[] Dendrochronology Program Library Run ACRU Program COF 12:58 Fri 28 Apr 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30070

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: ACRU\_GOSH2\_Corr2-50

File of DATED series: ACRU\_GOSH2\_Corr2

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 1903 to 2016 114 years

Continuous time span is 1903 to 2016 114 years

Portion with two or more series is 1903 to 2016 114 years

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

\*C\* Number of dated series 37 \*C\*

\*O\* Master series 1903 2016 114 yrs \*O\*

\*F\* Total rings in all series 3181 \*F\*

\*E\* Total dated rings checked 3181 \*E\*

\*C\* Series intercorrelation .491 \*C\*

\*H\* Average mean sensitivity .224 \*H\*

\*A\* Segments, possible problems 22 \*A\*

\*\*\* Mean length of series 86.0 \*\*\*

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

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

1838B 1 absent rings: 1945

1 absent rings .031%

1950 .518 34 2000 .651 35

1951 1.001 32 2001 .340 35

1952 .307 32 2002 .280 35

1903 .657 2 1953 -.223 32 2003 -1.632 35

1904 -.793 2 1954 .103 33 2004 -.413 35

1905 -.989 2 1955 2.298 34 2005 -.798 35

1906 .824 2 1956 .712 35 2006 -1.754 35

1907 2.204 2 1957 .777 35 2007 -1.442 35

1908 .670 2 1958 .665 35 2008 .426 35

1909 -.837 2 1959 .299 35 2009 1.038 35

1910 -2.247 2 1960 .839 35 2010 .137 35

1911 -1.359 2 1961 1.097 35 2011 .280 35

1912 -.735 2 1962 .031 35 2012 1.192 35

1913 .450 2 1963 -.761 35 2013 .346 35

1914 1.113 2 1964 .333 35 2014 .544 35

1915 1.044 2 1965 -.707 35 2015 .338 35

1916 1.018 3 1966 -1.331 35 2016 -1.319 35

1917 -1.021 5 1967 -1.321 35

1918 .010 6 1968 -1.877 35

1919 -.498 6 1969 -1.162 35

1920 -1.134 8 1970 -.382 35

1921 -1.714 11 1971 -.193 35

1922 -.581 13 1972 .338 35

1923 .323 15 1973 -.586 35

1924 .169 18 1974 .522 35

1925 1.127 21 1975 1.587 35

1926 1.194 21 1976 1.125 35

1927 1.599 22 1977 .135 35

1928 .508 26 1978 1.478 35

1929 .359 28 1979 .873 35

1930 -3.335 28 1980 .669 35

1931 -.019 29 1981 -.224 35

1932 .500 29 1982 -.126 35

1933 .730 29 1983 -1.512 35

1934 1.771 29 1984 -.489 35

1935 1.086 30 1985 -1.052 35

1936 -.777 30 1986 -1.573 35

1937 .638 30 1987 -.469 35

1938 -.720 30 1988 -.338 35

1939 -1.385 30 1989 .836 35

1940 -.822 30 1990 .120 35

1941 -.329 31 1991 -.155 35

1942 .032 31 1992 .517 35

1943 -1.387 33 1993 .244 35

1944 .374 33 1994 .525 35

1945 -2.173 33 1 1995 .282 35

1946 -.125 33 1996 -.015 35

1947 .542 34 1997 .784 35

1948 -.608 34 1998 1.619 35

1949 -.653 34 1999 .947 35

PART 5: CORRELATION OF SERIES BY SEGMENTS: ACRU\_GOSH2\_Corr2-50 12:58 Fri 28 Apr 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 1823A 1924 2016 .48 .49 .64 .59

2 1823B 1928 2016 .46 .52 .60

3 1823C 1935 2016 .58 .48 .46

4 1824A 1923 2016 .65 .67 .46 .60

5 1824B 1921 2016 .67 .68 .43 .48

6 1825A 1918 2016 .62 .65 .51 .58

7 1825B 1916 2016 .58 .58 .42 .48

8 1826A 1903 2016 .50 .57 .44 .39

9 1826BRE 1903 2016 .36B .28A .20B .31A

10 1827A 1928 2016 .63 .44 .34

11 1827B 1928 2016 .73 .49 .37B

12 1828A1 1956 2016 .47 .31A

13 1828A2 1920 1950 .54

14 1828B1 1955 2016 .39 .26A

15 1828B2 1917 1950 .66

16 1829A 1928 2016 .52 .43 .56

17 1829B 1917 2016 .40 .43 .32B .63

18 1830A 1925 2016 .66 .33 .23B

19 1830B 1925 2016 .71 .39 .30A

20 1831A 1920 2016 .60 .62 .45 .40

21 1831B 1921 2016 .72 .69 .49 .38

22 1832A 1922 2016 .80 .79 .47 .32A

23 1832B 1925 2016 .75 .44B .47

24 1834A 1923 2016 .40 .39 .40 .26A

25 1834B 1927 2016 .34 .37 .41

26 1835A 1924 2016 .53 .54 .23B .21B

27 1835B 1921 2016 .50 .48 .48 .54

28 1836A 1929 2016 .62 .50 .48

29 1836B 1929 2016 .43 .25B .35

30 1838A 1924 2016 .50 .54 .37 .39

31 1838B 1922 2016 .58 .60 .45 .41

32 1839A 1941 2016 .24A .26A .38

33 1839B 1954 2016 .51 .50

34 1841A 1947 2016 .54 .56 .61

35 1841B 1943 2016 .35 .39 .50

36 1842ARE 1943 2016 .10B .25B .21B

37 1842B 1931 2016 .32A .42 .46

Av segment correlation .56 .53 .42 .42

PART 6: POTENTIAL PROBLEMS: ACRU\_GOSH2\_Corr2-50 12:58 Fri 28 Apr 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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1823A 1924 to 2016 93 years Series 1

[B] Entire series, effect on correlation ( .530) is:

Lower 1930> -.099 1929< -.018 1980< -.018 1928< -.017 1925< -.012 2013> -.012 Higher 1945 .021 2003 .021

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

1929 1930 4.9 SD

1823A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1924 283 203 243 323 169 109

1930 158 149 179 231 307 210 144 176 118 114

1940 173 224 249 145 220 148 187 193 160 147

1950 191 209 174 138 151 229 217 196 190 174

1960 199 217 193 170 212 143 130 153 130 131

1970 152 134 184 196 252 243 273 160 225 171

1980 96 106 121 92 144 91 53 86 97 139

1990 129 155 211 173 156 217 198 245 283 241

2000 253 158 165 110 157 123 112 89 117 133

2010 91 64 79 113 82 36 18

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1823B 1928 to 2016 89 years Series 2

[B] Entire series, effect on correlation ( .529) is:

Lower 1930> -.093 1968< -.020 1929< -.017 1973> -.015 1991> -.010 1950< -.007 Higher 1945 .031 2003 .028

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

1929 1930 4.5 SD

1823B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1928 189 113

1930 150 160 184 253 310 211 134 170 139 119

1940 199 258 256 149 209 117 162 180 153 167

1950 159 214 197 160 154 240 222 193 192 172

1960 160 178 153 161 157 158 134 148 87 117

1970 134 136 157 170 173 160 172 104 187 150

1980 114 93 79 61 80 78 55 83 87 93

1990 76 144 170 132 98 118 103 125 116 103

2000 142 114 110 61 90 74 68 64 101 105

2010 81 59 71 80 86 50 34

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1823C 1935 to 2016 82 years Series 3

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

Lower 2006> -.016 2013> -.015 1987< -.014 1997< -.013 1946< -.012 1974< -.011 Higher 2003 .047 1978 .016

1823C Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1935 241 138 150 88 86

1940 106 182 169 119 204 123 117 197 133 157

1950 185 210 197 169 145 181 204 165 149 155

1960 169 178 153 131 177 123 108 126 119 145

1970 147 151 173 111 145 189 243 159 265 241

1980 202 204 197 177 257 201 192 158 181 196

1990 195 147 236 167 226 165 139 145 162 170

2000 196 127 152 98 131 104 120 111 113 102

2010 101 67 100 160 129 48 28

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1824A 1923 to 2016 94 years Series 4

[B] Entire series, effect on correlation ( .642) is:

Lower 1939> -.023 1952< -.011 2016> -.011 1943< -.010 1969> -.009 1955< -.008 Higher 1930 .105 1945 .023

1824A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1923 205 144 189 239 291 257 299

1930 118 195 197 227 211 214 186 194 183 206

1940 164 165 148 99 140 109 149 161 159 173

1950 166 184 121 129 142 154 133 133 168 171

1960 153 170 148 151 156 117 109 122 67 153

1970 213 230 143 78 159 162 191 169 146 93

1980 162 141 88 72 65 76 83 96 151 111

1990 115 109 131 131 151 106 110 120 121 101

2000 102 108 95 57 80 68 58 60 95 110

2010 83 64 95 58 63 69 63

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1824B 1921 to 2016 96 years Series 5

[B] Entire series, effect on correlation ( .606) is:

Lower 1952< -.043 1936> -.022 1989< -.012 1984< -.012 1992< -.010 1922> -.010 Higher 1930 .068 1945 .036

1824B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1921 19 210 112 132 173 223 253 240 275

1930 102 199 229 292 268 240 240 193 177 170

1940 154 159 150 106 136 80 125 128 125 109

1950 136 176 90 112 130 181 156 130 169 163

1960 155 182 159 147 127 104 88 112 74 150

1970 198 196 197 147 187 197 162 147 135 130

1980 167 149 124 94 76 91 77 96 109 91

1990 94 89 80 101 109 100 120 112 120 104

2000 119 125 104 74 84 109 78 94 91 101

2010 79 129 114 80 86 67 67

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1825A 1918 to 2016 99 years Series 6

[B] Entire series, effect on correlation ( .600) is:

Lower 1980< -.025 2008< -.022 1950< -.016 1944< -.012 2013> -.009 1961< -.009 Higher 1930 .046 1945 .019

1825A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1918 174 123

1920 144 142 229 252 260 258 228 272 189 201

1930 102 154 138 119 173 160 84 178 111 116

1940 99 97 128 107 99 84 120 140 149 166

1950 132 190 200 187 207 251 179 166 179 185

1960 203 157 144 109 124 137 120 114 98 104

1970 101 107 134 85 92 108 109 81 112 92

1980 62 59 64 63 81 55 64 78 81 95

1990 87 73 86 68 77 76 79 82 89 72

2000 69 65 48 39 53 50 34 34 30 53

2010 47 41 59 66 49 57 36

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1825B 1916 to 2016 101 years Series 7

[B] Entire series, effect on correlation ( .499) is:

Lower 2002< -.022 1993< -.013 1976< -.012 1944< -.012 2010> -.011 1980< -.008 Higher 2003 .021 1955 .016

1825B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1916 175 173 123 94

1920 100 153 263 369 376 353 352 342 261 233

1930 124 203 223 192 229 184 73 181 123 106

1940 72 71 111 88 75 62 95 132 122 125

1950 124 180 160 188 218 244 153 168 149 166

1960 185 156 120 115 142 146 130 129 80 119

1970 103 126 140 131 171 169 111 88 138 195

1980 120 131 113 101 131 90 92 140 124 104

1990 101 77 102 71 88 74 72 67 72 60

2000 60 64 45 39 65 66 44 58 63 68

2010 87 65 87 64 74 62 43

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1826A 1903 to 2016 114 years Series 8

[B] Entire series, effect on correlation ( .445) is:

Lower 1906< -.030 1917> -.024 2013< -.022 1945> -.015 1990< -.011 1986> -.011 Higher 1930 .098 1955 .022

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

1917 +3.2 SD

1826A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1903 162 85 82 84 210 160 124

1910 105 84 116 159 210 192 241 274 224 209

1920 164 67 142 158 258 288 263 300 206 262

1930 97 127 177 145 172 246 189 303 287 240

1940 316 365 361 351 459 379 434 320 246 271

1950 332 342 323 242 311 483 313 348 299 266

1960 345 348 347 317 289 272 281 206 226 193

1970 192 218 284 243 262 314 316 298 262 247

1980 230 180 133 101 120 146 165 131 138 152

1990 92 116 109 127 114 118 149 130 141 91

2000 74 72 65 49 52 31 42 65 103 74

2010 87 117 192 64 217 220 158

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1826BRE 1903 to 2016 114 years Series 9

[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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1903 1952 9 - - - - - - - - - - .36| .11 -.03 -.13 -.26 -.30 -.11 .22 .17 .39\* .17

1925 1974 0 -.05 .08 .07 -.19 -.03 -.07 .08 -.03 .06 -.01 .28\*-.20 -.13 -.11 -.10 -.30 .17 .06 -.10 .26 .17

1950 1999 -2 -.18 -.24 -.04 -.04 -.12 .04 -.01 .10 .22\* .15 .20| .07 .06 .10 .00 -.30 -.08 .06 -.38 .00 -.03

1967 2016 0 .11 -.40 -.25 .13 -.01 -.31 -.12 .26 .11 .06 .31\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .299) is:

Lower 1945> -.031 2013< -.029 1984< -.023 1968> -.015 1906> -.014 1943> -.013 Higher 1930 .040 1955 .028

1903 to 1952 segment:

Lower 1945> -.070 1906> -.043 1943> -.027 1903< -.027 1933< -.023 1934< -.023 Higher 1930 .128 1921 .030

1925 to 1974 segment:

Lower 1945> -.069 1968> -.034 1943> -.027 1963> -.026 1966> -.022 1934< -.021 Higher 1930 .141 1955 .073

1950 to 1999 segment:

Lower 1968> -.050 1984< -.040 1963> -.035 1966> -.033 1991> -.026 1985> -.024 Higher 1955 .095 1983 .078

1967 to 2016 segment:

Lower 1968> -.047 2013< -.047 1984< -.044 1985> -.022 1976< -.022 1992< -.020 Higher 1983 .046 2003 .042

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

1984 1985 4.7 SD

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

1906 +3.2 SD; 1945 +3.1 SD; 1984 -5.8 SD

1826BRE Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1903 86 84 85 202 168 118 82

1910 54 108 111 147 156 181 171 153 134 106

1920 113 39 90 100 280 380 303 340 216 190

1930 26 95 74 61 97 150 89 150 181 147

1940 209 238 251 280 307 324 340 319 288 192

1950 228 279 304 225 237 437 267 289 254 243

1960 323 300 313 347 292 283 294 222 268 225

1970 193 179 229 218 213 224 163 193 214 151

1980 149 150 147 102 78 132 102 106 115 132

1990 130 179 116 137 148 167 139 148 132 137

2000 137 110 108 90 132 134 95 103 141 135

2010 129 128 182 71 165 231 150

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1827A 1928 to 2016 89 years Series 10

[B] Entire series, effect on correlation ( .546) is:

Lower 1972< -.032 2009< -.028 2000< -.016 1950< -.013 1932< -.010 1969> -.009 Higher 1945 .047 1930 .044

1827A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1928 314 261

1930 138 303 206 244 346 302 147 231 221 201

1940 227 214 185 170 200 102 188 171 136 126

1950 149 266 230 216 221 341 272 283 258 227

1960 269 262 253 268 334 279 283 221 223 309

1970 298 280 158 197 280 362 391 297 408 354

1980 224 262 142 153 148 138 180 162 220 296

1990 274 207 182 202 204 218 163 195 189 175

2000 133 173 156 123 122 165 141 153 200 118

2010 129 118 148 151 105 91 77

1827B 1928 to 2016 89 years Series 11

[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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1967 2016 -3 -.14 -.29 -.34 -.23 .03 .03 .09 .38\* .21 .29 .37| - - - - - - - - - -

[B] Entire series, effect on correlation ( .560) is:

Lower 2016> -.036 2009< -.025 1943> -.019 1973> -.013 2005> -.011 1998< -.010 Higher 1930 .062 1945 .031

1967 to 2016 segment:

Lower 2016> -.075 2009< -.048 1973> -.027 2005> -.021 1983> -.020 1998< -.019 Higher 2006 .078 1968 .048

1827B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1928 357 203

1930 88 188 185 174 236 190 84 132 97 103

1940 98 107 111 147 181 103 154 193 152 125

1950 162 223 208 206 203 314 227 258 243 205

1960 176 192 183 146 181 186 180 124 74 122

1970 120 131 115 227 261 355 317 229 279 292

1980 302 284 164 176 130 76 74 66 81 97

1990 105 82 71 93 92 91 72 75 64 94

2000 63 74 52 47 56 60 35 45 52 38

2010 49 44 55 42 59 41 60

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1828A1 1956 to 2016 61 years Series 12

[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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1967 2016 0 .05 .04 .04 .01 -.11 .00 .27 -.04 .13 -.13 .31\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .346) is:

Lower 2015< -.044 2016> -.036 2006> -.035 2003> -.025 1977< -.024 1968> -.024 Higher 1983 .045 1998 .030

1967 to 2016 segment:

Lower 2015< -.048 2016> -.039 2006> -.038 2003> -.027 1968> -.026 1977< -.024 Higher 1983 .053 1998 .037

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

2015 2016 4.1 SD

1828A1 Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1956 264 188 251 463

1960 448 381 251 168 170 118 107 129 150 171

1970 128 112 142 94 118 145 112 56 82 98

1980 114 107 131 65 89 46 58 73 59 114

1990 83 71 94 84 124 140 168 185 238 194

2000 159 171 151 140 153 128 142 103 101 117

2010 81 150 127 79 82 49 68

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1828A2 1920 to 1950 31 years Series 13

[B] Entire series, effect on correlation ( .536) is:

Lower 1936< -.053 1920< -.029 1946< -.020 1921> -.019 1943> -.018 1945> -.014 Higher 1930 .070 1939 .010

1828A2 Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 66 122 131 200 188 182 226 190 166 260

1930 106 191 230 315 254 181 47 141 147 117

1940 134 211 190 167 190 148 134 166 149 144

1950 149

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1828B1 1955 to 2016 62 years Series 14

[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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1967 2016 0 .08 -.11 -.11 -.15 .00 -.03 .01 .03 .00 .05 .26\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .261) is:

Lower 2016> -.062 1957< -.033 2009< -.030 2012< -.027 1996< -.026 2003> -.025 Higher 2006 .044 1983 .031

1967 to 2016 segment:

Lower 2016> -.079 2009< -.038 1996< -.034 2003> -.034 2012< -.034 2007> -.024 Higher 2006 .053 1983 .036

1828B1 Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 330 231 171 251 327

1960 291 253 238 218 252 209 157 148 126 94

1970 91 145 139 86 101 160 132 128 178 180

1980 178 113 155 96 127 88 104 156 175 219

1990 151 122 117 123 107 88 55 76 91 76

2000 53 57 50 54 43 60 35 50 59 34

2010 35 40 25 27 43 22 40

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1828B2 1917 to 1950 34 years Series 15

[B] Entire series, effect on correlation ( .656) is:

Lower 1921> -.043 1930> -.034 1919> -.023 1948> -.014 1922< -.009 1940> -.006 Higher 1945 .027 1934 .020

1828B2 Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 49 94 139

1920 75 135 100 179 149 166 184 211 188 201

1930 129 204 241 246 280 207 113 180 162 144

1940 192 194 158 129 162 89 141 166 153 130

1950 149

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1829A 1928 to 2016 89 years Series 16

[B] Entire series, effect on correlation ( .526) is:

Lower 1951< -.130 1936> -.013 2011< -.012 1948> -.011 1986> -.009 1974< -.008 Higher 1930 .055 1998 .015

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

1951 -5.3 SD

1829A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1928 166 165

1930 115 215 180 160 220 164 154 146 127 102

1940 122 109 119 107 154 101 157 174 188 115

1950 205 27 120 118 156 221 205 241 178 152

1960 225 196 166 99 181 88 56 71 34 80

1970 86 85 84 75 81 114 102 117 152 168

1980 146 108 159 90 191 152 145 148 134 162

1990 124 107 160 132 124 106 123 131 210 127

2000 98 122 123 83 112 94 60 59 82 106

2010 81 51 80 69 59 122 70

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1829B 1917 to 2016 100 years Series 17

[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 -6 -.15 -.03 .11 -.23 .34\*-.05 .03 .23 .09 -.03 .32| .09 .09 -.01 -.34 .04 -.12 -.21 -.07 -.05 -.10

[B] Entire series, effect on correlation ( .480) is:

Lower 1951< -.156 1917< -.020 1948> -.011 2010> -.009 1974< -.008 1997< -.008 Higher 1930 .047 2003 .029

1950 to 1999 segment:

Lower 1951< -.304 1967> -.019 1969> -.017 1974< -.015 1997< -.014 1988> -.011 Higher 1968 .053 1955 .046

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

1950 1951 -4.9 SD

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

1951 -5.9 SD

1829B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1917 28 106 98

1920 112 99 113 171 188 185 138 186 142 172

1930 77 176 199 210 257 197 164 180 122 86

1940 113 100 111 105 117 61 151 143 180 129

1950 193 11 95 109 104 187 120 121 146 147

1960 129 124 111 88 123 72 71 99 54 95

1970 100 81 78 45 59 94 104 107 139 135

1980 146 105 98 74 87 97 93 105 150 163

1990 121 129 159 132 116 103 96 93 125 115

2000 103 124 127 68 106 103 89 86 129 159

2010 190 135 144 175 148 168 96

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1830A 1925 to 2016 92 years Series 18

[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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1967 2016 -3 -.19 -.18 -.05 .00 -.24 .00 .01 .26\* .16 .08 .23| - - - - - - - - - -

[B] Entire series, effect on correlation ( .571) is:

Lower 1973> -.024 1945> -.022 1968> -.018 2007> -.017 1988< -.014 1969> -.012 Higher 1930 .160 1955 .016

1967 to 2016 segment:

Lower 1973> -.046 2007> -.032 1968> -.031 1969> -.022 1974< -.022 1988< -.019 Higher 1986 .045 2003 .044

1830A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 360 345 336 301 275

1930 109 245 198 182 224 208 172 174 163 139

1940 131 133 156 124 192 175 177 206 188 173

1950 245 273 233 189 202 317 235 280 252 236

1960 308 287 241 188 177 172 191 225 263 306

1970 179 202 244 330 213 250 241 282 296 335

1980 213 239 231 194 176 119 107 158 111 167

1990 177 194 192 184 170 215 155 208 192 236

2000 252 154 227 162 192 173 178 230 201 233

2010 143 184 224 137 114 126 108

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1830B 1925 to 2016 92 years Series 19

[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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1967 2016 0 -.04 -.21 -.16 .09 -.16 -.04 -.07 .19 .04 .09 .30\* - - - - - - - - - -

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

Lower 1989< -.022 2006> -.011 1948> -.011 2013< -.011 2016> -.011 1964< -.010 Higher 1930 .139 1955 .019

1967 to 2016 segment:

Lower 1989< -.053 1980< -.019 2006> -.017 2016> -.015 1977> -.013 1968> -.013 Higher 2003 .067 1975 .047

1830B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 315 302 256 173 210

1930 84 161 196 162 194 200 158 164 156 146

1940 130 150 146 111 135 114 146 154 182 175

1950 213 198 143 134 158 294 181 252 225 172

1960 219 295 252 232 176 144 163 183 182 203

1970 150 162 179 169 177 257 238 240 198 200

1980 140 156 124 125 117 141 96 157 96 103

1990 128 173 156 155 156 222 171 209 206 233

2000 253 164 222 141 159 166 170 169 195 204

2010 147 174 169 125 160 127 139

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1831A 1920 to 2016 97 years Series 20

[B] Entire series, effect on correlation ( .549) is:

Lower 1960< -.046 1945> -.031 2003> -.028 1920> -.016 1923< -.013 1968> -.011 Higher 1930 .140 1955 .012

1831A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1920 322 295 295 261 260 291 332 317 282 268

1930 145 270 233 269 300 242 180 188 150 132

1940 146 144 158 155 229 224 195 194 151 170

1950 281 278 250 178 169 236 181 196 200 203

1960 139 171 166 138 180 136 125 151 172 194

1970 245 241 176 180 172 200 193 148 176 172

1980 187 128 102 91 99 95 65 86 103 99

1990 102 116 130 137 163 185 186 164 186 162

2000 113 109 165 159 116 112 84 56 68 104

2010 80 75 75 80 66 48 33

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1831B 1921 to 2016 96 years Series 21

[B] Entire series, effect on correlation ( .517) is:

Lower 2010< -.065 2000< -.038 2003> -.028 1973> -.013 1952> -.011 1945> -.009 Higher 1930 .080 2016 .017

1831B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1921 287 276 260 285 393 360 325 300 246

1930 141 220 270 287 303 295 203 265 194 152

1940 167 196 186 153 145 143 162 217 191 179

1950 187 280 320 259 201 244 159 145 137 152

1960 129 149 112 100 115 106 98 86 72 80

1970 77 131 115 127 136 154 105 80 90 83

1980 85 61 72 42 33 28 26 25 34 37

1990 44 47 46 44 49 54 60 78 85 87

2000 50 60 58 63 54 50 44 41 58 72

2010 41 57 55 57 57 55 35

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

1832A 1922 to 2016 95 years Series 22

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

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

1967 2016 0 -.19 -.07 -.31 -.22 -.23 -.20 .01 .00 -.10 .10 .32\* - - - - - - - - - -

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

Lower 2003> -.041 1999< -.032 1997< -.016 2013> -.013 1973> -.012 1996> -.012 Higher 1930 .126 2016 .014

1967 to 2016 segment:

Lower 2003> -.083 1999< -.060 1997< -.035 1973> -.023 2013> -.023 1996> -.019 Higher 2016 .062 1983 .052

1832A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1922 142 361 453 495 518 513 392 353

1930 73 256 338 356 339 359 204 308 253 226

1940 233 169 162 148 210 179 226 303 187 176

1950 221 254 212 207 274 325 274 243 212 187

1960 200 235 156 175 178 150 121 137 136 141

1970 180 210 294 270 262 332 234 173 227 217

1980 201 191 178 137 174 199 220 326 273 282

1990 291 306 282 285 288 290 345 252 314 211

2000 254 212 240 258 236 195 187 135 163 207

2010 130 156 137 177 115 130 65

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

1832B 1925 to 2016 92 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

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

1950 1999 -1 -.08 -.09 -.42 -.31 .12 -.05 .00 .29 .10 .44\* .44| .13 .02 .04 .17 .21 -.32 -.13 -.23 -.09 -.22

[B] Entire series, effect on correlation ( .665) is:

Lower 1998< -.026 1943> -.013 1973> -.011 1969< -.011 1956> -.010 1989< -.009 Higher 1930 .118 1945 .022

1950 to 1999 segment:

Lower 1998< -.058 1973> -.028 1956> -.023 1985> -.022 1989< -.020 1965> -.017 Higher 1968 .066 1986 .044

1832B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 530 470 417 314 306

1930 56 193 271 266 246 316 173 248 160 138

1940 189 206 216 187 157 72 116 216 143 197

1950 249 215 148 136 143 229 263 217 181 175

1960 184 197 140 106 152 153 126 140 76 60

1970 113 133 114 144 140 179 166 161 185 144

1980 172 155 115 121 151 177 113 149 174 164

1990 216 231 222 242 214 274 170 223 178 252

2000 216 214 225 175 189 183 169 143 224 224

2010 158 181 187 124 148 229 133

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

1834A 1923 to 2016 94 years Series 24

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

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

1967 2016 0 -.05 -.22 -.19 -.20 -.31 -.21 .18 .10 -.06 -.02 .26\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .345) is:

Lower 2000< -.046 2003> -.024 1955< -.017 1973> -.015 1968> -.015 2016> -.013 Higher 1934 .018 1983 .015

1967 to 2016 segment:

Lower 2000< -.091 2003> -.055 1973> -.032 1968> -.032 2016> -.029 1976< -.023 Higher 1983 .040 1978 .033

1834A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1923 249 222 202 176 198 176 154

1930 130 181 196 169 224 157 113 130 94 68

1940 89 82 105 100 118 116 132 150 145 152

1950 173 172 188 152 152 151 153 164 159 196

1960 218 221 224 192 227 137 132 125 176 187

1970 194 174 185 241 307 304 210 190 252 205

1980 210 174 162 125 139 124 131 151 145 193

1990 194 187 240 205 220 243 185 195 196 179

2000 129 204 210 214 217 178 160 124 170 209

2010 168 240 221 194 158 166 178

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

1834B 1927 to 2016 90 years Series 25

[B] Entire series, effect on correlation ( .362) is:

Lower 1951< -.047 1991< -.027 1936> -.025 2003> -.023 1973> -.018 2014< -.017 Higher 2006 .025 1934 .018

1834B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1927 230 144 153

1930 133 178 158 148 225 141 196 200 128 122

1940 142 118 160 141 178 142 152 187 129 118

1950 136 103 139 152 160 191 214 208 228 217

1960 253 244 277 216 281 174 166 151 152 156

1970 162 158 158 302 307 315 249 255 410 352

1980 301 220 216 155 186 167 155 165 148 245

1990 158 124 203 154 147 177 168 160 185 156

2000 183 171 164 169 137 145 115 141 147 223

2010 153 174 209 231 144 201 153

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

1835A 1924 to 2016 93 years Series 26

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

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

1950 1999 -5 -.07 -.07 -.23 .28 -.06 .40\* .37 .19 .10 .09 .23| .06 -.21 -.22 .02 -.14 -.18 -.06 -.13 -.22 .10

1967 2016 -4 -.02 -.20 -.27 .07 .20 .23 .38\* .21 .11 .07 .21| - - - - - - - - - -

[B] Entire series, effect on correlation ( .432) is:

Lower 1972< -.043 1936> -.031 1945> -.015 1950< -.015 1966> -.012 1998< -.011 Higher 1930 .138 1939 .012

1950 to 1999 segment:

Lower 1972< -.071 1950< -.029 1966> -.029 1998< -.023 1962> -.016 1977> -.015 Higher 1955 .037 1973 .033

1967 to 2016 segment:

Lower 1972< -.076 1998< -.020 2009< -.017 2012< -.016 2005> -.013 1977> -.012 Higher 1978 .030 2016 .027

1835A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1924 236 285 336 284 269 269

1930 182 276 276 252 244 247 279 242 219 158

1940 165 185 187 162 234 200 214 243 154 215

1950 173 294 183 218 286 279 241 217 285 224

1960 266 210 265 153 254 172 214 120 151 138

1970 150 194 64 83 146 157 222 235 235 256

1980 207 182 207 139 169 139 118 118 87 102

1990 87 95 117 102 125 72 55 80 70 63

2000 63 96 72 66 69 79 67 52 92 69

2010 72 82 73 89 130 124 71

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

1835B 1921 to 2016 96 years Series 27

[B] Entire series, effect on correlation ( .527) is:

Lower 1930> -.050 1956< -.015 1963> -.013 1968> -.012 1937< -.011 1972< -.010 Higher 1945 .039 1955 .020

1835B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1921 26 200 240 219 321 352 321 315 306

1930 223 295 248 248 270 239 210 176 156 137

1940 138 183 169 169 287 120 171 284 262 268

1950 276 426 273 332 310 466 206 282 266 269

1960 246 315 187 312 296 255 182 198 205 120

1970 190 144 120 119 132 231 264 202 210 177

1980 202 141 188 108 194 165 153 153 142 147

1990 119 121 169 115 118 107 103 125 159 156

2000 126 152 84 84 100 91 79 57 86 136

2010 104 123 150 190 148 190 68

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1836A 1929 to 2016 88 years Series 28

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

Lower 2012< -.022 1948> -.018 1994< -.010 1936> -.010 1939> -.009 2007> -.009 Higher 1945 .033 1930 .018

1836A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 143

1930 66 93 169 178 206 200 168 136 85 126

1940 155 131 142 119 145 74 158 171 207 169

1950 184 226 171 135 152 199 201 167 148 120

1960 204 172 132 109 116 117 127 97 87 118

1970 119 109 223 103 234 308 248 194 197 127

1980 117 103 145 102 109 136 155 222 200 240

1990 230 202 201 204 168 144 214 224 237 336

2000 288 314 236 164 166 136 136 198 242 223

2010 223 195 169 207 231 204 172

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

1836B 1929 to 2016 88 years Series 29

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

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

1950 1999 -7 -.23 .14 -.24 .26\*-.17 -.06 .03 .10 .00 -.03 .25| .21 .21 -.18 .23 -.02 -.10 -.24 -.25 -.28 -.14

[B] Entire series, effect on correlation ( .399) is:

Lower 1952< -.124 1939> -.023 1936> -.019 1996> -.017 2009< -.010 2012< -.009 Higher 1930 .076 1945 .050

1950 to 1999 segment:

Lower 1952< -.150 1996> -.032 1966> -.019 1973> -.012 1979< -.011 1964< -.010 Higher 1965 .016 1960 .015

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

1952 -5.0 SD

1836B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1929 125

1930 25 100 142 175 193 215 207 193 96 182

1940 139 129 144 127 121 70 125 136 138 145

1950 171 187 81 131 130 158 158 166 166 141

1960 200 180 160 135 122 102 143 126 122 115

1970 143 125 231 198 218 226 230 219 194 116

1980 107 84 123 122 134 144 130 183 145 240

1990 160 157 218 231 250 264 547 471 381 361

2000 263 240 310 197 260 221 233 271 245 217

2010 252 198 201 239 260 266 191

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1838A 1924 to 2016 93 years Series 30

[B] Entire series, effect on correlation ( .437) is:

Lower 1999< -.034 1930> -.033 1983> -.029 1924< -.017 1936> -.017 1926< -.017 Higher 1945 .058 1955 .017

1838A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1924 219 316 238 288 244 234

1930 192 348 358 293 332 200 215 213 149 87

1940 93 97 93 44 74 14 39 100 119 105

1950 124 86 138 141 140 182 131 164 136 109

1960 113 105 79 80 68 86 48 33 28 41

1970 45 52 135 145 160 201 191 192 178 166

1980 173 163 170 220 240 162 111 137 132 284

1990 158 186 136 168 128 121 107 177 247 127

2000 166 166 111 117 137 130 97 110 189 210

2010 227 148 174 87 114 138 85

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1838B 1922 to 2016 95 years Series 31

[B] Entire series, effect on correlation ( .551) is:

Lower 2014< -.034 1973> -.019 2011< -.016 1935< -.015 1936> -.013 1922< -.012 Higher 1945 .048 1930 .045

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

1945 -2.173 33 1

1838B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1922 101 170 161 291 274 365 359 300

1930 179 218 215 266 257 181 182 163 149 93

1940 92 94 89 34 81 0 72 78 81 87

1950 201 116 144 163 174 194 106 125 121 51

1960 52 61 36 31 34 45 33 15 14 44

1970 72 64 132 218 239 344 270 317 228 148

1980 196 169 141 80 140 122 99 103 112 167

1990 146 169 173 187 232 186 223 203 305 241

2000 309 240 183 149 157 118 83 111 144 196

2010 179 115 171 145 89 85 62

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

1839A 1941 to 2016 76 years Series 32

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

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

1941 1990 0 .19 .01 .19 .13 .19 .02 .13 .04 -.07 -.11 .24\*-.06 -.08 -.10 -.06 -.01 .07 -.16 .04 -.02 .10

1950 1999 0 .19 .01 .13 .09 .23 .05 .15 .00 -.07 -.06 .26\*-.08 -.07 -.14 -.01 -.07 -.01 -.18 .03 -.02 .14

[B] Entire series, effect on correlation ( .312) is:

Lower 1951< -.026 1986> -.026 1992< -.019 1977< -.014 1965> -.013 1972< -.010 Higher 2003 .028 1978 .014

1941 to 1990 segment:

Lower 1986> -.033 1951< -.033 1965> -.017 1972< -.013 1977< -.011 1947< -.010 Higher 1978 .021 1989 .018

1950 to 1999 segment:

Lower 1986> -.042 1951< -.031 1965> -.022 1992< -.022 1956> -.012 1972< -.011 Higher 1973 .046 1978 .020

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

1973 1974 4.1 SD

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

1973 -7.0 SD

1839A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1941 200 156 130 115 87 78 71 75 118

1950 181 79 130 146 197 193 235 233 270 172

1960 140 142 107 91 101 131 90 78 63 60

1970 121 91 63 14 99 96 101 56 113 117

1980 134 114 162 146 148 154 184 223 184 212

1990 190 175 146 177 187 174 180 176 212 254

2000 248 185 199 131 156 135 135 120 224 260

2010 246 160 254 219 189 140 118

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1839B 1954 to 2016 63 years Series 33

[B] Entire series, effect on correlation ( .541) is:

Lower 1986> -.046 1985> -.026 1983> -.020 2013> -.014 2002> -.011 1965> -.010 Higher 2003 .066 1955 .040

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

1986 +3.1 SD

1839B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1954 133 214 145 140 139 88

1960 91 88 67 52 69 63 48 26 16 18

1970 39 31 35 43 109 89 109 78 99 106

1980 107 55 117 97 118 123 134 120 84 98

1990 99 82 83 70 75 67 60 82 106 134

2000 149 98 186 89 150 126 105 85 188 287

2010 214 162 219 260 230 139 99

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

1841A 1947 to 2016 70 years Series 34

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

Lower 1969< -.037 1958< -.019 1996> -.015 1947< -.010 1955< -.010 1972> -.008 Higher 1983 .026 2016 .023

1841A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1947 202 193 204

1950 226 335 264 213 254 254 217 274 185 219

1960 217 240 166 150 172 156 138 145 148 96

1970 180 157 291 207 187 236 189 185 227 189

1980 221 203 204 157 201 177 147 178 215 257

1990 241 191 208 233 223 191 259 235 273 197

2000 173 172 193 144 130 114 138 119 194 170

2010 162 215 263 187 182 239 132

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1841B 1943 to 2016 74 years Series 35

[B] Entire series, effect on correlation ( .474) is:

Lower 1945> -.037 1974< -.018 1983> -.015 1969< -.015 1968> -.012 1975< -.012 Higher 2003 .057 1955 .028

1841B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 184 201 220 317 269 203 173

1950 211 377 407 409 275 441 299 315 236 228

1960 214 250 174 125 196 175 150 160 154 79

1970 180 177 218 102 83 102 143 109 165 167

1980 191 183 165 138 107 95 77 89 119 106

1990 132 111 106 139 121 149 118 162 183 130

2000 137 114 140 79 88 90 105 130 178 170

2010 208 225 269 167 210 231 162

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

1842ARE 1943 to 2016 74 years Series 36

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

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

1943 1992 6 .02 .27 .25 -.04 -.14 -.06 .01 -.13 .10 -.33 .10|-.06 .03 -.01 .07 .16 .27\*-.02 -.11 .14 .10

1950 1999 10 .09 .18 .25 -.11 -.12 -.11 -.13 -.28 -.31 -.30 .25|-.17 -.01 .13 .20 .04 .26 .23 .17 .08 .29\*

1967 2016 -10 .35\* .10 .18 -.03 -.14 -.15 -.29 -.25 -.11 -.23 .21| - - - - - - - - - -

[B] Entire series, effect on correlation ( .197) is:

Lower 1947< -.099 1968> -.033 1975< -.023 1945> -.020 1969> -.015 2007> -.014 Higher 2016 .041 1955 .032

1943 to 1992 segment:

Lower 1947< -.136 1968> -.043 1975< -.032 1969> -.020 1945> -.018 1986> -.016 Higher 1955 .055 1973 .035

1950 to 1999 segment:

Lower 1968> -.081 1975< -.060 1969> -.041 1986> -.029 1983> -.022 1952> -.020 Higher 1955 .064 1973 .054

1967 to 2016 segment:

Lower 1968> -.057 1975< -.046 2001< -.029 1969> -.026 2007> -.023 1986> -.022 Higher 2016 .076 1973 .036

1842ARE Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1943 143 196 170 184 67 27 87

1950 139 165 187 150 131 172 147 135 143 121

1960 119 114 98 82 121 96 55 103 170 221

1970 218 196 229 120 121 93 97 89 116 111

1980 140 117 143 156 174 152 176 217 234 251

1990 231 202 182 179 186 179 174 185 200 179

2000 219 167 177 160 138 119 131 174 172 226

2010 207 224 249 173 148 195 123

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

1842B 1931 to 2016 86 years Series 37

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

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

1931 1980 0 .17 .02 -.02 -.15 .00 .01 -.09 .10 -.07 .18 .32\*-.03 .07 .00 .12 .07 -.08 -.05 -.22 -.04 -.14

[B] Entire series, effect on correlation ( .383) is:

Lower 1945> -.050 1931< -.049 1995< -.021 1968> -.020 1983> -.017 1947< -.015 Higher 2016 .031 2003 .031

1931 to 1980 segment:

Lower 1945> -.080 1931< -.077 1968> -.033 1947< -.022 1979< -.019 1938> -.018 Higher 1966 .037 1955 .030

1842B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1931 99 141 157 163 138 102 210 179 141

1940 122 118 178 129 184 188 192 93 27 81

1950 93 131 193 146 136 236 230 258 244 202

1960 169 198 140 112 145 114 56 65 127 116

1970 143 168 159 94 108 154 115 102 145 96

1980 116 78 96 122 180 123 126 117 145 183

1990 133 133 150 151 182 109 134 143 209 192

2000 221 138 149 94 115 89 109 142 131 172

2010 162 182 212 167 138 177 95

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

PART 7: DESCRIPTIVE STATISTICS: ACRU\_GOSH2\_Corr2-50 12:58 Fri 28 Apr 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 1823A 1924 2016 93 4 0 .530 1.66 3.23 .596 .664 .248 2.72 .611 .027 1

2 1823B 1928 2016 89 3 0 .529 1.38 3.10 .538 .741 .217 2.59 .376 -.029 1

3 1823C 1935 2016 82 3 0 .494 1.56 2.65 .460 .521 .226 2.65 .539 .012 1

4 1824A 1923 2016 94 4 0 .642 1.38 2.99 .527 .734 .204 2.42 .417 -.037 1

5 1824B 1921 2016 96 4 0 .606 1.37 2.92 .528 .689 .210 2.61 .445 -.082 1

6 1825A 1918 2016 99 4 0 .600 1.16 2.72 .585 .864 .186 2.66 .530 -.079 1

7 1825B 1916 2016 101 4 0 .499 1.32 3.75 .729 .859 .221 2.62 .451 -.026 1

8 1826A 1903 2016 114 4 0 .445 2.05 4.83 1.002 .840 .233 2.81 .475 -.052 1

9 1826BRE 1903 2016 114 4 4 .299 1.80 4.37 .831 .784 .243 2.70 .403 -.014 1

10 1827A 1928 2016 89 3 0 .546 2.14 4.08 .726 .657 .209 2.64 .430 -.018 1

11 1827B 1928 2016 89 3 1 .560 1.43 3.57 .810 .834 .233 2.71 .459 -.039 2

12 1828A1 1956 2016 61 2 1 .346 1.41 4.63 .833 .835 .255 2.75 .572 -.108 1

13 1828A2 1920 1950 31 1 0 .536 1.69 3.15 .548 .365 .290 2.49 .504 -.004 1

14 1828B1 1955 2016 62 2 1 .261 1.25 3.30 .772 .888 .247 2.71 .546 -.015 1

15 1828B2 1917 1950 34 1 0 .656 1.60 2.80 .494 .532 .273 2.47 .491 -.078 1

16 1829A 1928 2016 89 3 0 .526 1.28 2.41 .468 .507 .289 2.78 .417 -.019 1

17 1829B 1917 2016 100 4 1 .480 1.22 2.57 .415 .502 .263 2.38 .354 -.087 1

18 1830A 1925 2016 92 3 1 .571 2.08 3.60 .590 .600 .193 2.44 .341 -.043 1

19 1830B 1925 2016 92 3 1 .586 1.77 3.15 .469 .551 .188 2.57 .376 -.024 2

20 1831A 1920 2016 97 4 0 .549 1.71 3.32 .692 .856 .163 2.54 .374 -.050 2

21 1831B 1921 2016 96 4 0 .517 1.35 3.93 .917 .932 .169 2.51 .409 -.078 1

22 1832A 1922 2016 95 4 1 .604 2.36 5.18 .881 .720 .206 2.48 .387 -.061 1

23 1832B 1925 2016 92 3 1 .665 1.89 5.30 .747 .680 .241 2.38 .361 .038 1

24 1834A 1923 2016 94 4 1 .345 1.76 3.07 .446 .722 .146 2.63 .464 -.008 1

25 1834B 1927 2016 90 3 0 .362 1.84 4.10 .557 .644 .185 2.68 .523 .021 2

26 1835A 1924 2016 93 4 2 .432 1.70 3.36 .760 .810 .218 2.55 .474 -.008 1

27 1835B 1921 2016 96 4 0 .527 1.94 4.66 .825 .673 .239 2.67 .458 -.006 2

28 1836A 1929 2016 88 3 0 .556 1.71 3.36 .549 .658 .218 2.47 .348 -.017 1

29 1836B 1929 2016 88 3 1 .399 1.84 5.47 .797 .765 .220 2.58 .325 -.102 1

30 1838A 1924 2016 93 4 0 .437 1.50 3.58 .723 .762 .265 2.85 .502 -.082 1

31 1838B 1922 2016 95 4 0 .551 1.51 3.65 .833 .820 .305 2.70 .504 -.060 3

32 1839A 1941 2016 76 3 2 .312 1.50 2.70 .568 .748 .240 2.46 .362 -.027 1

33 1839B 1954 2016 63 2 0 .541 1.08 2.87 .571 .743 .275 2.85 .524 -.050 1

34 1841A 1947 2016 70 3 0 .588 1.98 3.35 .451 .455 .186 2.80 .492 .015 1

35 1841B 1943 2016 74 3 0 .474 1.78 4.41 .798 .767 .222 2.66 .531 -.036 1

36 1842ARE 1943 2016 74 3 3 .197 1.57 2.51 .477 .716 .205 2.50 .425 .079 1

37 1842B 1931 2016 86 3 1 .383 1.44 2.58 .438 .538 .259 2.67 .580 .051 1

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Total or mean: 3181 120 22 .491 1.63 5.47 .657 .713 .224 2.85 .448 -.030

- = [ COFECHA ACRU COF ] = -