[] Dendrochronology Program Library Run BEAL Program COF 15:09 Tue 28 Mar 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30039

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: MMRB1400A\_BEAL\_Corr4-50

File of DATED series: MMRB1400A\_BEAL\_Corr4

CONTENTS:

Part 1: Title page, options selected, summary, absent rings by series

Part 2: Histogram of time spans

Part 3: Master series with sample depth and absent rings by year

Part 4: Bar plot of Master Dating Series

Part 5: Correlation by segment of each series with Master

Part 6: Potential problems: low correlation, divergent year-to-year changes, absent rings, outliers

Part 7: Descriptive statistics

RUN CONTROL OPTIONS SELECTED VALUE

1 Cubic smoothing spline 50% wavelength cutoff for filtering

32 years

2 Segments examined are 50 years lagged successively by 25 years

3 Autoregressive model applied A Residuals are used in master dating series and testing

4 Series transformed to logarithms Y Each series log-transformed for master dating series and testing

5 CORRELATION is Pearson (parametric, quantitative)

Critical correlation, 99% confidence level .3281

6 Master dating series saved N

7 Ring measurements listed Y

8 Parts printed 1234567

9 Absent rings are omitted from master series and segment correlations (Y)

Time span of Master dating series is 1904 to 2015 112 years

Continuous time span is 1904 to 2015 112 years

Portion with two or more series is 1917 to 2015 99 years

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\*C\* Number of dated series 24 \*C\*

\*O\* Master series 1904 2015 112 yrs \*O\*

\*F\* Total rings in all series 1510 \*F\*

\*E\* Total dated rings checked 1497 \*E\*

\*C\* Series intercorrelation .585 \*C\*

\*H\* Average mean sensitivity .310 \*H\*

\*A\* Segments, possible problems 5 \*A\*

\*\*\* Mean length of series 62.9 \*\*\*

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

ABSENT RINGS listed by SERIES: (See Master Dating Series for absent rings listed by year)

1057A 1 absent rings: 1936

1 absent rings .066%

1950 -.297 6 2000 -.550 24

1951 .283 6 2001 -.049 24

1952 .231 6 2002 .693 24

1953 -.833 6 2003 .442 24

1904 2.416 1 1954 -.586 6 2004 1.574 24

1905 -.165 1 1955 .175 7 2005 -.035 24

1906 .071 1 1956 -.267 9 2006 -1.261 24

1907 -1.431 1 1957 -.538 10 2007 -.277 24

1908 -.325 1 1958 .419 10 2008 .294 24

1909 -1.645 1 1959 .591 12 2009 1.150 24

1910 -.697 1 1960 .314 13 2010 -2.482 24

1911 -1.283 1 1961 .750 13 2011 .263 24

1912 -.763 1 1962 -.332 15 2012 1.521 24

1913 -.315 1 1963 .491 15 2013 .223 24

1914 1.478 1 1964 .708 16 2014 1.270 24

1915 1.520 1 1965 .829 17 2015 -1.590 24

1916 1.943 1 1966 -.562 17

1917 .143 2 1967 .455 18

1918 .651 2 1968 -.709 18

1919 -.990 2 1969 -.398 21

1920 .426 3 1970 -.418 21

1921 .884 3 1971 -1.141 21

1922 1.701 4 1972 -2.104 21

1923 1.110 4 1973 -.193 21

1924 1.180 4 1974 -.362 21

1925 .021 4 1975 -.713 22

1926 .512 6 1976 .522 22

1927 .686 6 1977 1.369 23

1928 -.305 6 1978 1.678 24

1929 -1.237 6 1979 .243 24

1930 -.932 6 1980 1.306 24

1931 -.237 6 1981 .031 24

1932 .370 6 1982 .486 24

1933 .331 6 1983 .072 24

1934 1.001 6 1984 .731 24

1935 -.065 6 1985 -.686 24

1936 -3.572 6 1 1986 -1.067 24

1937 .377 6 1987 -.896 24

1938 1.249 6 1988 -.918 24

1939 .584 6 1989 -.235 24

1940 .576 6 1990 -.068 24

1941 .415 6 1991 -.056 24

1942 1.293 6 1992 .517 24

1943 .188 6 1993 1.756 24

1944 -.091 6 1994 .888 24

1945 -1.608 6 1995 -.210 24

1946 -1.992 6 1996 -.674 24

1947 -.374 6 1997 -1.136 24

1948 -2.002 6 1998 -1.333 24

1949 -.137 6 1999 -.258 24

PART 5: CORRELATION OF SERIES BY SEGMENTS: MMRB1400A\_BEAL\_Corr4-50 15:09 Tue 28 Mar 2017 Page 5

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Correlations of 50-year dated segments, lagged 25 years

Flags: A = correlation under .3281 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1900 1925 1950 1975

1949 1974 1999 2024

--- -------- --------- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----

1 452A 1978 2015 .59

2 452B 1977 2015 .49

3 166A 1962 2015 .55 .65

4 166B 1959 2015 .43 .51

5 1036A 1926 2015 .35 .23A .45

6 1036B 1922 2015 .53 .47 .41 .67

7 1046A 1964 2015 .58 .68

8 1046B 1975 2015 .78

9 1047A 1969 2015 .62

10 1047B 1960 2015 .51 .55

11 1050B 1965 2015 .60 .62

12 1057A 1904 2015 .15B .16A .28A .58

13 1057B 1926 2015 .55 .51 .75

14 1060A 1962 2015 .52 .67

15 1060B 1969 2015 .63

16 1198A 1920 2015 .64 .59 .50 .72

17 1198B 1917 2015 .64 .63 .50 .57

18 1195A 1957 2015 .48 .68

19 1195B 1959 2015 .52 .68

20 1196A 1955 2015 .53 .67

21 1196B 1967 2015 .62

22 1197A 1956 2015 .39 .63

23 1197B 1956 2015 .27A .55

24 1050A 1969 2015 .49

Av segment correlation .49 .46 .48 .62

PART 6: POTENTIAL PROBLEMS: MMRB1400A\_BEAL\_Corr4-50 15:09 Tue 28 Mar 2017 Page 5

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For each series with potential problems the following diagnostics may appear:

[A] Correlations with master dating series of flagged 50-year segments of series filtered with 32-year spline,

at every point from ten years earlier (-10) to ten years later (+10) than dated

[B] Effect of those data values which most lower or raise correlation with master series

Symbol following year indicates value in series is greater (>) or lesser (<) than master series value

[C] Year-to-year changes very different from the mean change in other series

[D] Absent rings (zero values)

[E] Values which are statistical outliers from mean for the year

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452A 1978 to 2015 38 years Series 1

[B] Entire series, effect on correlation ( .591) is:

Lower 1985< -.158 1987> -.012 2001< -.012 1990> -.011 1998> -.010 1979> -.010 Higher 2010 .066 2015 .027

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1985 -5.8 SD

452A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1978 342 327

1980 298 244 271 183 239 50 174 298 298 322

1990 443 320 410 397 327 351 296 222 283 320

2000 313 254 339 290 356 285 230 297 346 325

2010 149 275 388 267 336 132

====================================================================================================================================

452B 1977 to 2015 39 years Series 2

[B] Entire series, effect on correlation ( .492) is:

Lower 1977< -.174 2000< -.033 1998> -.021 1987> -.016 1995> -.013 1988> -.013 Higher 2010 .173 2015 .041

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1977 -4.8 SD

452B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1977 94 236 282

1980 332 249 309 237 295 201 211 323 338 329

1990 347 337 378 318 354 353 231 225 286 221

2000 162 240 314 263 342 282 217 281 287 286

2010 110 286 329 292 334 111

====================================================================================================================================

166A 1962 to 2015 54 years Series 3

[B] Entire series, effect on correlation ( .586) is:

Lower 1963< -.069 1974< -.061 1976< -.016 1979> -.015 1986> -.013 1992< -.011 Higher 2010 .059 2015 .022

166A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1962 197 157 256 354 259 381 250 262

1970 281 231 232 283 167 206 238 472 472 392

1980 342 276 289 296 287 170 252 296 219 208

1990 217 166 153 355 298 163 130 153 125 132

2000 165 147 194 220 324 150 81 84 207 320

2010 74 189 277 124 152 57

====================================================================================================================================

166B 1959 to 2015 57 years Series 4

[B] Entire series, effect on correlation ( .463) is:

Lower 2010> -.055 1981< -.042 1963< -.036 1995< -.026 2005> -.013 1987> -.013 Higher 2015 .061 2004 .023

166B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 325

1960 299 236 110 90 208 249 222 396 353 330

1970 377 351 313 348 317 279 331 428 515 391

1980 515 312 383 392 457 358 322 361 261 237

1990 280 261 235 368 210 67 58 73 67 123

2000 89 96 134 153 274 216 139 85 111 139

2010 105 101 153 135 177 90

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1036A 1926 to 2015 90 years Series 5

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1950 1999 0 .13 .07 .23 .09 -.09 -.29 .04 .17 .02 -.17 .23\*-.12 -.05 -.21 -.17 -.21 .08 .03 -.07 .13 -.04

[B] Entire series, effect on correlation ( .426) is:

Lower 1956< -.047 1979< -.035 1957< -.029 1945> -.020 1986> -.014 1974< -.012 Higher 1936 .046 2010 .025

1950 to 1999 segment:

Lower 1956< -.054 1957< -.032 1986> -.032 1972> -.027 1971> -.026 1968> -.020 Higher 1977 .039 1993 .038

[C] Year-to-year changes diverging by over 4.0 std deviations:

1957 1958 4.6 SD

[E] Outliers 3 3.0 SD above or -4.5 SD below mean for year

1945 +3.2 SD; 1956 -5.4 SD; 1957 -7.7 SD

1036A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1926 320 200 105 48

1930 43 70 96 182 227 245 71 353 379 431

1940 439 490 624 452 459 439 263 384 237 330

1950 301 272 264 220 258 190 106 83 233 322

1960 209 295 221 255 325 327 239 291 328 339

1970 325 370 344 442 226 218 397 593 473 200

1980 328 348 244 294 304 274 381 246 192 238

1990 284 273 355 389 289 253 202 132 71 67

2000 72 72 66 58 114 56 19 51 80 119

2010 18 68 176 226 200 54

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1036B 1922 to 2015 94 years Series 6

[B] Entire series, effect on correlation ( .601) is:

Lower 1990< -.017 1972> -.016 1986> -.014 1945> -.010 1981> -.009 1996> -.009 Higher 2010 .072 1948 .012

1036B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1922 303 292 190 204 174 112 66 29

1930 23 30 74 118 200 227 59 329 419 512

1940 496 492 690 423 447 338 253 248 122 175

1950 207 183 220 172 135 184 143 129 168 150

1960 155 198 198 247 236 241 170 229 166 202

1970 281 198 227 346 176 140 201 298 396 187

1980 345 372 284 279 227 124 216 91 70 94

1990 41 91 73 100 110 110 113 82 42 57

2000 49 63 74 80 123 84 26 47 69 88

2010 13 76 204 89 126 67

====================================================================================================================================

1046A 1964 to 2015 52 years Series 7

[B] Entire series, effect on correlation ( .648) is:

Lower 1966> -.040 2005> -.026 1965< -.021 1980< -.009 2006< -.008 1995> -.008 Higher 2015 .056 1993 .016

1046A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1964 79 86 132 173 148 157

1970 167 163 134 141 153 129 394 428 390 288

1980 259 245 274 376 482 328 265 204 303 440

1990 434 426 435 577 490 430 342 307 251 334

2000 329 369 407 415 421 469 217 212 303 306

2010 160 323 385 182 237 68

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1046B 1975 to 2015 41 years Series 8

[B] Entire series, effect on correlation ( .781) is:

Lower 1975< -.033 1987< -.021 2005> -.015 1995> -.009 1983> -.008 1990> -.007 Higher 2010 .058 2015 .012

1046B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1975 393 689 629 565 434

1980 551 465 482 530 534 405 333 273 307 410

1990 459 403 413 465 443 386 266 246 180 248

2000 231 242 346 333 300 297 178 199 288 336

2010 117 275 391 163 210 76

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1047A 1969 to 2015 47 years Series 9

[B] Entire series, effect on correlation ( .618) is:

Lower 1972< -.042 2004< -.021 1998> -.018 1984< -.014 1974> -.012 1971> -.011 Higher 2010 .046 1993 .022

1047A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1969 897

1970 724 742 423 709 793 687 591 825 906 603

1980 726 522 502 402 382 329 276 398 405 488

1990 410 426 480 672 512 223 320 175 293 262

2000 273 211 335 367 242 179 175 138 205 319

2010 72 200 314 225 360 111

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1047B 1960 to 2015 56 years Series 10

[B] Entire series, effect on correlation ( .514) is:

Lower 1960< -.020 1987> -.017 2013> -.016 1961< -.015 1994< -.010 1975> -.010 Higher 2010 .026 1980 .019

1047B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1960 186 221 302 379 377 408 317 396 394 437

1970 441 373 267 497 466 481 420 514 455 413

1980 562 364 411 377 314 246 166 297 244 224

1990 198 133 139 188 113 76 103 95 98 193

2000 105 144 187 118 142 76 12 43 48 75

2010 16 69 79 121 130 50

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1050B 1965 to 2015 51 years Series 11

[B] Entire series, effect on correlation ( .614) is:

Lower 1996< -.058 1997> -.025 1966> -.018 1989< -.017 1975> -.013 1991< -.011 Higher 2010 .079 2015 .017

1050B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1965 261 294 456 185 179

1970 174 137 200 387 301 365 346 286 447 311

1980 442 281 218 184 249 214 209 196 103 92

1990 108 89 124 211 178 92 43 150 88 120

2000 120 138 194 128 223 102 96 138 153 185

2010 68 221 270 196 249 103

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1057A 1904 to 2015 112 years Series 12

[\*] Early part of series cannot be checked from 1904 to 1916 -- not matched by another series

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

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1917 1966 -6 -.10 -.32 -.05 .05 .20\* .12 .09 -.01 -.28 -.16 .15| .07 .06 .10 .15 .18 .06 -.08 -.17 .07 -.10

1925 1974 0 -.13 -.31 -.09 .01 .15 .09 .05 .00 -.29 -.11 .16\* .13 .05 .12 .14 .16 -.04 -.10 -.18 .01 -.19

1950 1999 0 -.12 -.33 -.18 -.21 -.11 -.24 .04 .13 .19 .22 .28\*-.12 .14 .04 -.07 -.05 -.10 .06 .17 .00 -.25

[B] Entire series, effect on correlation ( .487) is:

Lower 2003< -.029 1925< -.020 1928> -.012 1918> -.011 1959< -.010 1929> -.010 Higher 1936 .059 2010 .052

1917 to 1966 segment:

Lower 1925< -.051 1959< -.026 1928> -.024 1918> -.023 1929> -.018 1939< -.016 Higher 1936 .230 1948 .022

1925 to 1974 segment:

Lower 1925< -.056 1928> -.028 1959< -.027 1929> -.023 1967< -.019 1939< -.017 Higher 1936 .232 1938 .020

1950 to 1999 segment:

Lower 1959< -.033 1967< -.025 1996> -.019 1993< -.018 1986> -.017 1956> -.017 Higher 1978 .065 1998 .065

[D] 1 Absent rings: Year Master N series Absent

1936 -3.572 6 1

1057A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1904 329 149 160 107 146 108

1910 138 124 142 159 238 242 265 227 275 190

1920 198 250 202 158 150 93 140 143 146 125

1930 114 87 92 71 55 24 0 23 81 41

1940 34 24 44 25 18 10 19 31 13 59

1950 99 122 186 173 324 562 566 529 464 193

1960 152 452 402 247 209 309 202 101 41 43

1970 27 60 59 83 103 100 198 263 524 284

1980 215 235 174 113 139 103 127 99 85 55

1990 55 48 73 77 116 118 128 109 49 99

2000 68 138 177 91 131 84 111 148 200 314

2010 131 192 407 229 326 73

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1057B 1926 to 2015 90 years Series 13

[B] Entire series, effect on correlation ( .667) is:

Lower 1935< -.017 1929> -.016 1957> -.013 2006> -.013 2002< -.012 1994< -.009 Higher 2010 .069 1936 .032

1057B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1926 145 171 118 132

1930 123 156 127 148 132 49 9 77 56 38

1940 27 49 37 23 17 4 11 34 17 36

1950 42 41 33 48 63 90 161 290 307 318

1960 244 202 114 211 253 248 156 187 111 104

1970 86 111 85 219 278 355 364 574 482 385

1980 337 357 354 277 397 276 215 176 260 380

1990 311 310 231 277 177 172 170 91 61 84

2000 65 166 109 96 175 115 126 142 130 189

2010 45 98 190 138 233 61

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1060A 1962 to 2015 54 years Series 14

[B] Entire series, effect on correlation ( .590) is:

Lower 1964< -.060 1966> -.041 1998> -.036 1962> -.025 1997> -.021 1992< -.017 Higher 2010 .124 2015 .045

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1998 +3.1 SD

1060A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1962 196 209 86 149 221 140 74 94

1970 72 34 20 9 47 52 257 259 371 325

1980 467 405 396 358 372 184 107 103 125 137

1990 172 266 198 255 275 253 290 319 358 343

2000 286 304 337 320 322 179 120 119 128 243

2010 62 223 565 264 397 139

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1060B 1969 to 2015 47 years Series 15

[B] Entire series, effect on correlation ( .629) is:

Lower 1980< -.030 1978< -.027 1998> -.026 1997< -.020 1999< -.016 1994< -.015 Higher 2010 .159 2015 .027

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1997 -4.6 SD

1060B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1969 168

1970 83 38 27 23 166 252 594 503 283 209

1980 205 228 398 669 807 597 400 549 434 516

1990 674 696 552 609 453 404 446 327 494 403

2000 466 435 543 523 657 532 427 519 665 645

2010 229 440 641 372 502 214

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1198A 1920 to 2015 96 years Series 16

[B] Entire series, effect on correlation ( .707) is:

Lower 1981< -.017 1967< -.015 1956> -.011 1972> -.009 1970> -.009 2014< -.008 Higher 2010 .058 1936 .029

1198A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 268 260 264 253 270 240 221 217 178 136

1930 144 157 206 162 235 199 101 180 209 188

1940 213 205 197 159 127 87 81 117 106 213

1950 157 168 196 145 152 199 219 177 151 181

1960 193 176 155 217 173 146 90 94 121 140

1970 196 154 148 150 127 126 158 248 226 216

1980 229 138 194 191 262 208 206 163 182 207

1990 243 280 308 426 299 283 218 185 122 256

2000 173 237 248 317 265 203 180 202 245 309

2010 121 202 270 179 159 87

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1198B 1917 to 2015 99 years Series 17

[B] Entire series, effect on correlation ( .588) is:

Lower 2010> -.049 1918< -.019 2002< -.017 1951> -.017 1941< -.014 1935> -.011 Higher 1936 .081 2015 .029

[E] Outliers 1 3.0 SD above or -4.5 SD below mean for year

1951 +3.6 SD

1198B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 184 187 161

1920 203 211 292 263 270 241 208 240 202 147

1930 174 249 258 237 273 237 95 193 205 160

1940 164 121 175 154 155 93 83 131 106 124

1950 115 203 139 99 106 127 120 118 105 113

1960 175 121 113 213 157 164 96 134 101 87

1970 101 114 113 109 155 101 139 209 207 174

1980 188 154 177 171 176 163 133 120 149 166

1990 179 208 268 273 252 251 167 151 108 113

2000 127 193 123 196 218 187 137 157 145 143

2010 129 140 178 117 264 58

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1195A 1957 to 2015 59 years Series 18

[B] Entire series, effect on correlation ( .668) is:

Lower 1998> -.056 1995< -.021 2001< -.020 2015> -.015 1997> -.010 1979> -.010 Higher 2010 .149 2004 .011

[E] Outliers 2 3.0 SD above or -4.5 SD below mean for year

1998 +3.3 SD; 2010 -4.5 SD

1195A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1957 227 266 304

1960 287 336 262 200 212 278 92 197 159 112

1970 102 58 57 80 120 165 273 304 324 327

1980 407 262 244 183 215 139 106 120 161 132

1990 139 137 183 242 167 63 104 151 272 228

2000 173 92 144 190 271 201 148 197 208 167

2010 24 130 184 117 193 124

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1195B 1959 to 2015 57 years Series 19

[B] Entire series, effect on correlation ( .657) is:

Lower 1995> -.021 1998> -.019 2000> -.017 1984< -.016 1966< -.012 1994< -.011 Higher 2010 .090 2006 .012

1195B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 255

1960 118 103 98 99 129 139 47 133 109 70

1970 68 74 73 265 216 130 208 254 241 122

1980 186 121 170 155 110 117 88 79 103 104

1990 151 123 175 174 121 183 159 108 140 140

2000 177 179 174 139 175 91 63 94 103 147

2010 52 151 179 151 184 77

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1196A 1955 to 2015 61 years Series 20

[B] Entire series, effect on correlation ( .556) is:

Lower 1962< -.054 2010> -.038 1965< -.026 1966> -.014 2006> -.013 1955< -.012 Higher 2015 .068 1972 .019

1196A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 175 196 200 222 289

1960 196 224 116 201 279 168 198 180 185 137

1970 207 97 91 288 275 232 296 319 352 260

1980 417 341 330 271 338 212 158 184 142 190

1990 203 178 227 303 276 155 78 110 71 163

2000 145 223 371 392 404 341 267 196 219 284

2010 170 256 258 171 238 98

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1196B 1967 to 2015 49 years Series 21

[B] Entire series, effect on correlation ( .621) is:

Lower 2010> -.090 1972< -.039 1974> -.012 1989> -.011 1975> -.009 2001< -.009 Higher 2015 .035 2004 .015

1196B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1967 316 273 269

1970 265 177 98 240 324 327 352 322 368 274

1980 364 302 322 267 303 275 180 224 203 343

1990 241 230 253 322 289 200 193 172 178 197

2000 200 184 246 276 348 253 209 278 277 349

2010 245 281 312 190 353 140

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1197A 1956 to 2015 60 years Series 22

[B] Entire series, effect on correlation ( .610) is:

Lower 1976< -.034 1998> -.034 1973< -.020 1966> -.014 1970< -.010 1957> -.010 Higher 2010 .124 2015 .021

1197A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 53 75 57 53

1960 67 103 69 96 76 101 73 59 32 68

1970 37 60 56 45 56 73 61 148 157 96

1980 199 178 193 143 285 215 173 210 193 257

1990 326 284 424 400 314 278 286 251 337 315

2000 327 307 275 239 320 217 190 306 290 341

2010 155 240 252 292 353 166

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1197B 1956 to 2015 60 years Series 23

[A] Segment High -10 -9 -8 -7 -6 -5 -4 -3 -2 -1 +0 +1 +2 +3 +4 +5 +6 +7 +8 +9 +10

--------- ---- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---

1956 2005 0 -.26 .20 -.06 -.12 -.08 .05 -.16 -.19 .19 -.07 .27\* .23 .18 .07 .04 .13 -.18 -.07 -.24 -.18 -.02

[B] Entire series, effect on correlation ( .487) is:

Lower 1959< -.058 1990< -.024 1998> -.022 1985> -.018 1973< -.016 1983< -.014 Higher 2010 .199 1978 .018

1956 to 2005 segment:

Lower 1959< -.085 1998> -.034 1985> -.029 1990< -.028 1973< -.023 2000> -.017 Higher 1978 .047 1993 .046

1197B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 53 58 65 23

1960 65 64 46 67 87 77 52 45 23 42

1970 52 55 64 46 72 91 112 156 234 189

1980 183 118 195 112 140 198 182 160 213 223

1990 149 204 251 297 220 187 205 189 254 301

2000 297 248 316 201 241 135 170 274 178 286

2010 73 155 211 260 213 143

====================================================================================================================================

1050A 1969 to 2015 47 years Series 24

[B] Entire series, effect on correlation ( .494) is:

Lower 1992< -.047 1998< -.024 1997> -.019 1974> -.016 2002< -.015 1975> -.013 Higher 2004 .026 1993 .026

1050A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1969 223

1970 226 140 150 400 448 415 429 417 381 219

1980 431 261 273 314 274 255 260 206 157 146

1990 145 137 106 228 207 128 109 141 68 109

2000 116 95 85 82 137 94 83 89 88 97

2010 61 91 112 61 111 48

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PART 7: DESCRIPTIVE STATISTICS: MMRB1400A\_BEAL\_Corr4-50 15:09 Tue 28 Mar 2017 Page 6

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Corr //-------- Unfiltered --------\\ //---- Filtered -----\\

No. No. No. with Mean Max Std Auto Mean Max Std Auto AR

Seq Series Interval Years Segmt Flags Master msmt msmt dev corr sens value dev corr ()

--- -------- --------- ----- ----- ----- ------ ----- ----- ----- ----- ----- ----- ----- ----- --

1 452A 1978 2015 38 1 0 .591 2.89 4.43 .785 .317 .298 2.40 .432 .013 1

2 452B 1977 2015 39 1 0 .492 2.72 3.78 .700 .206 .259 2.40 .650 .001 1

3 166A 1962 2015 54 2 0 .586 2.29 4.72 .934 .508 .320 2.72 .559 -.064 2

4 166B 1959 2015 57 2 0 .463 2.46 5.15 1.240 .813 .266 2.73 .560 .035 1

5 1036A 1926 2015 90 3 1 .426 2.46 6.24 1.347 .766 .349 2.65 .485 .048 1

6 1036B 1922 2015 94 4 0 .601 1.85 6.89 1.270 .803 .370 2.77 .479 -.080 1

7 1046A 1964 2015 52 2 0 .648 2.92 5.77 1.254 .718 .235 2.67 .551 -.114 2

8 1046B 1975 2015 41 1 0 .781 3.53 6.89 1.394 .728 .254 2.61 .663 -.024 1

9 1047A 1969 2015 47 1 0 .618 4.22 9.06 2.203 .779 .319 2.57 .435 -.085 1

10 1047B 1960 2015 56 2 0 .514 2.45 5.62 1.537 .889 .329 2.64 .464 .006 1

11 1050B 1965 2015 51 2 0 .614 2.02 4.56 1.009 .598 .357 2.64 .572 .035 1

12 1057A 1904 2015 112 4 3 .487 1.57 5.66 1.218 .756 .397 2.83 .486 -.085 1

13 1057B 1926 2015 90 3 0 .667 1.65 5.74 1.187 .850 .382 2.59 .442 -.014 1

14 1060A 1962 2015 54 2 0 .590 2.22 5.65 1.255 .651 .379 2.81 .554 -.114 1

15 1060B 1969 2015 47 1 0 .629 4.26 8.07 1.948 .670 .342 2.49 .486 -.069 1

16 1198A 1920 2015 96 4 0 .707 1.94 4.26 .595 .599 .216 2.62 .447 .006 1

17 1198B 1917 2015 99 4 0 .588 1.65 2.92 .531 .570 .220 2.68 .386 -.032 1

18 1195A 1957 2015 59 2 0 .668 1.86 4.07 .805 .659 .340 2.44 .385 -.006 1

19 1195B 1959 2015 57 2 0 .657 1.37 2.65 .517 .338 .320 2.75 .583 -.060 1

20 1196A 1955 2015 61 2 0 .556 2.26 4.17 .830 .590 .293 2.62 .511 -.054 1

21 1196B 1967 2015 49 1 0 .621 2.61 3.68 .643 .314 .226 2.48 .435 .093 1

22 1197A 1956 2015 60 2 0 .610 1.88 4.24 1.099 .835 .281 2.71 .510 -.066 1

23 1197B 1956 2015 60 2 1 .487 1.54 3.16 .839 .756 .314 2.53 .438 -.074 1

24 1050A 1969 2015 47 1 0 .494 1.88 4.47 1.172 .813 .268 2.63 .489 -.009 1

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Total or mean: 1510 51 5 .585 2.22 9.06 1.076 .667 .310 2.83 .490 -.031

- = [ COFECHA BEAL COF ] = -