital Zircon U-Pb Geochronology Applied to Tectonics: Annual Review of Earth and Planetary Sciences, v. 42, p. 127–149, https://doi.org/10.1146/annurev-earth-050212-124012.

Gehrels, G.E., Blakey, R., Karlstrom, K.E., Timmons, J.M., Dickinson, B., and Pecha, M., 2011, Detrital zircon U-Pb geochronology of Paleozoic strata in the Grand Canyon, Arizona: Lithosphere, v. 3, p. 183–200, https://doi.org/10.1130/L121.1.

Lawver, L.A., Dalziel, I.W.D., Norton, I.O., Gahagan, L.M., and Davis, J., 2014, The PLATES 2014 Atlas of Plate Reconstructions (550 Ma to Present Day), PLATES Progress Report No. 374-0215: Austin, Texas, USA, University of Texas Institute for Geophysics, Technical Report No. 202, 220 p.

Pindell, J.L., and Kennan, L., 2009, Tectonic evolution of the Gulf of Mexico, Caribbean and northern South America in the mantle reference frame: An update, *in* James, K.H., Lorente, M.A., and Pindell, J.L., eds., The Origin and Evolution of the Caribbean Plate: Geological Society of London Special Publication 328, p. 1–55, https://doi.org/10.1144/SP328.1.

Saylor, J.E., and Sundell, K.E., 2016, Quantifying comparison of large detrital geochronology data sets: Geosphere, v. 12, p. 203–220, https://doi.org/10.1130/GES01237.1.

Sundell, K.E., and Saylor, J.E., 2017, Unmixing detrital geochronology age distributions: Geochemistry Geophysics Geosystems, v. 18, p. 2872–2886, https://doi.org/10.1002/2016GC006774.

Table 1

K-S P-values using error in the CDF

	MacDonnell B3	McGee Unit 1	Creel 1	Crossett Lumber E1	GD Royston	Hernasco 1	JT Stalvey	PC Crapps	Poison Springs 1	St Regis Paper Co	Superior McManus	Rizer 1	LV Ray Gas Unit 1-2	Alico Land Dev Co	Cecil Pate 1
MacDonnell B3		0.000	**0.124**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
McGee Unit 1	0.000		0.000	**0.175**	0.000	0.000	0.000	0.000	**0.057**	0.000	0.000	0.000	0.000	0.000	0.000
Creel 1	**0.124**	0.000		0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crossett Lumber E1	0.000	**0.175**	0.001		0.000	0.000	0.000	0.000	0.016	0.000	0.000	0.000	0.000	0.000	0.000
GD Royston	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.018	0.000	0.000	0.000	0.000	0.000	0.000
Hernasco 1	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JT Stalvey	0.000	0.000	0.000	0.000	0.000	0.000		0.044	0.000	0.007	0.000	0.000	0.000	0.000	0.000
PC Crapps	0.000	0.000	0.000	0.000	0.000	0.000	0.044		0.000	0.001	0.000	0.000	0.000	0.000	0.000
Poison Springs 1	0.000	**0.057**	0.000	0.016	0.018	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
St Regis Paper Co	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.001	0.000		0.000	0.000	0.000	0.000	0.000
Superior McManus	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Rizer 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
LV Ray Gas Unit 1-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
Alico Land Dev Co	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
Cecil Pate 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

K-S P-values for no error

	MacDonnell B3	McGee Unit 1	Creel 1	Crossett Lumber E1	GD Royston	Hernasco 1	JT Stalvey	PC Crapps	Poison Springs 1	St Regis Paper Co	Superior McManus	Rizer 1	LV Ray Gas Unit 1-2	Alico Land Dev Co	Cecil Pate 1
MacDonnell B3		0.000	**0.042**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
McGee Unit 1	0.000		0.000	0.075	0.000	0.000	0.000	0.000	**0.044**	0.000	0.000	0.000	0.000	0.000	0.000
Creel 1	**0.042**	0.000		0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crossett Lumber E1	0.000	0.075	0.001		0.000	0.000	0.000	0.000	0.008	0.000	0.000	0.000	0.000	0.000	0.000
GD Royston	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000
Hernasco 1	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JT Stalvey	0.000	0.000	0.000	0.000	0.000	0.000		0.013	0.000	0.004	0.000	0.000	0.000	0.000	0.000
PC Crapps	0.000	0.000	0.000	0.000	0.000	0.000	0.013		0.000	0.001	0.000	0.000	0.000	0.000	0.000
Poison Springs 1	0.000	**0.044**	0.000	0.008	0.009	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
St Regis Paper Co	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.001	0.000		0.000	0.000	0.000	0.000	0.000
Superior McManus	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Rizer 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
LV Ray Gas Unit 1-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
Alico Land Dev Co	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
Cecil Pate 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Average K-S P-values using Monte-Carlo

	MacDonnell B3	McGee Unit 1	Creel 1	Crossett Lumber E1	GD Royston	Hernasco 1	JT Stalvey	PC Crapps	Poison Springs 1	St Regis Paper Co	Superior McManus	Rizer 1	LV Ray Gas Unit 1-2	Alico Land Dev Co	Cecil Pate 1
MacDonnell B3		0.000	**0.060**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
McGee Unit 1	0.000		0.000	**0.075**	0.000	0.000	0.000	0.000	**0.044**	0.000	0.000	0.000	0.000	0.000	0.000
Creel 1	**0.060**	0.000		0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crossett Lumber E1	0.000	**0.075**	0.001		0.000	0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000
GD Royston	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.009	0.000	0.000	0.000	0.000	0.000	0.000
Hernasco 1	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JT Stalvey	0.000	0.000	0.000	0.000	0.000	0.000		0.022	0.000	0.004	0.000	0.000	0.000	0.000	0.000
PC Crapps	0.000	0.000	0.000	0.000	0.000	0.000	0.022		0.000	0.001	0.000	0.000	0.000	0.000	0.000
Poison Springs 1	0.000	**0.044**	0.000	0.009	0.009	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
St Regis Paper Co	0.000	0.000	0.000	0.000	0.000	0.000	0.004	0.001	0.000		0.000	0.000	0.000	0.000	0.000
Superior McManus	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Rizer 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
LV Ray Gas Unit 1-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
Alico Land Dev Co	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
Cecil Pate 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Supplemental Table 1: Kolmogorov-Smirnov (K-S) P-value results assessed as a first pass to examine whether samples were not statistically distinguishable from parent populations with the same distribution (Gehrels, 2012; Saylor and Sundell, 2016). K-S test statistics were calculated using Microsoft Excel macros from the Arizona LaserChron's collection of online analytical tools (see https://sites.google.com/a/laserchron.org/laserchron).

Table 2

D-values using error in the CDF

	MacDonnell B3	McGee Unit 1	Creel 1	Crossett Lumber E1	GD Royston	Hernasco 1	JT Stalvey	PC Crapps	Poison Springs 1	St Regis Paper Co	Superior McManus	Rizer 1	LV Ray Gas Unit 1-2	Alico Land Dev Co	Cecil Pate 1
MacDonnell B3		0.254	0.108	0.242	0.326	0.706	0.354	0.365	0.232	0.492	0.259	0.641	0.268	0.563	0.467
McGee Unit 1	0.254		0.211	0.118	0.230	0.935	0.585	0.596	0.122	0.726	0.492	0.876	0.499	0.794	0.698
Creel 1	0.108	0.211		0.221	0.340	0.738	0.378	0.390	0.234	0.530	0.301	0.680	0.292	0.587	0.496
Crossett Lumber E1	0.242	0.118	0.221		0.271	0.946	0.595	0.607	0.168	0.733	0.500	0.882	0.510	0.804	0.708
GD Royston	0.326	0.230	0.340	0.271		0.781	0.402	0.424	0.147	0.552	0.324	0.713	0.318	0.618	0.529
Hernasco 1	0.706	0.935	0.738	0.946	0.781		0.631	0.549	0.829	0.520	0.473	0.581	0.765	0.287	0.552
JT Stalvey	0.354	0.585	0.378	0.595	0.402	0.631		0.138	0.464	0.208	0.257	0.475	0.318	0.397	0.452
PC Crapps	0.365	0.596	0.390	0.607	0.424	0.549	0.138		0.475	0.242	0.353	0.584	0.384	0.292	0.555
Poison Springs 1	0.232	0.122	0.234	0.168	0.147	0.829	0.464	0.475		0.610	0.375	0.760	0.379	0.673	0.578
St Regis Paper Co	0.492	0.726	0.530	0.733	0.552	0.520	0.208	0.242	0.610		0.256	0.491	0.483	0.288	0.418
Superior McManus	0.259	0.492	0.301	0.500	0.324	0.473	0.257	0.353	0.375	0.256		0.405	0.314	0.314	0.237
Rizer 1	0.641	0.876	0.680	0.882	0.713	0.581	0.475	0.584	0.760	0.491	0.405		0.664	0.550	0.335
LV Ray Gas Unit 1-2	0.268	0.499	0.292	0.510	0.318	0.765	0.318	0.384	0.379	0.483	0.314	0.664		0.588	0.527
Alico Land Dev Co	0.563	0.794	0.587	0.804	0.618	0.287	0.397	0.292	0.673	0.288	0.314	0.550	0.588		0.521
Cecil Pate 1	0.467	0.698	0.496	0.708	0.529	0.552	0.452	0.555	0.578	0.418	0.237	0.335	0.527	0.521	

D-values for no error

	MacDonnell B3	McGee Unit 1	Creel 1	Crossett Lumber E1	GD Royston	Hernasco 1	JT Stalvey	PC Crapps	Poison Springs 1	St Regis Paper Co	Superior McManus	Rizer 1	LV Ray Gas Unit 1-2	Alico Land Dev Co	Cecil Pate 1
MacDonnell B3		0.282	0.128	0.249	0.334	0.711	0.356	0.366	0.267	0.492	0.268	0.641	0.270	0.563	0.467
McGee Unit 1	0.282		0.211	0.137	0.241	0.935	0.586	0.596	0.126	0.726	0.500	0.876	0.501	0.794	0.697
Creel 1	0.128	0.211		0.221	0.348	0.745	0.386	0.390	0.237	0.531	0.316	0.680	0.298	0.588	0.501
Crossett Lumber E1	0.249	0.137	0.221		0.279	0.946	0.597	0.607	0.181	0.733	0.508	0.883	0.512	0.804	0.708
GD Royston	0.334	0.241	0.348	0.279		0.782	0.407	0.426	0.158	0.557	0.337	0.718	0.322	0.619	0.533
Hernasco 1	0.711	0.935	0.745	0.946	0.782		0.648	0.583	0.832	0.536	0.487	0.586	0.772	0.323	0.557
JT Stalvey	0.356	0.586	0.386	0.597	0.407	0.648		0.158	0.465	0.219	0.265	0.478	0.334	0.416	0.465
PC Crapps	0.366	0.596	0.390	0.607	0.426	0.583	0.158		0.475	0.242	0.361	0.586	0.409	0.307	0.557
Poison Springs 1	0.267	0.126	0.237	0.181	0.158	0.832	0.465	0.475		0.610	0.388	0.761	0.380	0.673	0.580
St Regis Paper Co	0.492	0.726	0.531	0.733	0.557	0.536	0.219	0.242	0.610		0.256	0.493	0.509	0.302	0.425
Superior McManus	0.268	0.500	0.316	0.508	0.337	0.487	0.265	0.361	0.388	0.256		0.406	0.325	0.318	0.246
Rizer 1	0.641	0.876	0.680	0.883	0.718	0.586	0.478	0.586	0.761	0.493	0.406		0.694	0.553	0.338
LV Ray Gas Unit 1-2	0.270	0.501	0.298	0.512	0.322	0.772	0.334	0.409	0.380	0.509	0.325	0.694		0.602	0.534
Alico Land Dev Co	0.563	0.794	0.588	0.804	0.619	0.323	0.416	0.307	0.673	0.302	0.318	0.553	0.602		0.523
Cecil Pate 1	0.467	0.697	0.501	0.708	0.533	0.557	0.465	0.557	0.580	0.425	0.246	0.338	0.534	0.523	

Two std devs. of P-values using Monte-Carlo

	MacDonnell B3	McGee Unit 1	Creel 1	Crossett Lumber E1	GD Royston	Hernasco 1	JT Stalvey	PC Crapps	Poison Springs 1	St Regis Paper Co	Superior McManus	Rizer 1	LV Ray Gas Unit 1-2	Alico Land Dev Co	Cecil Pate 1
MacDonnell B3		0.000	**0.058**	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
McGee Unit 1	0.000		0.000	**0.062**	0.000	0.000	0.000	0.000	**0.018**	0.000	0.000	0.000	0.000	0.000	0.000
Creel 1	**0.058**	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Crossett Lumber E1	0.000	**0.062**	0.000		0.000	0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000
GD Royston	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.006	0.000	0.000	0.000	0.000	0.000	0.000
Hernasco 1	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
JT Stalvey	0.000	0.000	0.000	0.000	0.000	0.000		0.028	0.000	0.003	0.000	0.000	0.000	0.000	0.000
PC Crapps	0.000	0.000	0.000	0.000	0.000	0.000	0.028		0.000	0.000	0.000	0.000	0.000	0.000	0.000
Poison Springs 1	0.000	**0.018**	0.000	0.006	0.006	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000
St Regis Paper Co	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.000	0.000		0.000	0.000	0.000	0.000	0.000
Superior McManus	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000
Rizer 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	0.000
LV Ray Gas Unit 1-2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000
Alico Land Dev Co	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000
Cecil Pate 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

Supplemental Table 2: Kolmogorov-Smirnov (K-S) D-value results assessed as a first pass to examine whether samples were not statistically distinguishable from parent populations with the same distribution (Gehrels, 2012; Saylor and Sundell, 2016). K-S test statistics were calculated using Microsoft Excel macros from the Arizona LaserChron's collection of online analytical tools (see https://sites.google.com/a/laserchron.org/laserchron).

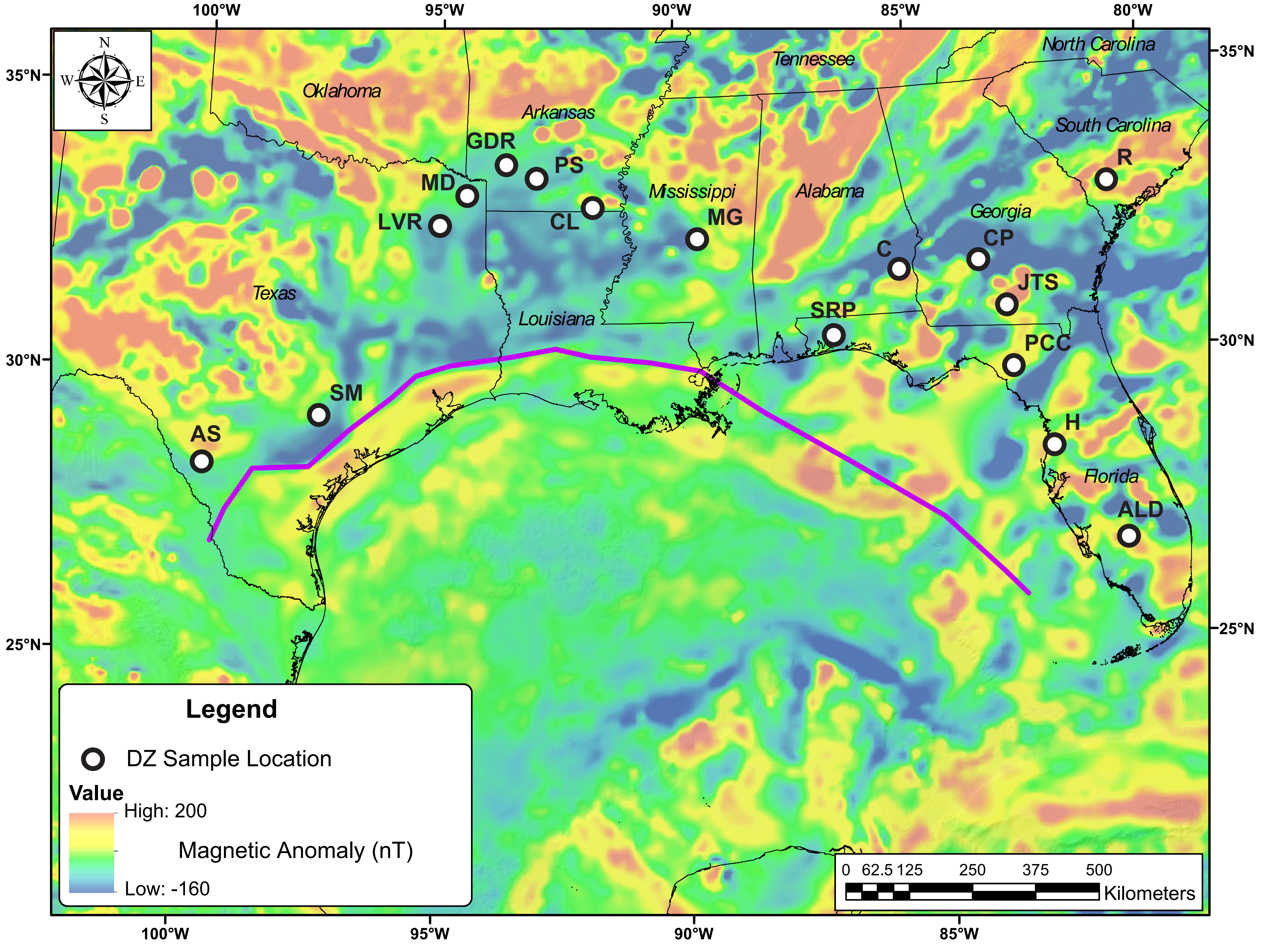
Table 3

Well ID	Sample Depth (ft)	County/State	Youngest Grain (Ma)	MDA (Ma)	MDA err (Ma)	Raw DZ ct	QC DZ ct	DZ % Pb-loss
Alico Land Dev Co 19-2	15640-16000	Hendry/FL	198.1	201.5	2.44	234	234	0
Amoco Stumberg*	19715-19743	Dimmit/TX	293.3	339.0	3.9	293	241	17.7
Cecil Pate #1*	4250-4520	Crisp/GA	199.1	271.7	2.53	262	248	5.34
Creel #1	4406-4734	Barbour/AL	304.2	326.7	4	281	272	3.2
Crossett Lumber E1	7870-9590	Ashley/AR	97.7	NA	NA	196	191	2.55
GD Royston #1*	3800-5200	Hempstead/AR	338.8	411.1	10.75	296	293	1.01
Hernasco #1	7700-8470	Hernando/FL	518	554.7	6.21	257	256	0.38
JT Stalvey Jr #1	5200-5480	Lowndes/GA	240.4	267.1	2.6	229	224	2.23
LV Ray Gas Unit 1-2*	13700-13756	Upshur/TX	403.1	554	13.2	161	155	1.88
MacDonnell B3	10677-10691	Cass/TX	301.2	312.1	8.03	299	299	0
McGee Unit #1	14947-14953	Scott/MS	428	462.6	10.8	293	290	1.03
PC Crapps #1	6500-8380	Lafayette/FL	519.1	539.9	1.44	245	243	0.82
Poison Springs #1*	5600-7200	Ouachita/AR	101.66	409.8	4.04	286	279	2.44
Rizer #1*	6006-6008	Colleton/SC	80.7	283.6	7.37	302	293	3.07
St Regis Paper Co B1*	16140-16920	Santa Rosa/FL	257.4	412.2	4.72	116	113	2.58
Superior McManus DC #1	20400-21644	Gonzales/TX	231.8	251.1	3.47	249	247	0.81

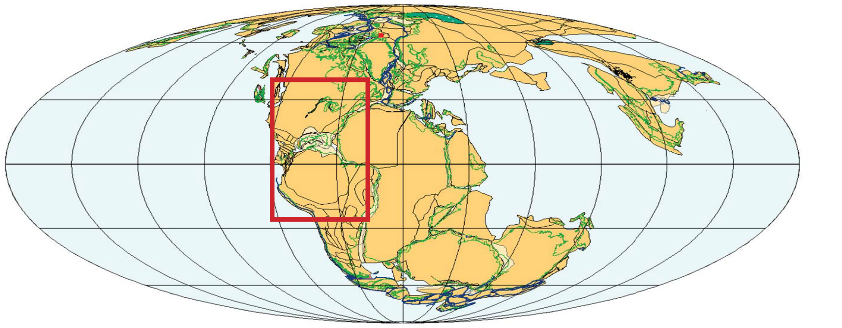
Notes:

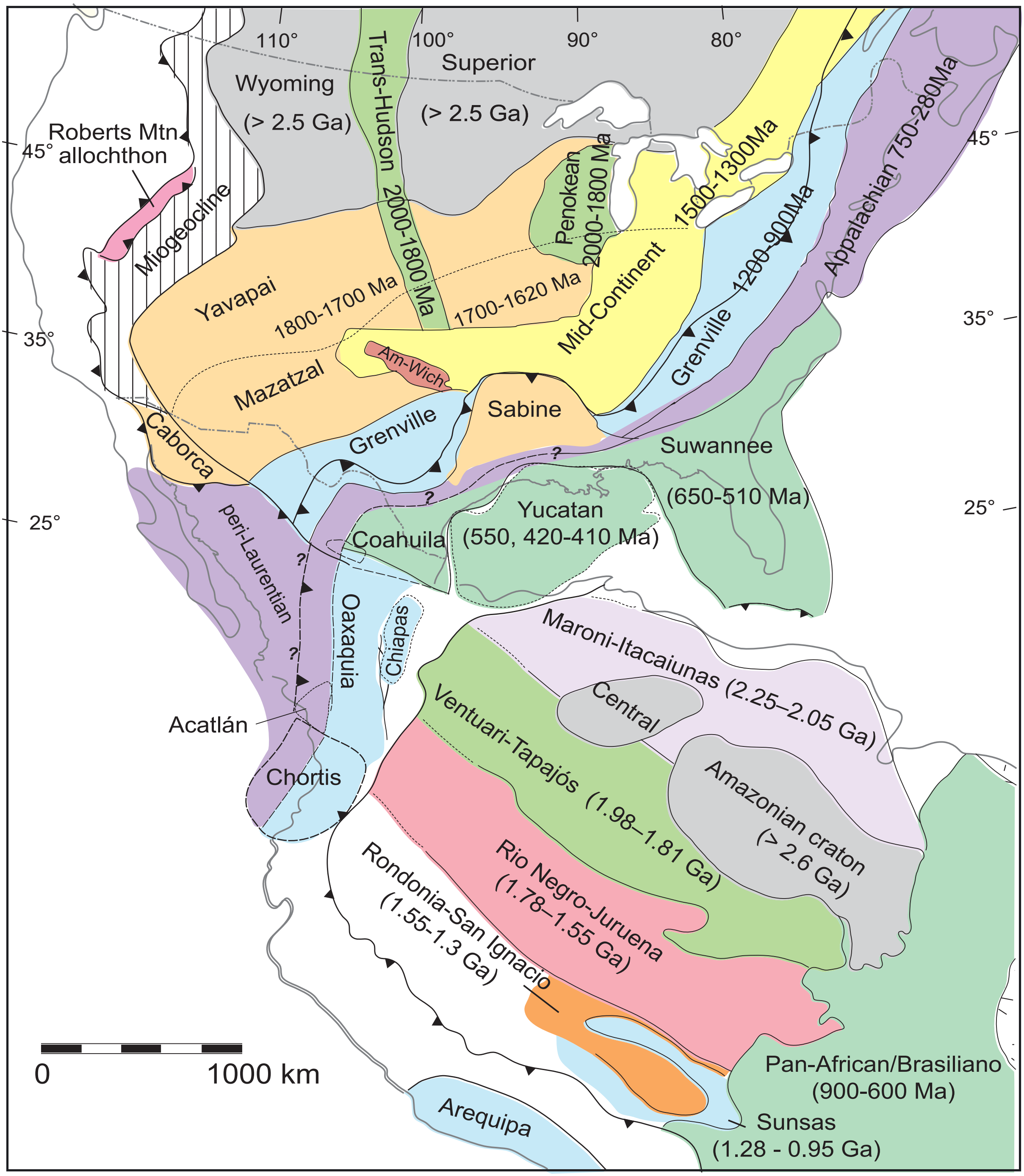
* - More than 40 Ma between MDA and youngest grain

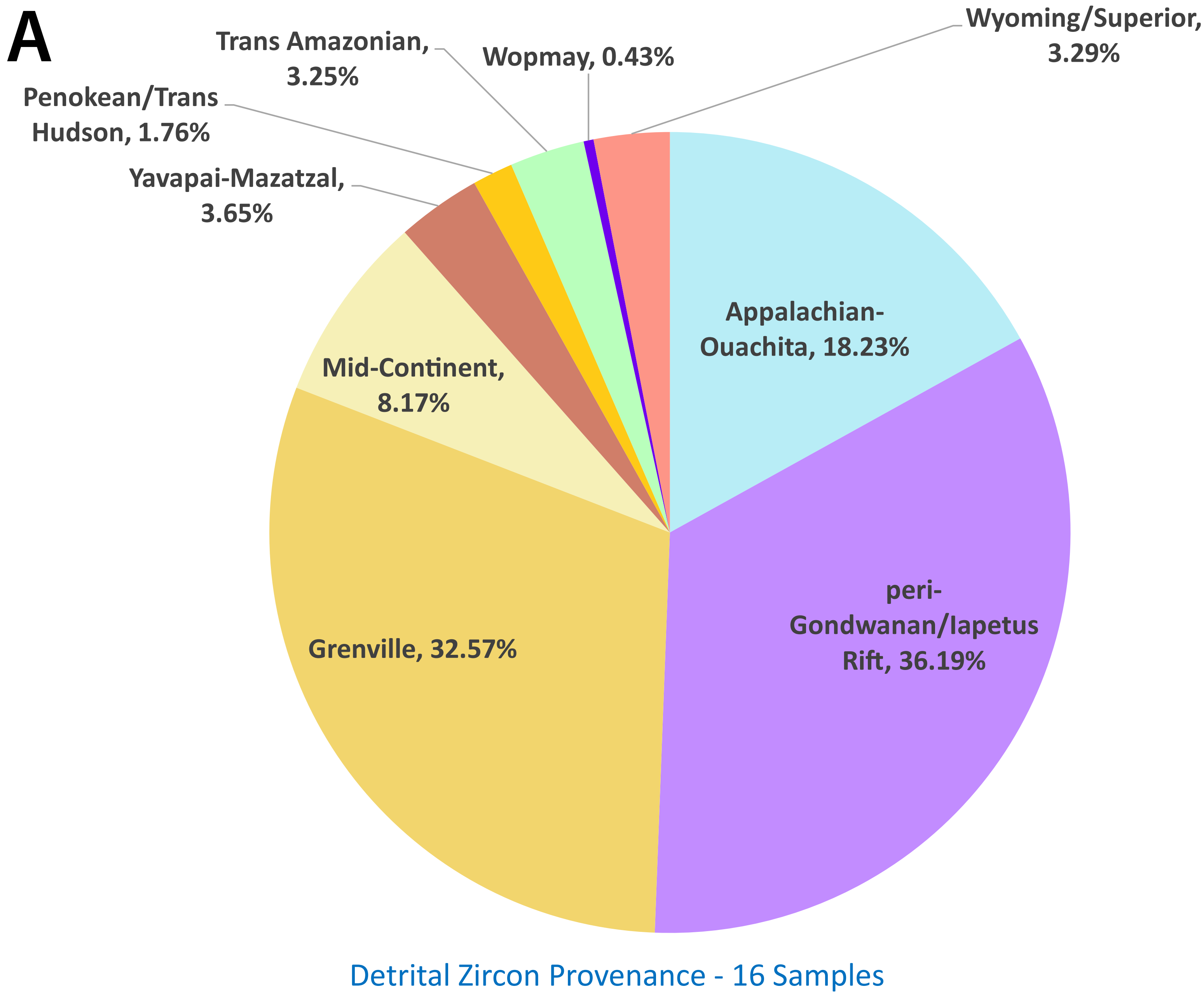
Supplemental Table 3: The youngest distribution of DZ U-Pb ages within a sample were also interpreted to define the maximum depositional age (MDA) of that sample (Gehrels, 2014). MDAs that approximate true depositional age can prove problematic in pre-salt GoM samples. Cawood et al. (2012) suggested that DZ U-Pb samples dominated by older U-Pb ages may reflect underlying amagmatic basement history.

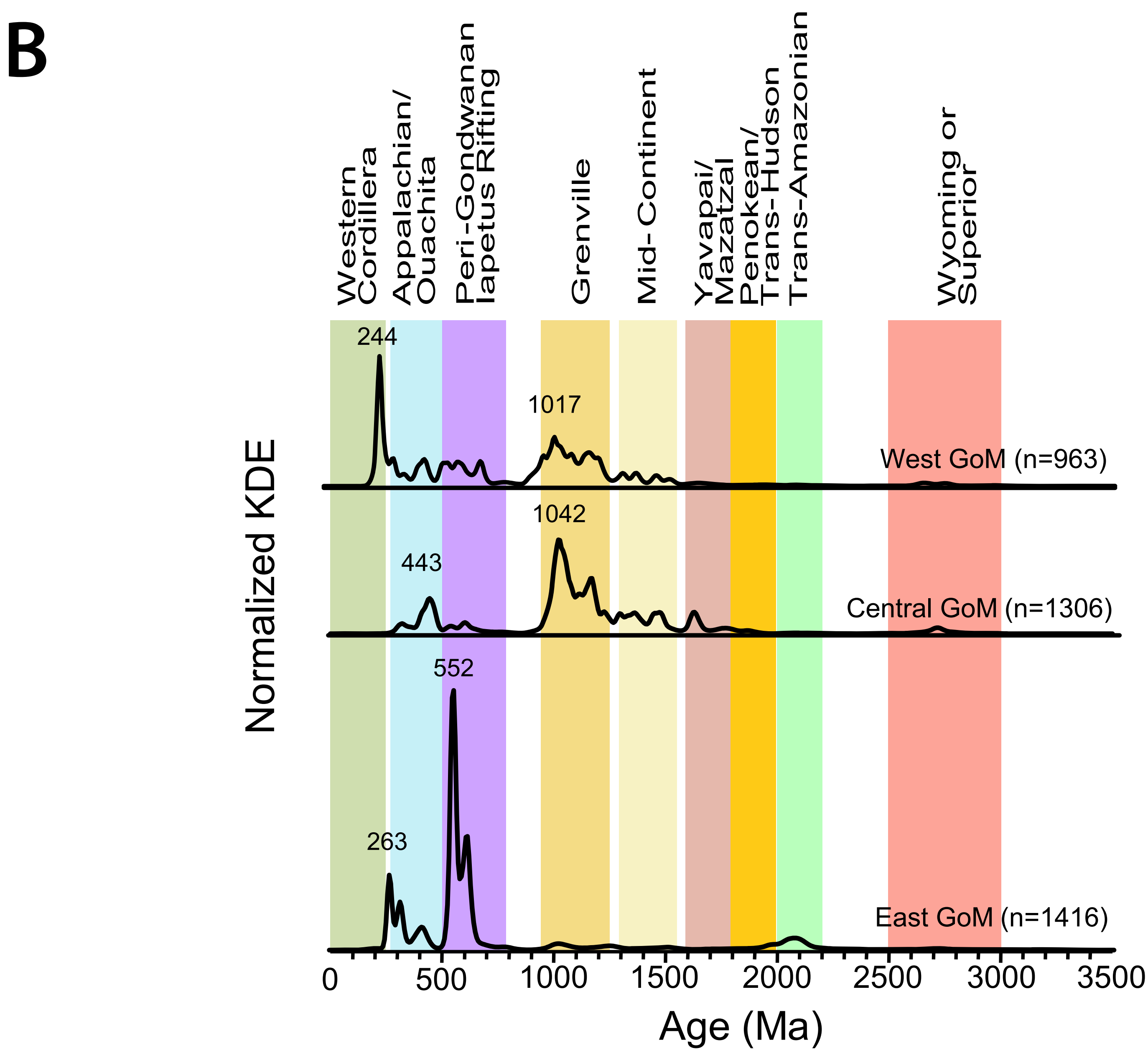


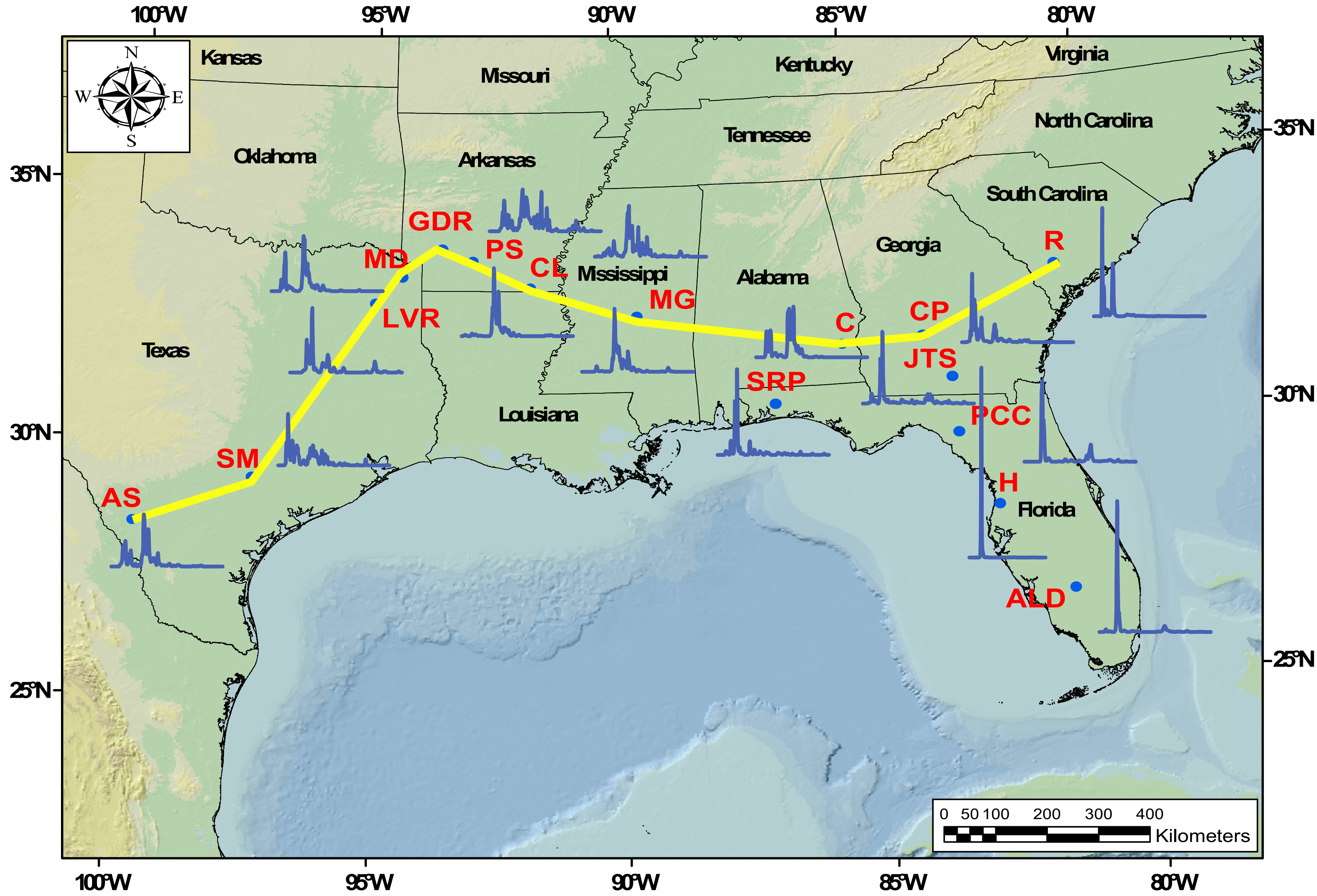
100°W
95°W
90°W
85°W
80°W
35°N
30°N
25°N
N
S
E
W
Oklahoma
Arkansas
Tennessee
North Carolina
South Carolina
Mississippi
Alabama
Georgia
Texas
Louisiana
Florida
GDR
PS
MD
LVR
CL
MG
R
C
CP
JTS
SRP
PCC
SM
AS
H
ALD
Legend
DZ Sample Location
Value
High: 200
Magnetic Anomaly (nT)
Low: -160
0 62.5 125 250 375 500
Kilometers


200Ma (Hettangian)

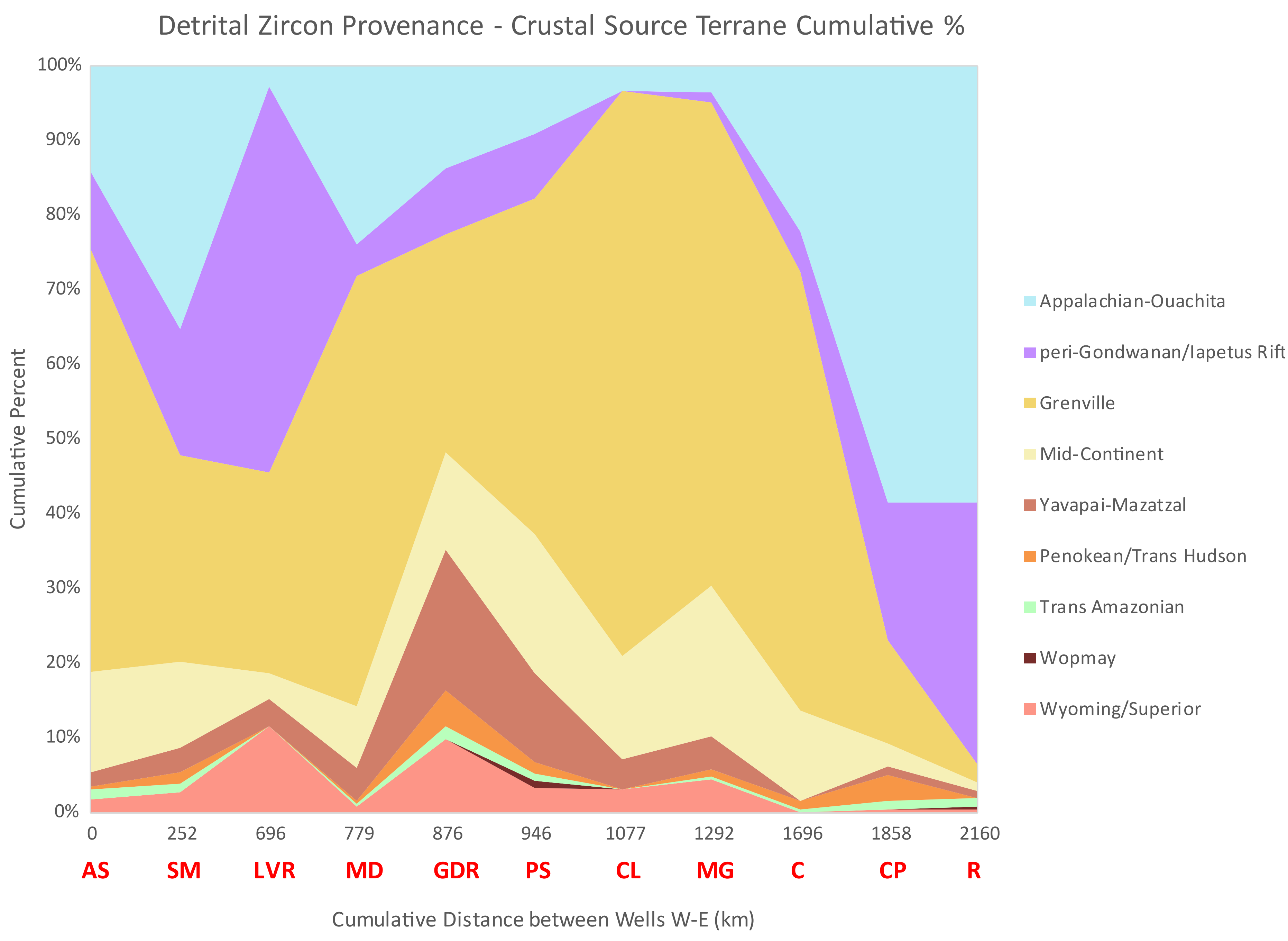

110°
100°
90°
80°
45°
35°
25°
Superior
(> 2.5 Ga)
Wyoming
(> 2.5 Ga)
Trans-Hudson 2000-1800 Ma
Roberts Mtn allochthon
Miogeocline
Penokean 2000-1800 Ma
1500-1300Ma
Mid-Continent
Appalachian 750-280Ma
1200-900Ma
Grenville
Yavapai
1800-1700 Ma
1700-1620 Ma
Mazatzal
Am-Wich
Sabine
Grenville
Caborca
Suwannee
(650-510 Ma)
Yucatan
(550, 420-410 Ma)
Coahuila
peri-Laurentian
Oaxaquia
Chiapas
Acatlán
Chortis
Maroni-Itacaiunas (2.25–2.05 Ga)
Central
Venturi-Tapajós (1.98–1.81 Ga)
Amazonian craton
(> 2.6 Ga)
Rio Negro-Juruena
(1.78–1.55 Ga)
Rondonia-San Ignacio
(1.55-1.3 Ga)
Pan-African/Brasiliano
(900-600 Ma)
Sunsas
(1.28 - 0.95 Ga)
Arequipa
0
1000 km


A
Trans Amazonian, 3.25%
Wopmay, 0.43%
Wyoming/Superior, 3.29%
Penokean/Trans Hudson, 1.76%
Yavapai-Mazatzal, 3.65%
Appalachian-Ouachita, 18.23%
Mid-Continent, 8.17%
peri-Gondwanan/Iapetus Rift, 36.19%
Grenville, 32.57%
Detrital Zircon Provenance - 16 Samples

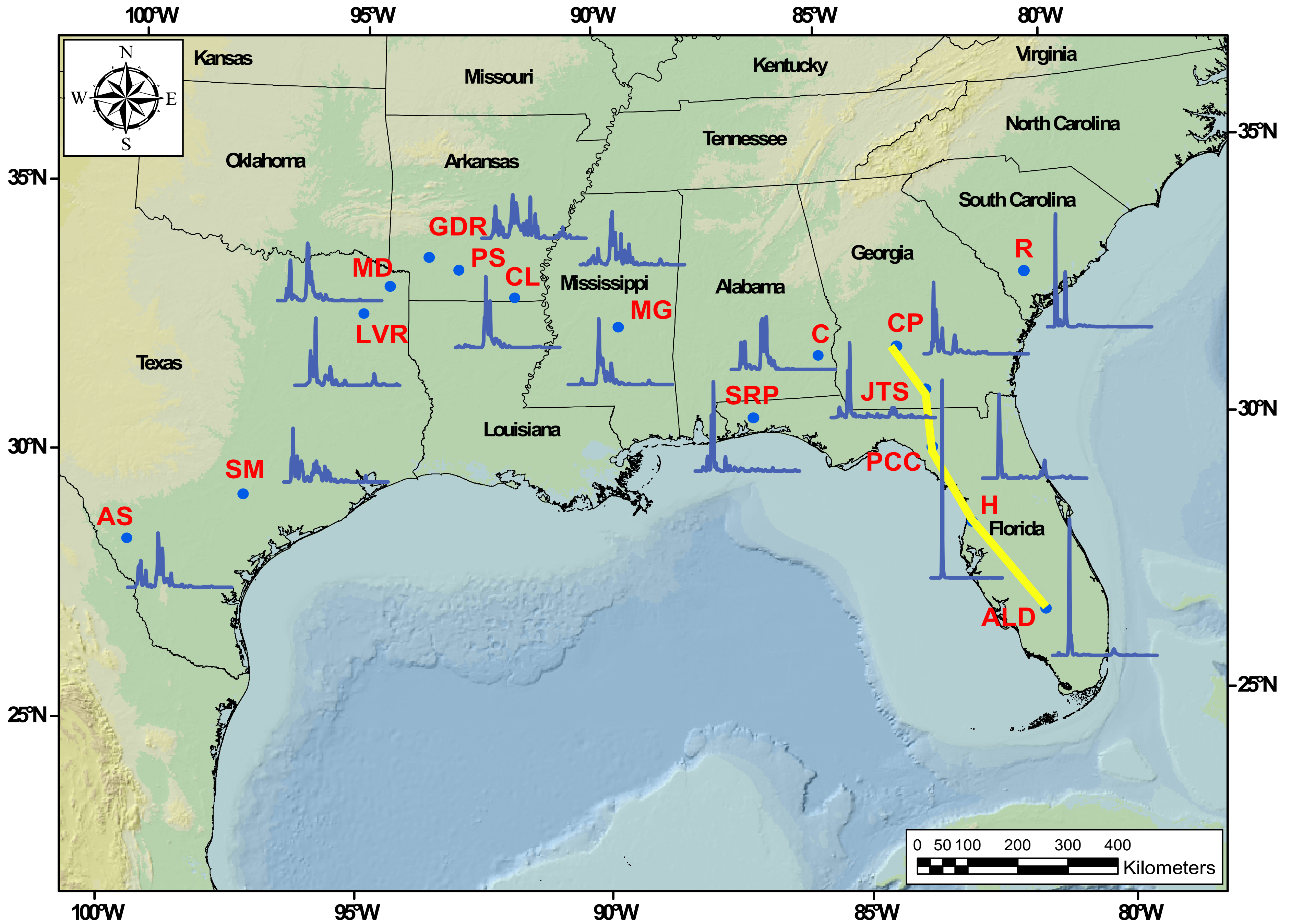

B
Western Cordillera
Appalachian/ Ouachita
Peri-Gondwanan Iapetus Rifting
Grenville
Mid-Continent
Yavapai/ Mazatzal
Penokean/ Trans-Hudson
Trans-Amazonian
Wyoming or Superior
244
1017
West GoM (n=963)
1042
443
Central GoM (n=1306)
552
263
East GoM (n=1416)
Normalized KDE
0
500
1000
1500
2000
2500
3000
3500
Age (Ma)



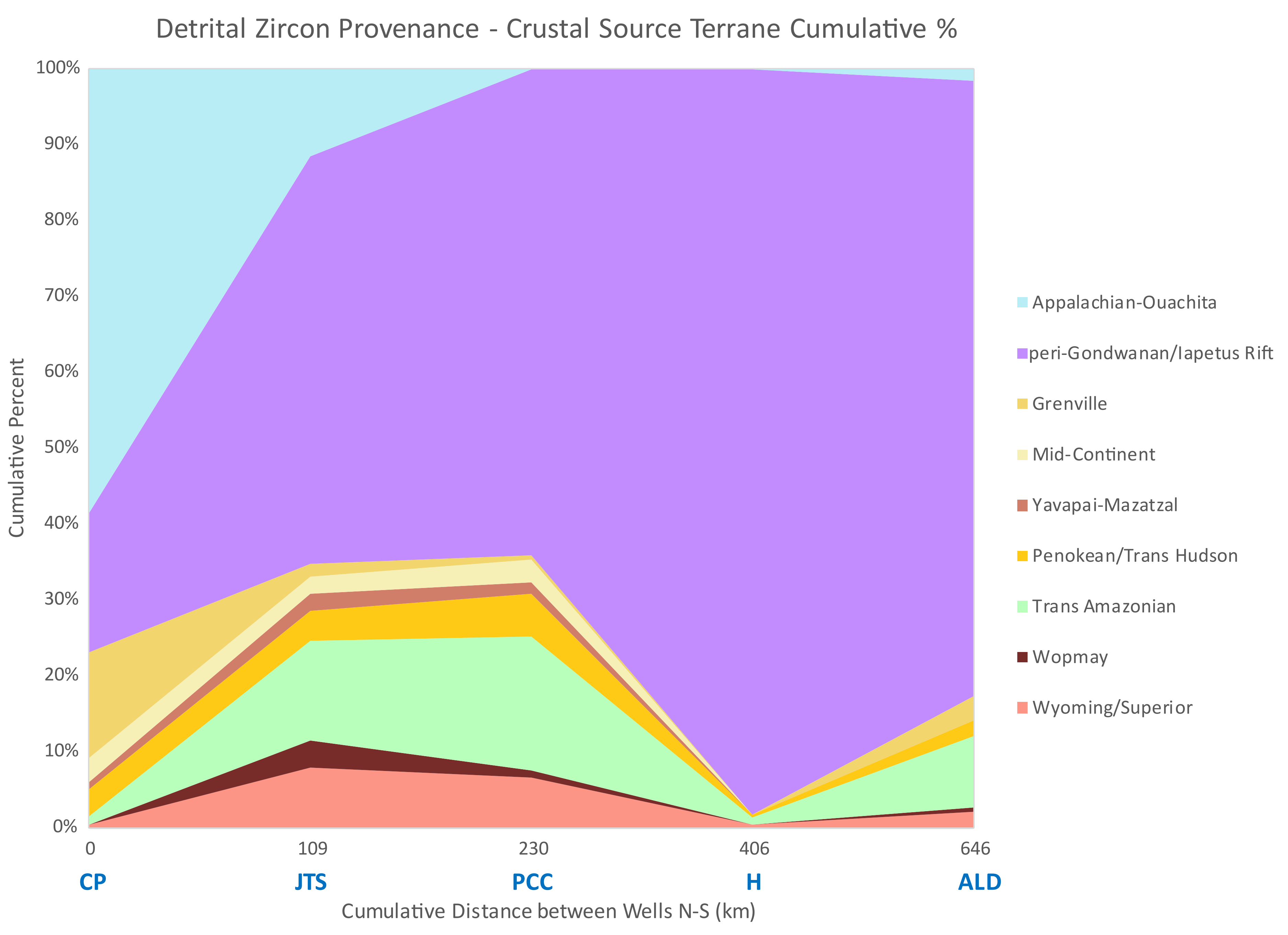
100°W
95°W
90°W
85°W
80°W
35°N
30°N
25°N
N
S
E
W
Kansas
Missouri
Kentucky
Virginia
North Carolina
Oklahoma
Arkansas
Tennessee
South Carolina
Georgia
Mississippi
Alabama
Texas
Louisiana
Florida
AS
SM
LVR
MD
GDR
PS
CL
MG
SRP
C
CP
JTS
PCC
H
R
ALD
0 50 100 200 300 400
Kilometers



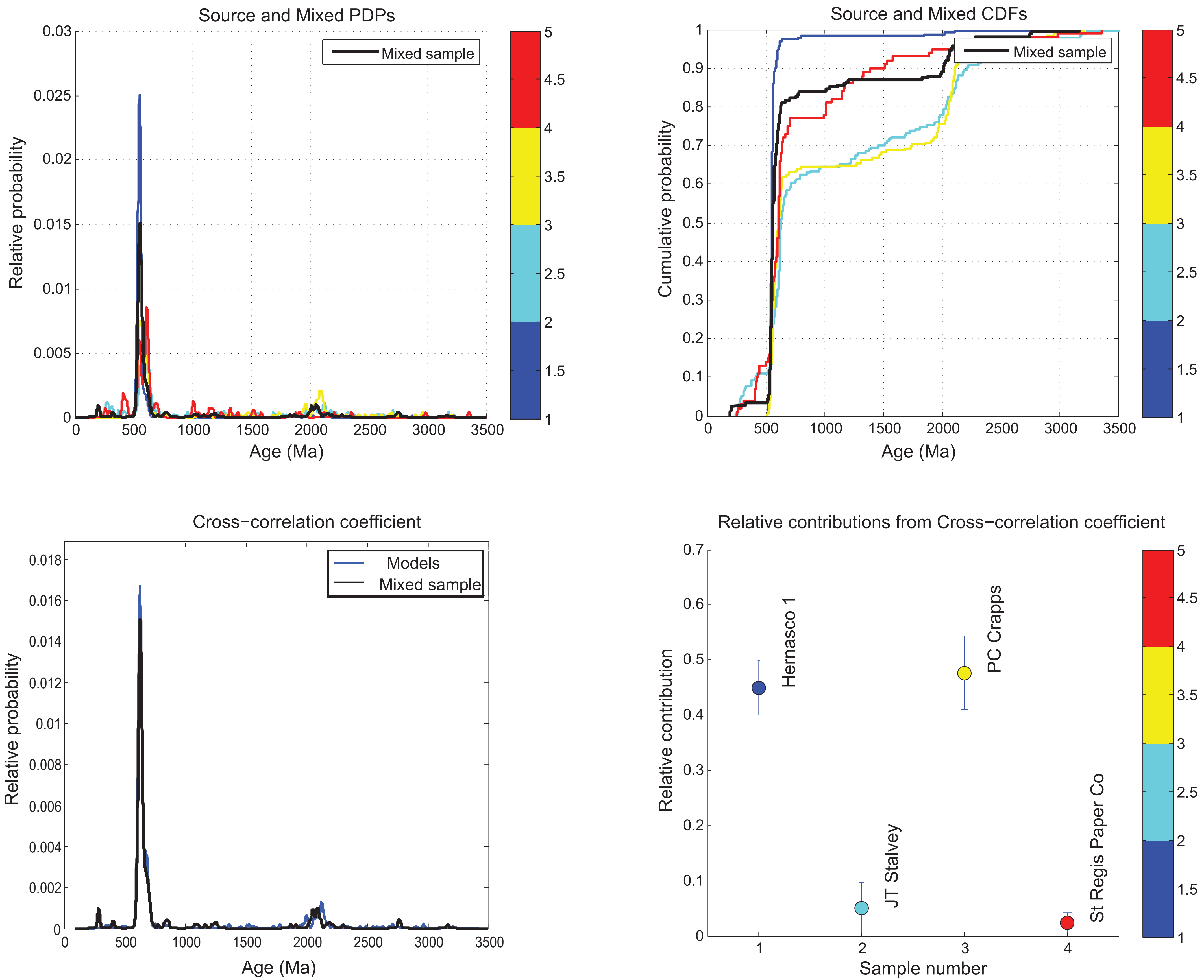
Detrital Zircon Provenance - Crustal Source Terrane Cumulative %
Cumulative Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
252
696
779
876
946
1077
1292
1696
1858
2160
AS
SM
LVR
MD
GDR
PS
CL
MG
C
CP
R
Cumulative Distance between Wells W-E (km)
Appalachian-Ouachita
peri-Gondwanan/Iapetus Rift
Grenville
Mid-Continent
Yavapai-Mazatzal
Penokean/Trans Hudson
Trans Amazonian
Wopmay
Wyoming/Superior



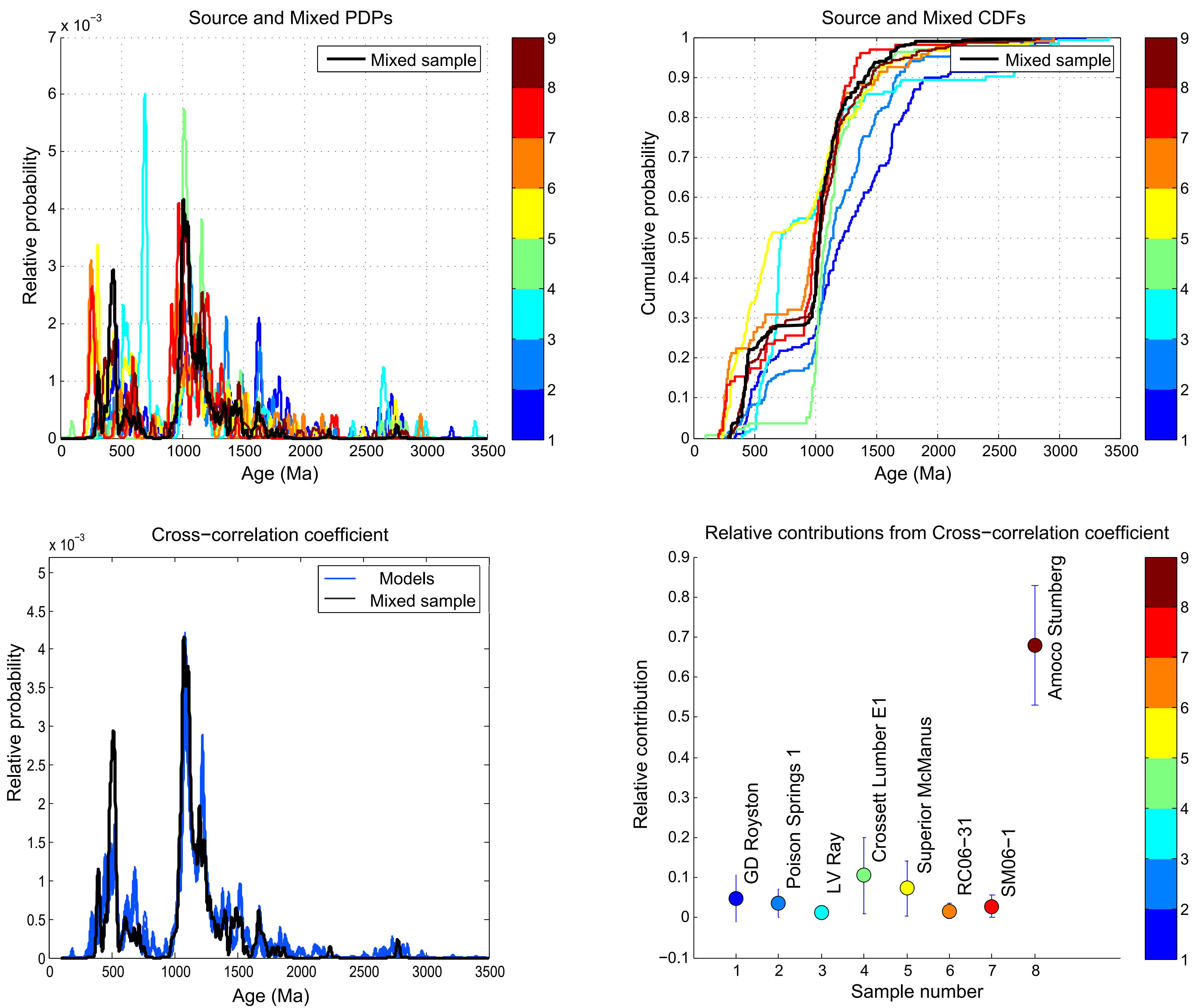
100°W
95°W
90°W
85°W
80°W
35°N
30°N
25°N
N
S
E
W
Kansas
Missouri
Kentucky
Virginia
Oklahoma
Arkansas
Tennessee
North Carolina
South Carolina
Georgia
Alabama
Mississippi
Louisiana
Texas
Florida
GDR
PS
CL
MD
LVR
MG
C
CP
R
SRP
JTS
PCC
SM
AS
H
ALD
0 50 100 200 300 400
Kilometers

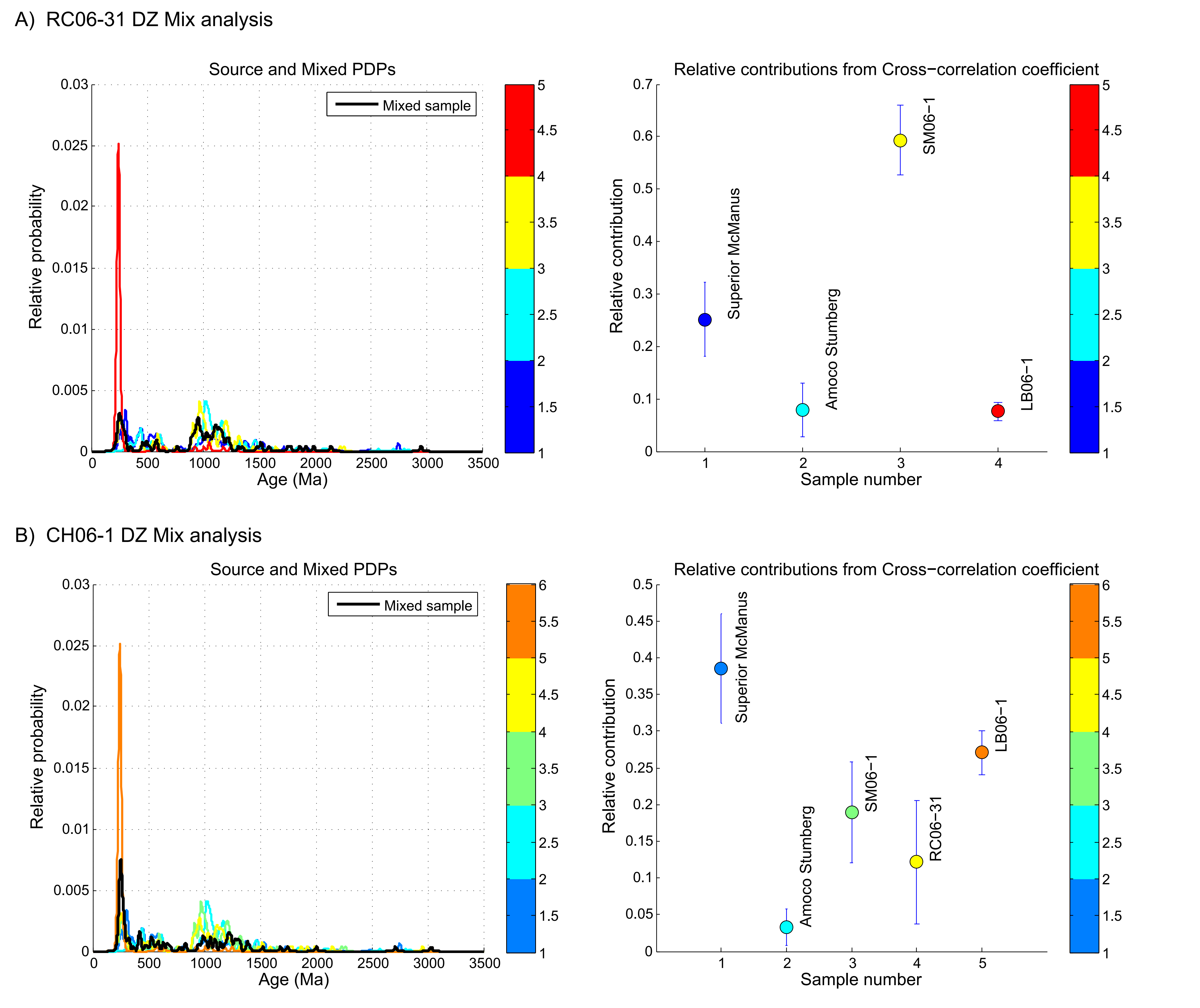


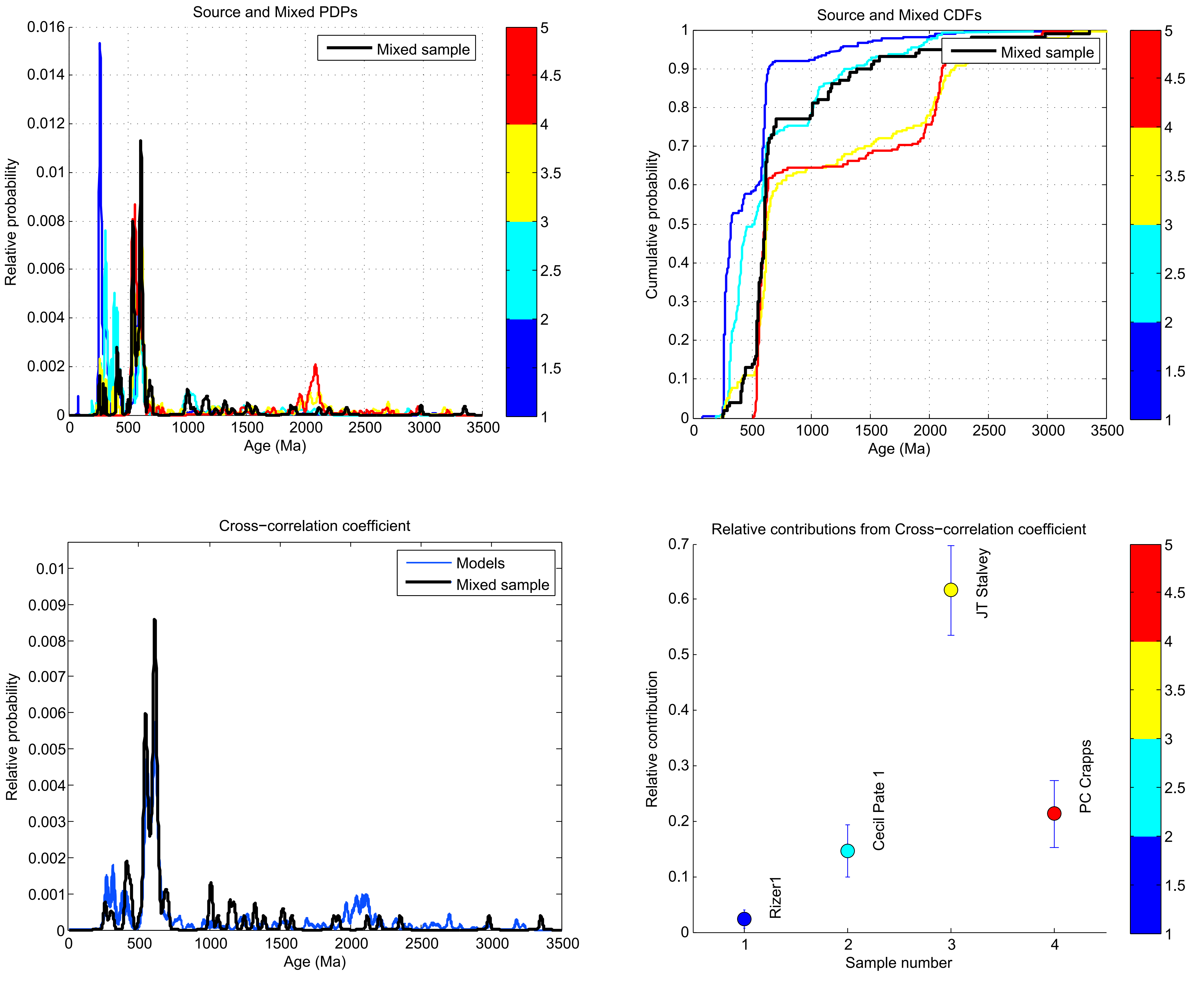
Detrital Zircon Provenance - Crustal Source Terrane Cumulative %
Cumulative Percent
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
109
230
406
646
CP
JTS
PCC
H
ALD
Cumulative Distance between Wells N-S (km)
Appalachian-Ouachita
peri-Gondwanan/Iapetus Rift
Grenville
Mid-Continent
Yavapai-Mazatzal
Penokean/Trans Hudson
Trans Amazonian
Wopmay
Wyoming/Superior



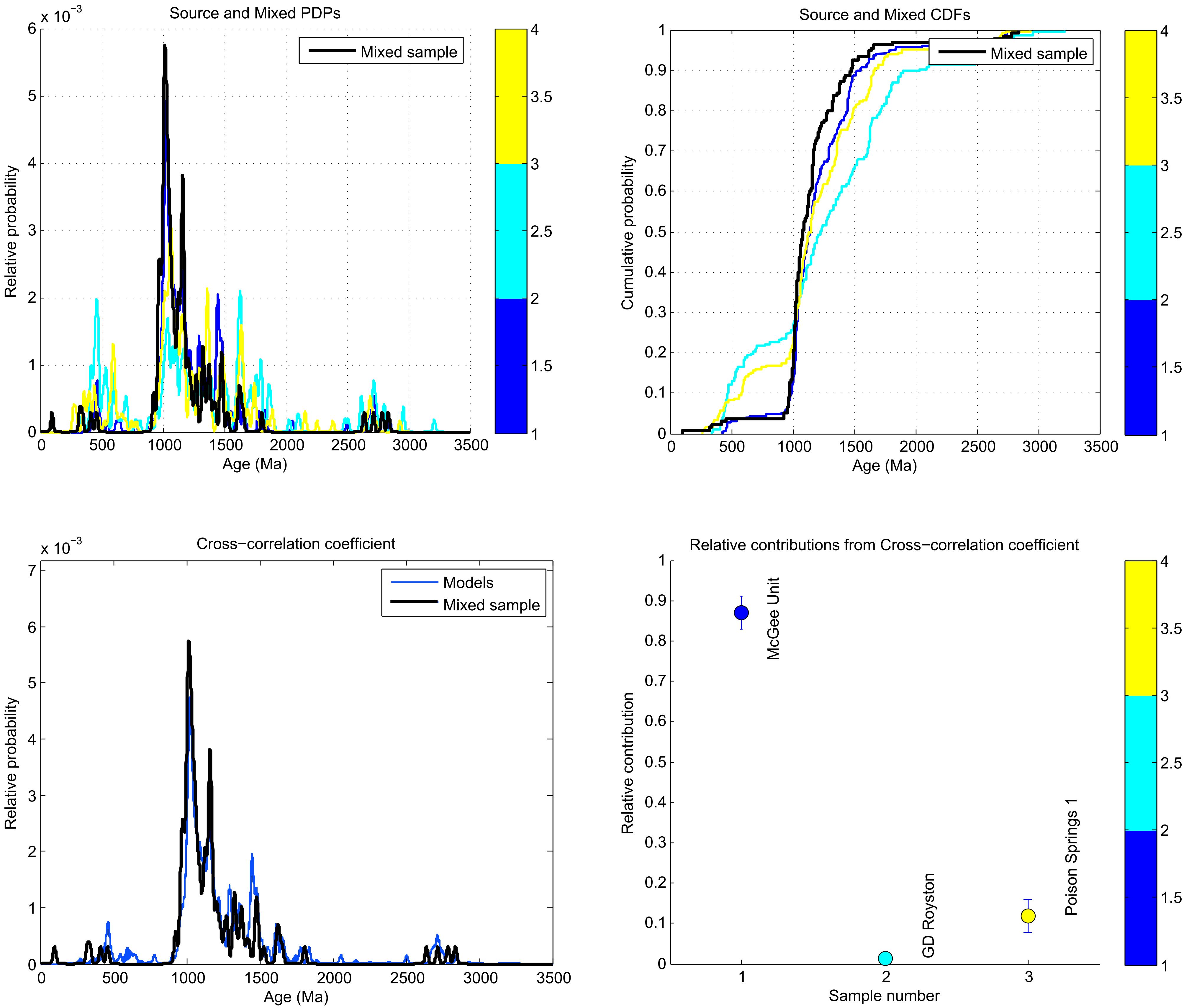
Source and Mixed PDPs
Relative probability
Age (Ma)
Mixed sample
Source and Mixed CDFs
Cumulative probability
Age (Ma)
Mixed sample
Cross−correlation coefficient
Relative probability
Age (Ma)
Models
Mixed sample
Relative contributions from Cross−correlation coefficient
Relative contribution
Sample number
Hernasco 1
JT Stalvey
PC Crapps
St Regis Paper Co


Source and Mixed PDPs
x 10^-3
Relative probability
Age (Ma)
Mixed sample
Source and Mixed CDFs
Cumulative probability
Age (Ma)
Mixed sample
Cross−correlation coefficient
x 10^-3
Relative probability
Age (Ma)
Models
Mixed sample
Relative contributions from Cross−correlation coefficient
Relative contribution
Sample number
GD Royston
Poison Springs 1
LV Ray
Crossett Lumber E1
Superior McManus
RC06−31
SM06−1
Amoco Stumberg

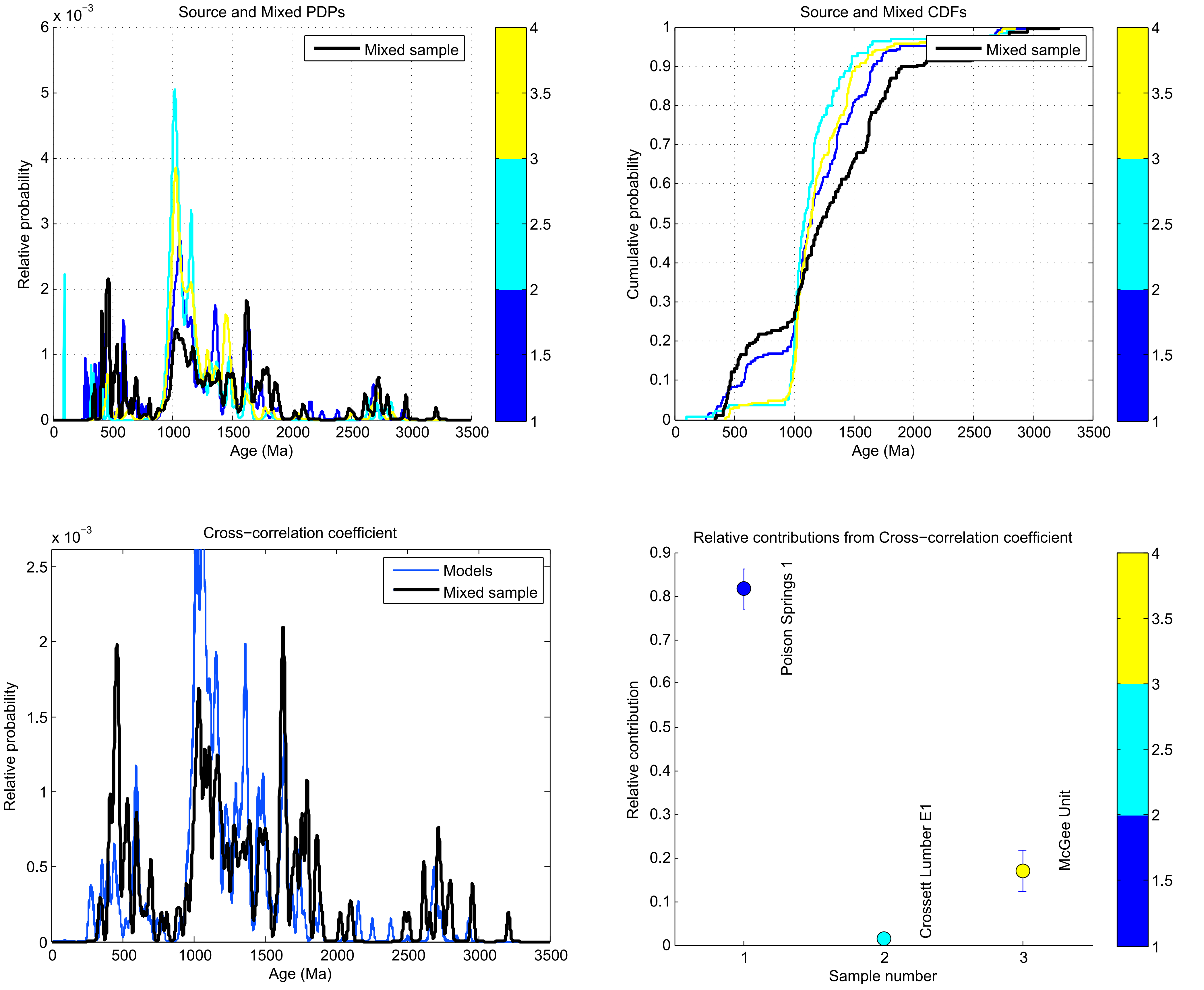

A) RC06-31 DZ Mix analysis
Source and Mixed PDPs
Mixed sample
Relative probability
Age (Ma)
0.03
0.025
0.02
0.015
0.01
0.005
0
0
500
1000
1500
2000
2500
3000
3500
5
4.5
4
3.5
3
2.5
2
1.5
1
Relative contributions from Cross−correlation coefficient
Relative contribution
Sample number
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1
2
3
4
Superior McManus
Amoco Stumberg
SM06−1
LB06−1
5
4.5
4
3.5
3
2.5
2
1.5
1
B) CH06-1 DZ Mix analysis
Source and Mixed PDPs
Mixed sample
Relative probability
Age (Ma)
0.03
0.025
0.02
0.015
0.01
0.005
0
0
500
1000
1500
2000
2500
3000
3500
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
Relative contributions from Cross−correlation coefficient
Relative contribution
Sample number
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1
2
3
4
5
Superior McManus
Amoco Stumberg
SM06−1
RC06−31
LB06−1
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1



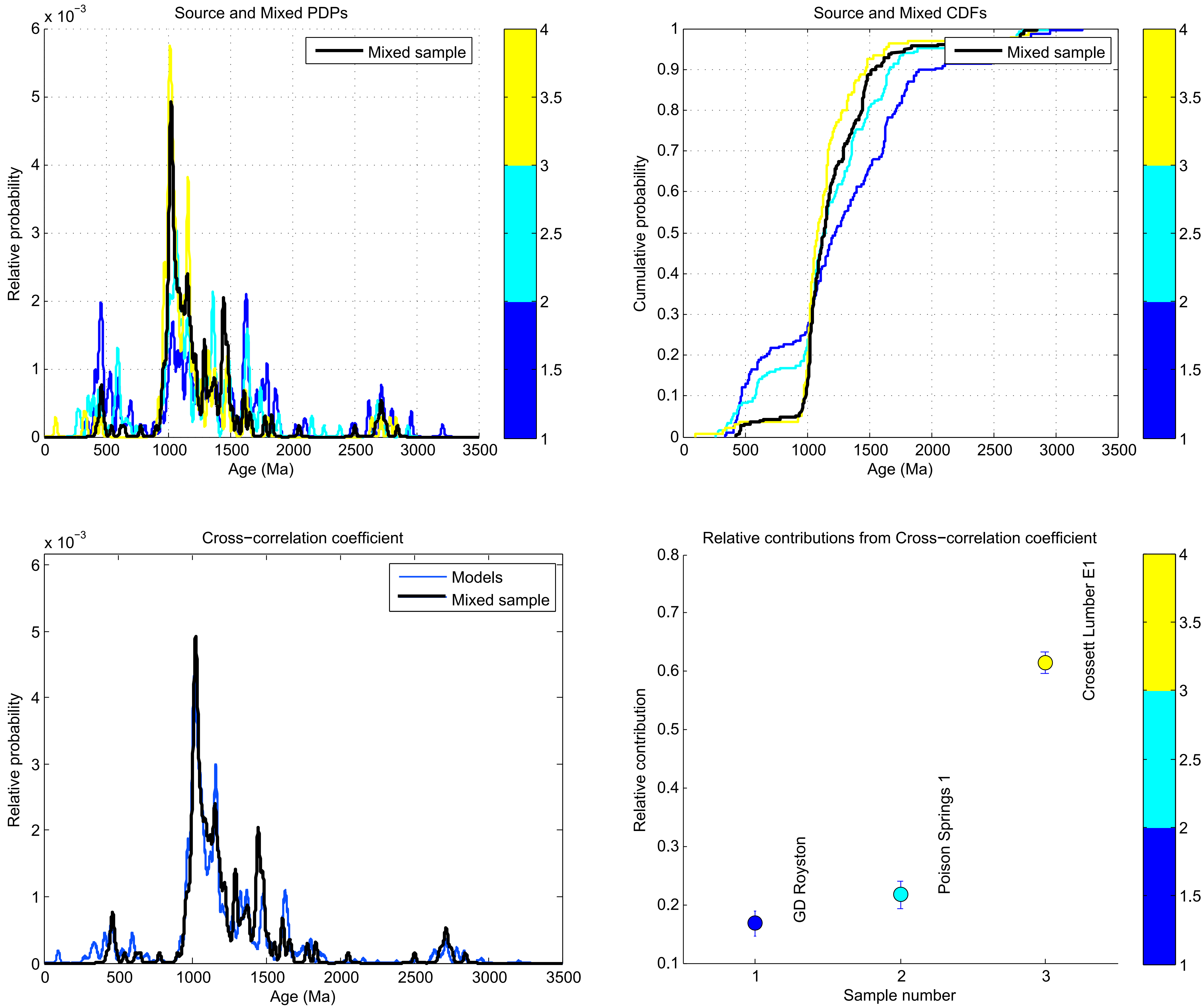
Supplemental Figure A: DZ Mix results for St Regis Paper Co sample (daughter) with PC Crapps, JT Stalvey, Cecil Pate, and Rizer 1 samples as parent modeling inputs. The DZMix modeling algorithm quantifies source mixing proportions through a combination of inverse Monte Carlo modeling and optimized forward modeling (Sundell and Saylor, 2017).



Supplemental Figure B: DZ Mix results for Crossett Lumber E1 sample (daughter) with Poison Springs 1, GD Royston, and McGee Unit samples as parent modeling inputs. The DZMix modeling algorithm quantifies source mixing proportions through a combination of inverse Monte Carlo modeling and optimized forward modeling (Sundell and Saylor, 2017).



Supplemental Figure C: DZ Mix results for GD Royston sample (daughter) with Poison Springs 1, Crossett Lumber E1, and McGee Unit samples as parent modeling inputs. The DZMix modeling algorithm quantifys source mixing proportions through a combination of inverse Monte Carlo modeling and optimized forward modeling (Sundell and Saylor, 2017).



Supplemental Figure D: DZ Mix results for McGee Unit sample (daughter) with Poison Springs 1, Crossett Lumber E1, and GD Royston samples as parent modeling inputs. The DZMix modeling algorithm quantifies source mixing proportions through a combination of inverse Monte Carlo modeling and optimized forward modeling (Sundell and Saylor, 2017).