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[] P R O G R A M C O F E C H A Version 6.06P 29975

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: MMRB1400A\_ACSA\_Corr4-50

File of DATED series: MMRB1400A\_ACSA\_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 1914 to 2015 102 years

Continuous time span is 1914 to 2015 102 years

Portion with two or more series is 1915 to 2015 101 years

>> 107A 2003 absent in 2 of 29 series, but is not usually narrow: master index is .206

>> 107B 2003 absent in 2 of 29 series, but is not usually narrow: master index is .206

>> 107B 2013 absent in 2 of 29 series, but is not usually narrow: master index is .862

>> 1061A 2011 absent in 2 of 29 series, but is not usually narrow: master index is .149

>> 1093B 2011 absent in 2 of 29 series, but is not usually narrow: master index is .149

>> 1093B 2013 absent in 2 of 29 series, but is not usually narrow: master index is .862

>> 1093B 2014 absent in 1 of 29 series, but is not usually narrow: master index is 2.010

>> 1093B 2015 absent in 1 of 29 series, but is not usually narrow: master index is .023

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

\*C\* Number of dated series 29 \*C\*

\*O\* Master series 1914 2015 102 yrs \*O\*

\*F\* Total rings in all series 2247 \*F\*

\*E\* Total dated rings checked 2246 \*E\*

\*C\* Series intercorrelation .599 \*C\*

\*H\* Average mean sensitivity .336 \*H\*

\*A\* Segments, possible problems 2 \*A\*

\*\*\* Mean length of series 77.5 \*\*\*

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

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

106B 1 absent rings: 1970

107A 1 absent rings: 2003

107B 5 absent rings: 2001 2003 2007 2012 2013

108A 1 absent rings: 1970

1059B 1 absent rings: 2012

1061A 1 absent rings: 2011

1068B 1 absent rings: 1968

1070A 1 absent rings: 2010

1070B 1 absent rings: 2010

1093A 1 absent rings: 2012

1093B 6 absent rings: 2001 2011 2012 2013 2014 2015

1191A 2 absent rings: 1968 2012

1499A 1 absent rings: 2012

1499B 1 absent rings: 2012

24 absent rings 1.068%

1950 -.323 21 2000 -.748 29

1951 .065 21 2001 -2.146 29 2

1952 -.344 21 2002 .185 29

1953 -.201 21 2003 .206 29 2<<

1954 .053 22 2004 1.159 29

1955 1.468 24 2005 .224 29

1956 -.216 25 2006 -.975 29

1957 -.961 25 2007 -1.124 29 1

1958 .657 25 2008 1.418 29

1959 .332 25 2009 1.331 29

1960 .526 25 2010 -1.258 29 2

1961 .791 25 2011 .149 29 2<<

1962 .396 26 2012 -.528 29 7

1963 .413 27 2013 .862 29 2<<

1914 -1.971 1 1964 .385 27 2014 2.010 29 1<<

1915 .294 2 1965 .063 27 2015 .023 29 1<<

1916 1.180 4 1966 -.778 28

1917 .688 4 1967 -.296 28

1918 -.332 7 1968 -1.855 28 2

1919 -.257 7 1969 -1.010 28

1920 .443 7 1970 -.458 28 2

1921 .983 7 1971 -1.338 28

1922 .106 8 1972 -1.361 28

1923 .291 9 1973 -.797 28

1924 .422 10 1974 .995 28

1925 -1.028 10 1975 1.356 28

1926 -.620 10 1976 1.038 28

1927 -.231 10 1977 .985 28

1928 -.632 10 1978 1.397 29

1929 -1.248 10 1979 -.387 29

1930 -.345 11 1980 -.021 29

1931 .624 11 1981 .233 29

1932 -.835 13 1982 -.930 29

1933 -.214 13 1983 -.524 29

1934 1.436 13 1984 1.043 29

1935 1.739 13 1985 1.606 29

1936 -2.968 13 1986 -1.515 29

1937 1.000 14 1987 .956 29

1938 1.056 15 1988 -1.270 29

1939 .556 15 1989 -1.710 29

1940 -.691 15 1990 .296 29

1941 .200 15 1991 .518 29

1942 1.019 15 1992 .505 29

1943 1.037 16 1993 -.700 29

1944 .248 17 1994 .665 29

1945 -3.552 17 1995 .315 29

1946 -.376 20 1996 .450 29

1947 .863 20 1997 .262 29

1948 -.885 20 1998 -.545 29

1949 .560 20 1999 .421 29

PART 5: CORRELATION OF SERIES BY SEGMENTS: MMRB1400A\_ACSA\_Corr4-50 12:27 Mon 23 Jan 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 106A 1938 2015 .75 .68 .77

2 106B 1918 2015 .61 .74 .66 .77

3 107A 1932 2015 .58 .46 .47

4 107B 1932 2015 .59 .41 .40

5 108A 1918 2015 .43 .54 .60 .78

6 108B 1937 2015 .54 .54 .76

7 428A 1962 2015 .58 .63

8 428B 1950 2015 .32A .44

9 1045A 1924 2015 .67 .68 .52 .71

10 1045B 1916 2015 .66 .72 .64 .73

11 1054A 1922 2015 .57 .59 .63 .68

12 1054B 1943 2015 .70 .55 .67

13 1059A 1918 2015 .54 .55 .66 .68

14 1059B 1916 2015 .56 .59 .68 .69

15 1061A 1914 2015 .59 .66 .55 .60

16 1061B 1915 2015 .65 .67 .43 .49

17 1068A 1946 2015 .52 .54 .60

18 1068B 1946 2015 .55 .58 .61

19 1070A 1955 2015 .74 .80

20 1070B 1955 2015 .58 .67

21 1090A 1954 2015 .44 .59

22 1090B 1944 2015 .45 .42 .60

23 1092A 1978 2015 .52

24 1092B 1956 2015 .37 .57

25 1093A 1930 2015 .57 .34B .38

26 1093B 1923 2015 .81 .81 .64 .53

27 1191A 1966 2015 .62

28 1499A 1946 2015 .68 .64 .77

29 1499B 1963 2015 .63 .73

Av segment correlation .61 .62 .55 .63

PART 6: POTENTIAL PROBLEMS: MMRB1400A\_ACSA\_Corr4-50 12:27 Mon 23 Jan 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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106A 1938 to 2015 78 years Series 1

[B] Entire series, effect on correlation ( .741) is:

Lower 1954> -.010 1989> -.009 1982> -.008 1951< -.007 1939< -.006 1991< -.006 Higher 1988 .012 1968 .012

106A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 296 220

1940 180 220 307 233 183 118 181 219 142 132

1950 88 76 83 105 134 106 83 54 90 69

1960 71 70 68 68 97 68 40 78 18 16

1970 11 25 26 33 174 212 214 238 274 208

1980 303 287 255 300 400 420 196 310 139 143

1990 152 113 98 96 113 76 60 43 33 38

2000 20 15 36 46 83 52 19 41 116 158

2010 44 91 95 93 115 67

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106B 1918 to 2015 98 years Series 2

[B] Entire series, effect on correlation ( .647) is:

Lower 1920< -.051 1929> -.018 1918> -.017 1950> -.012 1982> -.009 1999< -.008 Higher 1936 .064 1945 .021

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

1970 -.458 28 2

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

1936 -5.6 SD

106B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 157 151

1920 112 137 152 173 188 180 189 197 203 259

1930 247 331 244 226 291 264 54 254 260 265

1940 209 224 237 212 200 106 157 174 130 123

1950 159 134 92 130 95 85 48 47 101 66

1960 65 60 51 46 94 69 47 59 24 21

1970 0 53 41 46 242 317 296 356 349 243

1980 348 383 396 427 526 558 153 309 95 169

1990 286 212 151 109 172 96 108 87 38 33

2000 16 5 43 60 135 52 41 35 92 83

2010 31 30 42 107 96 68

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107A 1932 to 2015 84 years Series 3

[B] Entire series, effect on correlation ( .501) is:

Lower 1936> -.068 1986> -.046 2010> -.032 1956< -.017 2003< -.016 2015> -.012 Higher 1945 .097 2014 .016

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

2003 .206 29 2 >> WARNING: Ring is not usually narrow

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

1936 +3.1 SD

107A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 186 237 299 293 259 283 231 241

1940 183 251 249 236 217 114 170 173 154 205

1950 128 140 178 103 138 210 64 87 133 142

1960 86 138 109 91 67 72 64 79 79 77

1970 84 99 57 85 105 149 157 204 227 118

1980 163 159 95 79 152 204 223 229 125 128

1990 202 188 135 134 175 107 175 154 70 68

2000 34 16 43 0 39 42 21 3 11 18

2010 26 18 7 7 27 13

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107B 1932 to 2015 84 years Series 4

[B] Entire series, effect on correlation ( .469) is:

Lower 1995< -.063 1986> -.034 2010> -.014 1988> -.010 2006> -.009 1945> -.009 Higher 2014 .020 2001 .014

[D] 5 Absent rings: Year Master N series Absent

2001 -2.146 29 2

2003 .206 29 2 >> WARNING: Ring is not usually narrow

2007 -1.124 29 1

2012 -.528 29 7

2013 .862 29 2 >> WARNING: Ring is not usually narrow

107B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1932 125 161 242 279 203 288 254 223

1940 218 282 240 312 254 203 250 203 132 181

1950 158 146 167 150 185 236 131 125 165 179

1960 124 175 131 122 99 85 65 81 49 54

1970 58 38 54 85 143 193 147 162 211 158

1980 177 222 136 121 178 233 220 323 221 185

1990 203 155 127 131 154 63 77 55 42 28

2000 15 0 28 0 28 29 25 0 11 24

2010 9 23 0 0 47 12

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108A 1918 to 2015 98 years Series 5

[B] Entire series, effect on correlation ( .592) is:

Lower 1931< -.020 1920> -.017 1919< -.015 1956> -.012 1957< -.011 1970< -.010 Higher 2010 .019 1986 .018

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

1970 -.458 28 2

108A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 100 84

1920 168 136 126 127 132 134 188 179 151 132

1930 158 113 109 128 285 270 144 205 273 257

1940 201 237 230 226 125 92 105 147 117 209

1950 222 169 193 174 161 181 163 48 114 110

1960 108 74 62 48 75 44 43 47 21 26

1970 0 29 20 48 187 174 257 258 331 206

1980 353 343 293 386 486 557 282 320 286 232

1990 253 300 381 320 350 346 283 214 197 244

2000 150 71 146 153 208 155 89 68 143 95

2010 25 64 61 70 150 63

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108B 1937 to 2015 79 years Series 6

[B] Entire series, effect on correlation ( .644) is:

Lower 1937< -.084 1957< -.016 1993> -.013 1989> -.011 1948> -.009 1977< -.008 Higher 1945 .061 2010 .023

108B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1937 250 305 363

1940 278 303 310 362 297 176 202 232 219 288

1950 251 196 219 215 176 180 129 35 58 62

1960 67 60 68 82 132 90 71 63 38 36

1970 24 30 27 31 113 135 151 134 230 169

1980 273 254 218 330 442 479 337 374 288 331

1990 385 493 463 462 482 375 409 323 254 274

2000 196 112 233 190 253 207 110 74 147 150

2010 53 126 91 119 187 86

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428A 1962 to 2015 54 years Series 7

[B] Entire series, effect on correlation ( .594) is:

Lower 1986> -.046 1989< -.031 2001> -.027 1962< -.025 1994< -.012 2006> -.011 Higher 2010 .046 2014 .017

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

1989 -4.6 SD

428A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1962 11 41 132 101 118 152 108 136

1970 144 115 103 210 299 498 526 518 570 411

1980 458 437 315 326 396 371 314 340 220 98

1990 152 171 163 126 130 180 164 162 122 161

2000 127 119 141 132 139 71 76 50 111 120

2010 32 37 25 37 72 46

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428B 1950 to 2015 66 years Series 8

[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 .15 -.06 -.03 .17 -.24 .00 -.07 .26 -.08 .15 .32\*-.05 -.18 .02 -.02 -.13 -.24 .07 .20 .03 -.15

[B] Entire series, effect on correlation ( .377) is:

Lower 1986> -.065 2001> -.019 1966> -.018 1964< -.018 1961< -.017 1955< -.010 Higher 2014 .025 1989 .022

1950 to 1999 segment:

Lower 1986> -.091 1966> -.024 1961< -.020 1964< -.020 1979> -.013 1950> -.012 Higher 1989 .053 1984 .024

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

1989 -4.6 SD

428B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1950 83 113 94 27 20 23 8 15 29 14

1960 36 15 93 125 42 55 133 134 103 119

1970 117 86 129 207 238 250 262 312 328 293

1980 291 276 225 245 384 322 319 277 207 110

1990 172 234 197 117 163 173 141 162 99 140

2000 112 107 111 89 94 60 47 51 77 71

2010 27 26 29 33 77 49

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1045A 1924 to 2015 92 years Series 9

[B] Entire series, effect on correlation ( .704) is:

Lower 1956> -.022 1988> -.013 1948> -.012 1925> -.010 1989> -.009 1979> -.008 Higher 1936 .062 1945 .023

1045A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1924 386 307 266 284 232 165

1930 176 243 207 210 234 270 48 327 341 251

1940 157 230 263 287 278 133 246 293 275 238

1950 231 226 315 241 253 347 331 245 245 198

1960 273 234 270 232 193 195 190 228 212 254

1970 236 153 251 211 291 301 255 269 303 254

1980 222 194 112 143 210 248 94 205 193 206

1990 284 244 231 209 232 179 222 204 190 187

2000 113 103 177 176 217 181 124 96 225 250

2010 73 193 126 276 230 105

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1045B 1916 to 2015 100 years Series 10

[B] Entire series, effect on correlation ( .687) is:

Lower 1988> -.013 1986< -.010 1956> -.008 1948> -.008 1922> -.007 1924> -.007 Higher 1936 .020 1945 .020

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

1986 -6.1 SD

1045B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 319 224 162 192

1920 286 238 283 253 348 207 197 197 163 143

1930 209 198 152 133 233 288 91 268 335 198

1940 176 170 233 260 228 100 198 271 227 260

1950 229 197 205 166 168 226 228 123 172 163

1960 277 243 267 225 182 212 158 217 153 197

1970 213 191 221 180 279 269 278 281 438 276

1980 228 237 198 247 317 303 86 200 254 226

1990 276 254 292 216 246 267 239 218 200 228

2000 125 102 185 178 224 168 87 61 152 153

2010 59 103 91 187 224 100

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1054A 1922 to 2015 94 years Series 11

[B] Entire series, effect on correlation ( .619) is:

Lower 1936> -.044 1980< -.020 1946< -.018 1957> -.017 1996< -.017 1940> -.015 Higher 1945 .063 2010 .020

1054A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1922 144 129 118 62 55 57 86 69

1930 138 238 173 237 253 293 217 295 265 236

1940 278 267 302 284 246 156 150 197 183 271

1950 198 211 206 166 197 237 179 230 283 193

1960 228 269 231 192 223 248 168 179 142 137

1970 160 160 144 113 208 324 337 310 348 152

1980 41 110 84 164 198 249 125 252 105 92

1990 211 194 192 179 186 183 141 200 188 267

2000 289 246 313 301 286 171 160 181 276 211

2010 69 116 117 212 220 71

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1054B 1943 to 2015 73 years Series 12

[B] Entire series, effect on correlation ( .678) is:

Lower 1980< -.036 2001> -.029 1957> -.026 1956> -.016 1964< -.013 1993> -.011 Higher 1945 .074 2010 .022

1054B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 286 285 206 219 336 261 296

1950 321 270 242 245 277 375 339 349 391 272

1960 231 243 204 177 141 161 151 141 106 182

1970 164 173 173 159 247 320 250 187 199 115

1980 55 206 162 242 264 310 141 250 109 97

1990 153 200 318 287 273 302 209 242 146 230

2000 214 229 227 217 249 152 122 125 297 226

2010 73 127 121 255 244 101

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1059A 1918 to 2015 98 years Series 13

[B] Entire series, effect on correlation ( .603) is:

Lower 1936> -.070 1973> -.018 1943< -.016 1919> -.010 1932> -.010 1990< -.010 Higher 1945 .043 1986 .022

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

1936 +3.5 SD; 1973 +3.3 SD

1059A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 91 146

1920 114 196 148 142 110 86 107 126 101 80

1930 132 240 239 268 382 386 234 223 198 155

1940 116 107 141 83 78 34 101 156 58 129

1950 93 122 133 169 130 173 96 81 121 137

1960 162 196 168 161 149 147 106 135 115 136

1970 170 141 122 273 216 178 168 208 179 103

1980 125 208 144 216 259 312 143 275 155 134

1990 137 245 181 230 367 235 411 273 234 245

2000 215 156 238 166 170 140 73 69 158 174

2010 60 97 106 290 328 96

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1059B 1916 to 2015 100 years Series 14

[B] Entire series, effect on correlation ( .619) is:

Lower 1936> -.055 1978< -.025 1919> -.010 1917> -.009 1972> -.007 1971> -.007 Higher 1945 .068 1986 .028

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

2012 -.528 29 7

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

1936 +3.0 SD

1059B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 118 182 118 162

1920 125 156 95 104 84 47 92 103 86 70

1930 105 249 200 294 284 268 191 206 172 168

1940 142 157 168 153 141 74 149 213 181 186

1950 156 162 134 165 128 164 85 95 139 163

1960 173 296 250 264 214 173 125 106 101 130

1970 159 169 181 186 178 166 182 184 118 72

1980 110 165 130 138 209 295 113 176 95 98

1990 198 210 171 127 199 170 233 251 155 168

2000 107 85 125 116 128 116 28 20 53 58

2010 26 31 0 40 81 53

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1061A 1914 to 2015 102 years Series 15

[\*] Early part of series cannot be checked from 1914 to 1914 -- not matched by another series

[B] Entire series, effect on correlation ( .576) is:

Lower 1915> -.044 1933< -.020 2002< -.016 2011< -.013 1989> -.010 1984< -.009 Higher 1936 .090 1986 .022

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

2011 .149 29 2 >> WARNING: Ring is not usually narrow

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

1915 +3.5 SD; 1936 -4.7 SD

1061A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1914 86 386 254 184 162 148

1920 195 225 159 171 171 150 146 168 160 154

1930 129 157 135 106 205 252 66 231 201 205

1940 164 174 246 312 313 152 215 280 224 286

1950 261 235 186 182 193 251 162 172 160 168

1960 135 138 155 200 135 96 108 143 115 127

1970 195 69 108 191 230 204 158 144 190 105

1980 69 61 61 45 63 82 29 80 53 72

1990 76 81 78 30 94 51 69 53 40 61

2000 37 25 17 42 49 48 25 14 23 39

2010 13 0 7 16 50 12

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1061B 1915 to 2015 101 years Series 16

[B] Entire series, effect on correlation ( .574) is:

Lower 1915< -.047 2011< -.012 1974< -.011 1971< -.010 1932> -.009 1966> -.009 Higher 1936 .090 1945 .027

1061B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1915 134 257 202 181 163

1920 239 225 151 182 163 145 162 162 185 174

1930 203 220 216 223 269 295 74 207 172 169

1940 132 161 231 227 165 72 147 245 170 258

1950 160 303 230 131 128 201 132 126 127 90

1960 81 161 174 176 127 120 139 171 105 111

1970 131 41 48 62 63 73 90 93 108 73

1980 68 77 64 47 64 69 33 60 59 73

1990 112 117 119 43 81 110 105 81 77 89

2000 35 12 15 38 37 40 18 21 56 71

2010 32 6 19 13 62 24

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1068A 1946 to 2015 70 years Series 17

[B] Entire series, effect on correlation ( .563) is:

Lower 1988< -.039 1986> -.033 1949< -.023 1957> -.020 2005> -.011 1951< -.008 Higher 1955 .013 2010 .010

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

1988 -6.3 SD

1068A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 46 61 46 23

1950 92 46 23 67 122 313 142 236 318 356

1960 287 267 246 260 223 272 79 63 44 96

1970 104 155 113 203 315 354 381 468 469 281

1980 369 357 286 292 330 289 247 299 46 124

1990 218 274 217 133 147 162 120 130 104 110

2000 95 90 103 104 156 179 80 76 121 150

2010 72 126 66 128 164 71

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1068B 1946 to 2015 70 years Series 18

[B] Entire series, effect on correlation ( .585) is:

Lower 1947< -.038 1957> -.028 2001> -.024 1994< -.021 1982> -.012 2007> -.012 Higher 1988 .032 1968 .017

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

1968 -1.855 28 2

1068B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 29 18 14 57

1950 54 44 26 110 128 292 124 213 263 262

1960 192 233 204 210 137 181 21 42 0 91

1970 154 140 127 184 294 327 319 350 304 216

1980 136 144 179 187 253 210 126 190 71 78

1990 106 115 94 73 63 78 112 82 81 87

2000 76 84 104 109 142 144 61 96 138 113

2010 63 78 51 73 123 55

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1070A 1955 to 2015 61 years Series 19

[B] Entire series, effect on correlation ( .785) is:

Lower 1972> -.015 1989> -.014 1955< -.014 1984< -.013 1998> -.009 1959< -.009 Higher 1986 .026 2010 .020

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

2010 -1.258 29 2

1070A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 406 345 326 534 336

1960 466 443 529 493 363 420 290 261 210 265

1970 325 299 373 323 519 468 377 305 355 229

1980 257 247 169 189 182 256 113 173 75 131

1990 187 208 142 113 140 101 140 113 104 80

2000 58 43 56 63 93 59 24 31 89 86

2010 0 39 33 57 82 35

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1070B 1955 to 2015 61 years Series 20

[B] Entire series, effect on correlation ( .644) is:

Lower 1955< -.041 1989> -.024 1973< -.021 1957> -.020 1984< -.014 2001> -.013 Higher 1986 .051 2010 .039

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

2010 -1.258 29 2

1070B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 215 160 320 477 532

1960 434 476 440 355 350 407 303 236 186 325

1970 447 254 225 104 255 347 391 463 435 311

1980 299 265 161 153 135 135 55 106 58 102

1990 133 114 93 83 101 84 103 123 77 72

2000 33 26 38 56 104 47 10 8 62 56

2010 0 36 28 62 65 24

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1090A 1954 to 2015 62 years Series 21

[B] Entire series, effect on correlation ( .547) is:

Lower 1988> -.077 1989> -.039 1956> -.030 1999< -.020 1963< -.017 1998> -.011 Higher 1986 .076 2010 .043

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

1989 +3.2 SD

1090A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1954 261 388 362 231 259 258

1960 243 194 148 126 154 143 162 191 116 146

1970 131 129 144 221 256 323 249 177 157 77

1980 113 100 71 132 278 284 45 291 419 421

1990 373 303 356 273 234 310 340 257 280 180

2000 195 134 200 200 181 134 85 108 377 253

2010 52 224 86 213 226 101

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1090B 1944 to 2015 72 years Series 22

[B] Entire series, effect on correlation ( .547) is:

Lower 1988> -.047 1977< -.028 1950> -.021 1956> -.014 1989> -.014 1962< -.014 Higher 2010 .032 1968 .023

1090B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1944 122 101 162 267 201 210

1950 329 331 234 251 233 247 261 188 226 218

1960 292 267 191 259 256 230 196 221 137 171

1970 199 174 188 165 265 163 142 91 144 72

1980 142 134 78 81 359 430 140 308 366 296

1990 336 279 356 238 320 322 315 274 224 299

2000 243 187 264 216 202 150 147 184 458 352

2010 65 326 128 231 314 111

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1092A 1978 to 2015 38 years Series 23

[B] Entire series, effect on correlation ( .524) is:

Lower 1986> -.047 2000> -.027 2006> -.026 1979> -.022 1989< -.021 1991< -.013 Higher 2010 .053 2001 .038

1092A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1978 434 436

1980 471 395 339 345 398 356 306 299 264 201

1990 249 230 229 202 253 258 200 208 207 250

2000 228 142 230 174 224 176 190 132 168 176

2010 94 172 149 143 181 83

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1092B 1956 to 2015 60 years Series 24

[B] Entire series, effect on correlation ( .470) is:

Lower 1986> -.032 1957> -.023 1956> -.022 1991< -.020 1958< -.018 1979> -.016 Higher 2010 .041 2014 .025

1092B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 95 108 78 156

1960 104 94 120 136 219 173 163 114 134 151

1970 160 242 179 236 347 342 277 360 413 401

1980 455 394 361 383 428 403 324 351 255 178

1990 216 184 208 196 220 232 200 178 171 215

2000 163 101 172 154 147 134 124 102 131 137

2010 79 113 113 151 209 109

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1093A 1930 to 2015 86 years Series 25

[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 -5 -.03 .07 -.05 -.14 -.03 .44\*-.06 -.10 .20 -.09 .34|-.13 -.10 .01 -.06 -.30 .13 .10 -.15 .12 -.03

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

Lower 1950< -.137 1986> -.032 2006> -.022 2007> -.016 2001> -.014 2010> -.010 Higher 1936 .068 1945 .028

1950 to 1999 segment:

Lower 1950< -.202 1986> -.076 1982> -.009 1962< -.008 1989> -.007 1966> -.005 Higher 1955 .037 1985 .028

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

1949 1950 -4.4 SD 1950 1951 5.2 SD

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

2012 -.528 29 7

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

1950 -7.9 SD; 2007 +3.1 SD

1093A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1930 230 204 179 229 282 305 190 372 402 340

1940 284 296 344 330 321 238 307 316 220 227

1950 96 234 230 212 203 309 230 172 206 211

1960 224 242 156 164 144 138 133 116 72 90

1970 95 83 66 51 102 187 206 246 257 206

1980 159 205 213 244 293 380 337 385 242 183

1990 165 123 69 41 48 27 18 10 3 12

2000 3 13 13 8 12 5 18 24 21 15

2010 8 19 0 21 17 14

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1093B 1923 to 2015 93 years Series 26

[B] Entire series, effect on correlation ( .646) is:

Lower 2010> -.047 2011< -.023 1992< -.015 1989> -.011 2015> -.009 1953> -.008 Higher 1936 .072 1968 .012

[D] 6 Absent rings: Year Master N series Absent

2001 -2.146 29 2

2011 .149 29 2 >> WARNING: Ring is not usually narrow

2012 -.528 29 7

2013 .862 29 2 >> WARNING: Ring is not usually narrow

2014 2.010 29 1 >> WARNING: Ring is not usually narrow

2015 .023 29 1 >> WARNING: Ring is not usually narrow

>> WARNING: Last ring in series is ABSENT

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

2010 +3.3 SD

1093B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1923 195 209 182 185 214 206 196

1930 239 289 230 294 349 370 204 336 331 325

1940 209 214 228 228 205 152 173 174 127 152

1950 121 147 140 182 156 179 153 118 151 150

1960 135 124 130 144 138 124 116 138 73 81

1970 77 74 57 68 131 177 196 191 213 149

1980 186 182 127 189 240 289 185 270 167 152

1990 131 113 50 16 37 26 18 16 9 9

2000 8 0 4 11 10 8 4 3 51 24

2010 21 0 0 0 0 0

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

1191A 1966 to 2015 50 years Series 27

[B] Entire series, effect on correlation ( .627) is:

Lower 1989< -.054 1986> -.029 1966> -.013 1977< -.013 2003< -.012 1982> -.010 Higher 2001 .025 2014 .018

[D] 2 Absent rings: Year Master N series Absent

1968 -1.855 28 2

2012 -.528 29 7

1191A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1966 11 35 0 9

1970 19 37 89 105 206 268 231 184 324 236

1980 225 227 241 197 277 318 261 254 230 158

1990 253 267 325 229 250 276 231 183 162 172

2000 135 81 99 70 92 62 36 43 82 56

2010 8 24 0 30 70 25

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1499A 1946 to 2015 70 years Series 28

[B] Entire series, effect on correlation ( .661) is:

Lower 1952< -.068 1996< -.020 2000> -.014 1948> -.009 1950> -.006 1997< -.006 Higher 1986 .047 1988 .017

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

2012 -.528 29 7

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

1952 -4.8 SD

1499A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1946 42 71 57 79

1950 84 63 10 33 78 191 142 125 176 177

1960 178 210 176 270 244 227 200 222 183 175

1970 239 244 216 275 404 435 334 336 356 207

1980 270 226 179 153 194 225 85 189 104 112

1990 159 159 202 139 132 89 60 58 75 74

2000 95 63 87 82 112 81 57 41 117 92

2010 29 50 0 82 87 38

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1499B 1963 to 2015 53 years Series 29

[B] Entire series, effect on correlation ( .604) is:

Lower 1963< -.073 2012< -.035 2006> -.023 1968> -.016 1984< -.013 1971> -.010 Higher 1986 .067 2001 .027

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

2012 -.528 29 7

1499B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1963 263 326 316 304 343 339 351

1970 451 398 327 392 507 591 490 462 433 278

1980 284 302 242 175 197 259 102 244 158 108

1990 121 121 164 132 176 127 110 130 94 122

2000 77 41 97 63 101 80 98 68 158 121

2010 48 80 0 56 99 52

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PART 7: DESCRIPTIVE STATISTICS: MMRB1400A\_ACSA\_Corr4-50 12:27 Mon 23 Jan 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 ()

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1 106A 1938 2015 78 3 0 .741 1.28 4.20 .950 .830 .340 2.66 .483 -.049 1

2 106B 1918 2015 98 4 0 .647 1.56 5.58 1.158 .794 .382 2.44 .306 -.029 1

3 107A 1932 2015 84 3 0 .501 1.28 2.99 .780 .833 .374 2.60 .445 -.044 1

4 107B 1932 2015 84 3 0 .469 1.34 3.23 .862 .872 .449 2.86 .488 -.020 1

5 108A 1918 2015 98 4 0 .592 1.74 5.57 1.065 .825 .338 2.80 .473 .042 1

6 108B 1937 2015 79 3 0 .644 2.08 4.93 1.275 .888 .278 2.63 .533 .003 1

7 428A 1962 2015 54 2 0 .594 1.91 5.70 1.463 .913 .297 2.56 .448 .060 1

8 428B 1950 2015 66 2 1 .377 1.34 3.84 .970 .903 .339 2.56 .452 .004 1

9 1045A 1924 2015 92 4 0 .704 2.22 3.86 .632 .301 .271 2.45 .391 -.063 1

10 1045B 1916 2015 100 4 0 .687 2.10 4.38 .654 .402 .280 2.60 .343 -.048 2

11 1054A 1922 2015 94 4 0 .619 1.95 3.48 .716 .606 .272 2.54 .487 .034 1

12 1054B 1943 2015 73 3 0 .678 2.17 3.90 .748 .547 .273 2.58 .502 .018 1

13 1059A 1918 2015 98 4 0 .603 1.68 4.11 .757 .563 .321 2.85 .533 -.042 1

14 1059B 1916 2015 100 4 0 .619 1.45 2.96 .634 .694 .317 2.58 .412 -.031 1

15 1061A 1914 2015 102 4 0 .576 1.33 3.86 .816 .740 .375 2.50 .358 -.065 1

16 1061B 1915 2015 101 4 0 .574 1.23 3.03 .719 .745 .336 2.48 .367 -.028 1

17 1068A 1946 2015 70 3 0 .563 1.80 4.69 1.124 .781 .370 2.33 .317 -.011 1

18 1068B 1946 2015 70 3 0 .585 1.33 3.50 .837 .763 .389 2.61 .467 -.050 1

19 1070A 1955 2015 61 2 0 .785 2.17 5.34 1.512 .879 .354 2.60 .493 -.065 1

20 1070B 1955 2015 61 2 0 .644 1.89 5.32 1.517 .895 .412 2.60 .580 -.062 2

21 1090A 1954 2015 62 2 0 .547 2.11 4.21 .949 .535 .353 2.70 .458 -.063 1

22 1090B 1944 2015 72 3 0 .547 2.26 4.58 .860 .302 .327 2.70 .592 -.046 1

23 1092A 1978 2015 38 1 0 .524 2.42 4.71 .962 .866 .197 2.52 .482 .012 1

24 1092B 1956 2015 60 2 0 .470 2.08 4.55 1.034 .890 .211 2.48 .400 -.005 1

25 1093A 1930 2015 86 3 1 .463 1.63 4.02 1.167 .903 .359 2.45 .324 -.093 1

26 1093B 1923 2015 93 4 0 .646 1.38 3.70 .947 .902 .299 2.98 .440 -.131 1

27 1191A 1966 2015 50 1 0 .627 1.48 3.25 1.033 .886 .506 2.61 .441 -.011 1

28 1499A 1946 2015 70 3 0 .661 1.49 4.35 .946 .846 .366 2.52 .464 -.010 1

29 1499B 1963 2015 53 2 0 .604 2.11 5.91 1.438 .905 .368 2.67 .548 -.115 1

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Total or mean: 2247 86 2 .599 1.72 5.91 .951 .737 .336 2.98 .442 -.033

- = [ COFECHA MMRSMCOF ] = -