[] Dendrochronology Program Library Run BEAL Program COF 15:58 Mon 16 Oct 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30241

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: VMC1235\_Corr3-50

File of DATED series: VMC1235\_Corr3

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 1871 to 2015 145 years

Continuous time span is 1871 to 2015 145 years

Portion with two or more series is 1877 to 2015 139 years

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

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

\*O\* Master series 1871 2015 145 yrs \*O\*

\*F\* Total rings in all series 2220 \*F\*

\*E\* Total dated rings checked 2214 \*E\*

\*C\* Series intercorrelation .584 \*C\*

\*H\* Average mean sensitivity .297 \*H\*

\*A\* Segments, possible problems 9 \*A\*

\*\*\* Mean length of series 92.5 \*\*\*

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

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

262A 1 absent rings: 2015

262B 1 absent rings: 2015

263A 1 absent rings: 2015

263B 1 absent rings: 2015

268A 2 absent rings: 2002 2015

270A 1 absent rings: 2015

271A 1 absent rings: 2015

273A 1 absent rings: 2015

273B 1 absent rings: 2015

279A 1 absent rings: 2015

279B 1 absent rings: 2015

294A 1 absent rings: 2015

299A 1 absent rings: 1935

299B 1 absent rings: 2015

290B 1 absent rings: 2015

16 absent rings .721%

PART 2: TIME PLOT OF TREE-RING SERIES: VMC1235\_Corr3-50 15:58 Mon 16 Oct 2017 Page 2

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1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050 Ident Seq Time-span Yrs

: : : : : : : : : : : : : : : : : : : : : -------- --- ---- ---- ----

. . . . . . . . . . . . . . . . . . <=======> . 262A 1 1936 2015 80

. . . . . . . . . . . . . . . . . . <=======> . 262B 2 1936 2015 80

. . . . . . . . . . . . . . . . . . <=======> . 263A 3 1938 2015 78

. . . . . . . . . . . . . . . . . . <=======> . 263B 4 1936 2015 80

. . . . . . . . . . . . . . . . . . .<====> . 268A 5 1960 2015 56

. . . . . . . . . . . . . . . . . . <=====> . 268B 6 1959 2015 57

. . . . . . . . . . . . . . . . . . <=====> . 269A 7 1959 2015 57

. . . . . . . . . . . . . . . . . . <=====> . 269B 8 1952 2015 64

. . . . . . . . . . . . . . . . . . <========> . 270A 9 1925 2015 91

. . . . . . . . . . . . . . . . . <==========> . 270B 10 1906 2015 110

. . . . . . . . . . . . . . . . . <===========> . 271A 11 1894 2015 122

. . . . . . . . . . . . . . . . . <============> . 271B 12 1885 2015 131

. . . . . . . . . . . . . . . . . . .<====> . 273A 13 1965 2015 51

. . . . . . . . . . . . . . . . . . <=====> . 273B 14 1955 2015 61

. . . . . . . . . . . . . . . . . . <========> . 279A 15 1926 2015 90

. . . . . . . . . . . . . . . . . . <========> . 279B 16 1926 2015 90

. . . . . . . . . . . . . . . . . <============> . 280A 17 1886 2015 130

. . . . . . . . . . . . . . . . . <=============> . 280B 18 1871 2015 145

. . . . . . . . . . . . . . . . . <===========> . 290A 19 1896 2015 120

. . . . . . . . . . . . . . . . . . <=====> . 294A 20 1952 2015 64

. . . . . . . . . . . . . . . . . . <=====> . 294B 21 1952 2015 64

. . . . . . . . . . . . . . . . . <=============> . 299A 22 1877 2015 139

. . . . . . . . . . . . . . . . . <=============> . 299B 23 1877 2015 139

. . . . . . . . . . . . . . . . . <===========> . 290B 24 1895 2015 121

: : : : : : : : : : : : : : : : : : : : :

1050 1100 1150 1200 1250 1300 1350 1400 1450 1500 1550 1600 1650 1700 1750 1800 1850 1900 1950 2000 2050

1900 -1.785 8 1950 -.835 16 2000 .090 24

1901 -1.029 8 1951 .922 16 2001 -.744 24

1902 -1.717 8 1952 .537 19 2002 -1.903 24 1

1903 -.878 8 1953 -.984 19 2003 -3.103 24

1904 .638 8 1954 -.311 19 2004 -.098 24

1905 -1.016 8 1955 .630 20 2005 .283 24

1906 .007 9 1956 .449 20 2006 -.570 24

1907 -.111 9 1957 .134 20 2007 .735 24

1908 .755 9 1958 .206 20 2008 .550 24

1909 .166 9 1959 -.123 22 2009 1.563 24

1910 1.298 9 1960 -.252 23 2010 1.237 24

1911 1.235 9 1961 -.075 23 2011 .717 24

1912 .978 9 1962 -1.257 23 2012 .566 24

1913 -1.562 9 1963 -.516 23 2013 .571 24

1914 -.799 9 1964 .286 23 2014 .882 24

1915 -.347 9 1965 -.842 24 2015 -2.645 24 14

1916 .637 9 1966 -.984 24

1917 .463 9 1967 .529 24

1918 .173 9 1968 .918 24

1919 1.089 9 1969 .742 24

1920 1.551 9 1970 .155 24

1871 .534 1 1921 .802 9 1971 .602 24

1872 .718 1 1922 .115 9 1972 .276 24

1873 2.056 1 1923 -1.922 9 1973 .070 24

1874 1.425 1 1924 -1.235 9 1974 -.266 24

1875 -.609 1 1925 -.618 10 1975 .556 24

1876 -2.605 1 1926 .226 12 1976 .684 24

1877 1.308 3 1927 .335 12 1977 -.002 24

1878 .474 3 1928 .293 12 1978 .721 24

1879 -.163 3 1929 .527 12 1979 -.167 24

1880 -1.785 3 1930 .828 12 1980 .645 24

1881 -.131 3 1931 .823 12 1981 .761 24

1882 -2.579 3 1932 -.180 12 1982 .842 24

1883 -.161 3 1933 -.389 12 1983 -.606 24

1884 -.702 3 1934 -2.723 12 1984 -1.377 24

1885 1.443 4 1935 -2.171 12 1 1985 -.909 24

1886 -.204 5 1936 -.354 15 1986 -1.712 24

1887 1.451 5 1937 -.509 15 1987 -1.455 24

1888 .027 5 1938 .316 16 1988 -1.028 24

1889 .765 5 1939 .265 16 1989 .411 24

1890 .154 5 1940 .697 16 1990 1.195 24

1891 -.342 5 1941 .316 16 1991 .504 24

1892 .712 5 1942 .629 16 1992 -.083 24

1893 1.268 5 1943 .301 16 1993 -.679 24

1894 -.201 6 1944 1.186 16 1994 .532 24

1895 -1.342 7 1945 .289 16 1995 -.505 24

1896 .608 8 1946 -.475 16 1996 .818 24

1897 1.255 8 1947 1.534 16 1997 .852 24

1898 1.581 8 1948 -1.035 16 1998 .322 24

1899 .215 8 1949 -1.459 16 1999 .209 24

PART 5: CORRELATION OF SERIES BY SEGMENTS: VMC1235\_Corr3-50 15:58 Mon 16 Oct 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 1875 1900 1925 1950 1975

1924 1949 1974 1999 2024

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

1 262A 1936 2015 .41 .20B .44

2 262B 1936 2015 .40 .38 .55

3 263A 1938 2015 .51 .36 .44

4 263B 1936 2015 .62 .68 .61

5 268A 1960 2015 .20B .21B Possibly not missing ring 14

6 268B 1959 2015 .22A .42

7 269A 1959 2015 .57 .65

8 269B 1952 2015 .41 .54

9 270A 1925 2015 .64 .56 .59

10 270B 1906 2015 .69 .65 .49 .43

11 271A 1894 2015 .49 .56 .48 .46 .44

12 271B 1885 2015 .51 .54 .44 .56 .67

13 273A 1965 2015 .61 .59

14 273B 1955 2015 .39 .45

15 279A 1926 2015 .71 .51 .55

16 279B 1926 2015 .60 .54 .52

17 280A 1886 2015 .53 .75 .46 .34 .67

18 280B 1871 2015 .63 .70 .42 .28A .76

19 290A 1896 2015 .50 .48 .48 .53 .69

20 294A 1952 2015 .41 .62

21 294B 1952 2015 .08B .45 Seems to match A well – Could throw out – but sample size is low

22 299A 1877 2015 .51 .45 .57 .52 .75

23 299B 1877 2015 .56 .67 .68 .47 .41

24 290B 1895 2015 .31B .27B .25B .56 .54

Av segment correlation .51 .57 .52 .43 .54

PART 6: POTENTIAL PROBLEMS: VMC1235\_Corr3-50 15:58 Mon 16 Oct 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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262A 1936 to 2015 80 years Series 1

[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 4 .20 -.12 .12 -.06 -.24 -.07 -.10 .10 .05 .20 .20| .05 .03 .06 .22\*-.17 .16 -.10 -.37 -.31 -.18

[B] Entire series, effect on correlation ( .626) is:

Lower 1979> -.017 1982< -.017 1980< -.016 1953> -.013 1992> -.013 1971< -.013 Higher 2015 .099 1948 .051

1950 to 1999 segment:

Lower 1982< -.039 1980< -.038 1979> -.036 1971< -.030 1992> -.024 1977> -.022 Higher 1986 .070 1962 .038

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

262A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 12 19 60 63

1940 71 57 86 61 71 53 63 104 44 32

1950 49 120 145 138 191 240 160 244 164 138

1960 115 145 117 130 120 133 137 161 217 276

1970 294 206 212 133 159 180 294 362 342 365

1980 229 190 119 149 140 141 81 63 44 62

1990 90 79 111 89 95 73 68 70 68 46

2000 41 45 18 3 23 40 44 57 47 96

2010 73 58 46 34 38 0

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

262B 1936 to 2015 80 years Series 2

[B] Entire series, effect on correlation ( .584) is:

Lower 1959< -.084 2006> -.019 1979> -.016 1936< -.015 1965> -.015 1991< -.009 Higher 2015 .086 2003 .028

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

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

1959 -6.1 SD

262B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 7 17 58 99

1940 161 112 129 149 278 192 177 252 154 142

1950 147 162 156 120 118 181 159 149 125 81

1960 112 124 106 158 150 170 126 162 156 135

1970 212 263 296 223 178 167 196 200 266 279

1980 253 177 153 109 79 84 50 38 30 54

1990 105 50 51 42 58 36 38 31 30 36

2000 35 31 17 3 21 37 45 40 24 30

2010 27 27 23 32 22 0

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263A 1938 to 2015 78 years Series 3

[B] Entire series, effect on correlation ( .539) is:

Lower 1953> -.025 1982< -.022 2011< -.015 2001> -.013 1990< -.012 1946> -.011 Higher 2015 .070 1948 .056

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

263A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1938 254 324

1940 219 136 89 63 166 164 272 464 109 111

1950 79 291 311 314 430 224 127 118 69 72

1960 96 68 44 64 94 86 99 288 374 494

1970 553 439 436 230 295 347 359 333 365 285

1980 355 317 182 193 118 85 61 90 89 121

1990 94 94 99 57 65 59 72 73 72 118

2000 74 77 26 28 55 41 50 59 81 75

2010 110 51 96 91 69 0

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263B 1936 to 2015 80 years Series 4

[B] Entire series, effect on correlation ( .739) is:

Lower 1947< -.017 2003> -.013 2000> -.013 2002> -.012 1940< -.009 2001< -.008 Higher 2015 .127 1948 .011

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

263B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1936 57 32 52 49

1940 37 23 183 177 192 95 59 79 10 56

1950 146 186 155 83 156 255 297 294 174 178

1960 132 157 116 189 170 93 74 151 288 345

1970 363 321 266 189 244 307 345 288 293 221

1980 229 215 160 106 72 84 44 56 38 89

1990 108 110 67 45 68 51 64 86 68 87

2000 107 50 40 43 82 64 50 71 85 104

2010 104 64 65 72 108 0

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

268A 1960 to 2015 56 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

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

1960 2009 -7 .02 -.03 .08 .27\*-.14 -.05 -.15 .03 .15 -.02 .20| .13 .00 -.27 .02 .00 -.35 - - - -

1966 2015 -10 .24\* .03 -.07 .23 -.07 -.02 -.18 -.02 .13 .03 .21| - - - - - - - - - -

[B] Entire series, effect on correlation ( .333) is:

Lower 1972< -.075 1961< -.044 1983> -.029 1974> -.018 1962> -.014 1975< -.011 Higher 2015 .078 2002 .032

1960 to 2009 segment:

Lower 1972< -.072 1961< -.047 1983> -.039 1974> -.022 1962> -.019 1975< -.015 Higher 2002 .052 2009 .043

1966 to 2015 segment:

Lower 1972< -.105 1983> -.034 1974> -.022 1975< -.014 1994< -.013 1990< -.012 Higher 2015 .094 2002 .037

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

2002 -1.903 24 1

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

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

1961 -4.8 SD

268A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1960 278 242 280 314 323 271 319 341 438 354

1970 403 408 272 274 411 327 359 316 376 289

1980 272 278 340 349 276 240 211 203 118 173

1990 135 68 79 58 55 57 124 152 142 133

2000 96 62 0 7 26 52 77 135 92 208

2010 204 82 52 41 70 0

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

268B 1959 to 2015 57 years Series 6

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

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

1959 2008 0 .07 .03 -.25 .06 -.10 .04 -.18 -.08 .13 .13 .22\*-.10 .05 -.04 .14 .09 -.03 .11 - - -

[B] Entire series, effect on correlation ( .412) is:

Lower 1986> -.066 1975< -.031 1980< -.023 1962> -.021 1988< -.020 1995> -.017 Higher 2015 .154 2002 .026

1959 to 2008 segment:

Lower 1986> -.089 1975< -.040 1980< -.030 1962> -.028 1995> -.023 1983> -.020 Higher 2002 .054 1965 .030

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

1986 +4.6 SD

268B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 226

1960 231 250 271 253 321 245 250 262 344 355

1970 407 420 306 284 290 200 243 195 234 150

1980 134 149 172 168 134 141 186 130 86 102

1990 91 91 103 68 87 98 100 80 107 108

2000 58 37 12 36 69 106 160 262 182 311

2010 285 303 204 158 197 32

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269A 1959 to 2015 57 years Series 7

[B] Entire series, effect on correlation ( .645) is:

Lower 2009< -.086 1982< -.012 1984> -.012 1978< -.012 1987> -.010 1997< -.009 Higher 2015 .185 2003 .026

269A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1959 283

1960 213 203 165 172 220 171 216 295 317 365

1970 356 274 266 252 121 129 112 99 90 71

1980 125 99 72 43 64 47 41 58 60 89

1990 70 73 70 52 64 46 53 49 81 121

2000 92 84 47 25 106 106 87 169 119 56

2010 98 91 108 154 185 26

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269B 1952 to 2015 64 years Series 8

[B] Entire series, effect on correlation ( .542) is:

Lower 2000< -.055 1978< -.030 2009< -.025 1984> -.016 1988> -.015 1953> -.014 Higher 2015 .105 2003 .024

269B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 209 192 158 241 219 167 158 167

1960 182 185 105 165 213 162 266 424 432 475

1970 452 451 444 404 297 244 213 160 108 142

1980 183 162 144 122 141 113 51 62 113 118

1990 186 120 81 81 82 47 65 61 63 89

2000 42 38 26 11 35 44 75 113 96 73

2010 131 88 162 208 164 33

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270A 1925 to 2015 91 years Series 9

[B] Entire series, effect on correlation ( .739) is:

Lower 1983> -.015 1973< -.015 1994< -.012 1977< -.009 2001> -.009 1972> -.008 Higher 2015 .093 1934 .013

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

270A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1925 249 258 290 295 221

1930 294 311 190 173 110 111 124 121 154 148

1940 192 155 165 189 200 137 98 168 106 100

1950 97 306 316 116 112 200 204 233 264 246

1960 118 177 92 76 168 151 142 146 195 177

1970 75 105 165 67 27 77 92 41 60 44

1980 58 79 91 79 40 64 37 32 33 67

1990 85 59 49 43 38 41 83 74 64 69

2000 59 56 31 30 49 52 33 63 59 64

2010 54 48 54 52 72 0

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270B 1906 to 2015 110 years Series 10

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

Lower 1979< -.064 2015> -.018 1986> -.010 1912< -.009 1937> -.009 1935> -.008 Higher 1948 .035 1913 .026

270B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1906 190 122 168 158

1910 168 159 116 41 74 112 141 144 189 196

1920 211 140 130 96 97 146 194 176 157 159

1930 196 171 157 153 97 184 264 386 435 396

1940 413 390 413 291 364 314 280 301 141 168

1950 220 310 431 218 298 412 464 394 420 351

1960 343 367 186 172 229 191 242 309 390 354

1970 242 242 347 423 292 327 317 311 283 125

1980 191 200 210 154 138 169 187 153 144 139

1990 181 217 189 191 178 156 255 201 170 126

2000 115 67 33 27 65 58 19 39 36 77

2010 73 57 47 66 43 9

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271A 1894 to 2015 122 years Series 11

[B] Entire series, effect on correlation ( .595) is:

Lower 2002> -.028 1906< -.021 1968< -.017 1965> -.014 2010< -.013 1924> -.011 Higher 2015 .097 1913 .020

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

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

1923 +3.2 SD; 1924 +3.5 SD; 2002 +3.0 SD

271A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1894 302 237 331 302 270 197

1900 159 151 104 139 158 128 88 106 150 164

1910 176 145 179 101 112 102 138 108 122 132

1920 148 172 175 134 157 105 105 90 80 111

1930 93 95 72 65 44 59 61 34 45 57

1940 64 102 143 115 195 127 89 115 51 38

1950 39 57 57 25 41 51 49 41 41 57

1960 51 70 49 59 98 100 84 71 50 58

1970 61 84 93 79 118 169 148 91 68 61

1980 71 93 77 62 55 46 25 28 59 71

1990 91 59 42 44 54 47 65 70 78 65

2000 69 54 76 56 92 75 52 77 68 108

2010 62 49 53 57 42 0

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271B 1885 to 2015 131 years Series 12

[B] Entire series, effect on correlation ( .581) is:

Lower 2002> -.014 1934> -.013 1888> -.012 1948> -.012 1972< -.010 1894< -.009 Higher 2015 .047 1913 .017

271B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1885 506 376 378 379 360

1890 333 261 330 334 217 237 249 252 278 213

1900 121 152 154 201 276 214 182 165 193 195

1910 248 210 235 155 164 193 278 220 221 189

1920 194 171 153 128 174 136 154 147 124 146

1930 197 178 140 121 88 43 51 27 27 56

1940 46 53 56 81 138 92 65 127 69 46

1950 62 78 67 33 49 55 50 66 62 69

1960 70 94 62 128 173 133 145 162 131 125

1970 116 142 104 158 159 144 135 126 150 131

1980 160 149 154 113 97 120 92 80 100 127

1990 179 130 84 100 130 82 100 98 66 62

2000 62 71 105 69 132 131 101 148 188 177

2010 233 164 148 214 179 18

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273A 1965 to 2015 51 years Series 13

[B] Entire series, effect on correlation ( .672) is:

Lower 1971< -.028 1992< -.027 1983< -.023 1988> -.013 1979> -.012 2003> -.010 Higher 2015 .066 2002 .017

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

273A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1965 335 413 583 533 600

1970 426 323 448 464 361 463 357 298 294 301

1980 272 288 314 166 141 147 127 131 154 136

1990 168 118 72 59 90 75 78 72 60 62

2000 77 62 46 55 119 98 65 122 114 207

2010 129 168 185 153 121 0

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273B 1955 to 2015 61 years Series 14

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

Lower 1983< -.046 1955< -.026 1995> -.021 1964< -.015 1986> -.015 1959> -.015 Higher 2015 .120 1962 .021

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

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

1983 -4.6 SD

273B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1955 195 279 242 335 527

1960 478 418 245 372 285 280 368 533 478 600

1970 463 581 531 539 437 502 382 382 388 371

1980 326 259 267 113 130 167 201 223 285 262

1990 289 259 142 173 238 260 274 250 171 198

2000 167 152 96 70 164 163 112 210 193 265

2010 200 244 225 162 145 0

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279A 1926 to 2015 90 years Series 15

[B] Entire series, effect on correlation ( .723) is:

Lower 1969< -.023 1979> -.018 1966> -.011 1958> -.008 1936> -.007 2007< -.006 Higher 2015 .033 1948 .033

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

279A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1926 13 13 13 23

1930 30 42 37 45 20 40 133 146 154 158

1940 171 153 193 150 240 203 166 307 132 112

1950 118 219 174 122 168 172 176 164 272 257

1960 193 216 170 177 231 138 193 182 211 114

1970 94 96 85 79 122 136 119 61 127 179

1980 219 143 182 100 44 38 53 59 63 74

1990 86 78 77 70 105 62 104 108 92 62

2000 85 65 55 20 44 85 48 65 107 181

2010 130 153 149 133 116 0

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279B 1926 to 2015 90 years Series 16

[B] Entire series, effect on correlation ( .605) is:

Lower 1985< -.020 1986> -.017 1948> -.012 1970< -.011 1931< -.008 1999< -.008 Higher 2015 .034 1934 .020

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

1985 1986 4.2 SD

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

279B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1926 12 17 14 16

1930 21 17 26 27 21 46 162 108 198 177

1940 203 229 253 239 311 292 182 396 248 273

1950 335 325 330 149 183 308 297 252 276 167

1960 152 195 152 168 204 130 156 212 224 231

1970 124 216 238 182 126 130 203 131 211 140

1980 169 194 207 140 59 39 116 87 126 140

1990 114 134 138 112 132 48 151 86 59 40

2000 98 58 43 23 96 117 101 95 200 258

2010 265 189 114 129 161 0

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280A 1886 to 2015 130 years Series 17

[B] Entire series, effect on correlation ( .564) is:

Lower 1888< -.063 1953> -.028 1972< -.013 1894> -.011 2004< -.009 1963< -.007 Higher 2015 .049 1913 .014

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

1888 -4.5 SD; 1953 +3.0 SD

280A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1886 292 331 249 302

1890 289 269 273 306 298 265 356 283 252 204

1900 154 177 176 159 210 158 180 167 219 180

1910 222 224 184 119 141 143 171 142 106 154

1920 134 111 98 90 83 69 108 120 130 152

1930 157 180 142 150 71 81 82 89 82 70

1940 92 67 88 85 122 68 63 146 71 55

1950 57 87 92 137 138 104 141 90 95 106

1960 92 70 78 59 141 76 61 71 97 89

1970 72 116 59 78 85 114 109 123 125 67

1980 98 95 112 73 59 45 34 60 83 85

1990 102 98 102 94 117 53 58 77 46 50

2000 55 52 55 31 39 71 57 73 84 142

2010 111 98 73 72 113 12

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

280B 1871 to 2015 145 years Series 18

[\*] Early part of series cannot be checked from 1871 to 1876 -- 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

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

1950 1999 0 -.12 .25 -.10 -.04 -.06 .05 -.11 -.03 -.12 -.01 .28\*-.10 .13 .10 .04 .18 -.19 .07 .10 .00 -.33

[B] Entire series, effect on correlation ( .641) is:

Lower 1888> -.015 1901> -.014 1962> -.014 1957< -.013 1998< -.012 1886> -.011 Higher 2015 .061 1882 .023

1950 to 1999 segment:

Lower 1962> -.055 1957< -.033 1998< -.031 1951< -.029 1954< -.017 1987> -.015 Higher 1986 .067 1984 .039

280B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1871 301 304 360 326 254 213 282 255 227

1880 222 319 204 257 245 312 315 337 328 269

1890 277 228 269 264 223 192 252 236 274 222

1900 176 235 179 144 169 136 162 168 164 156

1910 175 180 168 117 118 142 132 122 100 123

1920 117 113 89 70 80 85 112 115 113 143

1930 143 133 95 80 41 53 120 138 154 194

1940 290 259 213 223 254 147 118 132 49 33

1950 38 44 73 74 40 64 109 31 61 82

1960 154 203 204 227 185 139 156 213 156 149

1970 73 66 44 72 75 151 161 119 156 100

1980 97 107 87 48 17 28 6 29 33 34

1990 44 58 52 42 42 27 26 33 12 18

2000 24 15 4 4 14 28 22 42 72 128

2010 100 78 75 80 134 6

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290A 1896 to 2015 120 years Series 19

[B] Entire series, effect on correlation ( .595) is:

Lower 1970< -.018 1918< -.017 1925> -.015 1929< -.012 1914> -.011 2003> -.011 Higher 2015 .077 1934 .020

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

1925 +3.0 SD

290A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1896 77 73 79 55

1900 42 30 27 49 47 27 40 51 57 61

1910 66 88 79 51 89 71 80 76 45 78

1920 94 95 82 50 53 100 77 67 62 44

1930 52 76 63 70 34 34 49 51 90 94

1940 89 104 89 72 66 70 40 77 61 74

1950 95 160 137 57 60 92 87 207 139 164

1960 132 185 117 165 195 136 122 184 189 164

1970 91 169 187 149 101 125 154 128 152 103

1980 192 214 199 145 122 118 101 106 100 134

1990 125 95 70 66 82 47 81 76 52 42

2000 63 46 43 54 104 89 51 60 71 77

2010 75 68 67 63 60 9

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294A 1952 to 2015 64 years Series 20

[B] Entire series, effect on correlation ( .626) is:

Lower 1952< -.036 1964< -.030 1995> -.018 1991< -.014 1962> -.011 1992< -.008 Higher 2015 .138 2003 .019

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

294A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 88 148 279 390 320 310 339 366

1960 343 295 262 232 171 215 169 225 308 357

1970 316 277 202 216 203 276 268 179 257 227

1980 217 195 218 117 141 145 124 95 121 188

1990 253 113 67 63 109 114 104 98 99 78

2000 52 45 47 33 61 57 43 67 42 63

2010 36 42 40 20 51 0

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

294B 1952 to 2015 64 years Series 21

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

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

1952 2001 -4 -.14 .00 .09 -.08 .09 -.20 .26\* .06 .18 .08 .08| .19 -.10 -.15 -.26 -.11 .00 -.12 .08 -.04 .19

[B] Entire series, effect on correlation ( .280) is:

Lower 1964< -.105 1952< -.024 1953> -.021 1976< -.019 1984> -.018 1980< -.015 Higher 2015 .059 2002 .034

1952 to 2001 segment:

Lower 1964< -.120 1953> -.033 1952< -.028 1984> -.028 1976< -.026 1980< -.021 Higher 1987 .030 1955 .030

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

1963 1964 -4.1 SD

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

1964 -5.4 SD

294B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1952 147 253 224 427 287 264 300 267

1960 304 224 209 242 140 200 193 298 305 297

1970 340 314 274 260 241 325 231 267 310 229

1980 200 207 254 210 225 218 188 125 134 118

1990 129 144 96 54 112 106 95 137 162 134

2000 69 48 14 17 62 81 65 93 112 84

2010 74 61 33 19 84 19

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299A 1877 to 2015 139 years Series 22

[B] Entire series, effect on correlation ( .628) is:

Lower 1909< -.023 1913> -.015 1959< -.014 1905> -.012 1900> -.012 1910< -.008 Higher 2015 .048 1882 .019

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

1935 -2.171 12 1

299A Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1877 249 155 138

1880 92 117 70 111 106 148 110 170 129 134

1890 105 119 115 117 63 42 63 130 113 87

1900 76 62 47 40 74 79 121 85 76 26

1910 33 48 45 40 27 37 34 53 58 51

1920 91 35 33 16 12 13 14 24 52 68

1930 66 37 41 22 5 0 59 104 92 125

1940 139 111 140 144 183 92 104 212 91 55

1950 77 174 133 98 115 116 117 165 178 101

1960 156 184 134 209 258 149 115 192 140 125

1970 136 114 139 122 156 171 217 118 118 145

1980 142 117 97 51 20 86 30 19 16 54

1990 96 43 73 55 61 55 119 90 93 53

2000 50 37 34 12 91 96 84 100 77 162

2010 164 163 154 216 186 20

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299B 1877 to 2015 139 years Series 23

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

Lower 1966< -.037 2008< -.016 1882> -.012 1891> -.008 1979> -.007 1913> -.007 Higher 2015 .027 1948 .025

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

1965 1966 -5.0 SD

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

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

1966 -7.0 SD

299B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1877 209 200 173

1880 96 105 96 131 105 135 110 160 126 134

1890 100 128 123 137 122 77 82 146 125 78

1900 54 61 54 58 93 84 89 65 73 71

1910 68 58 53 41 22 28 36 48 74 67

1920 75 47 34 13 10 10 8 26 59 118

1930 77 51 30 24 9 6 43 72 73 91

1940 104 77 83 99 138 123 132 276 92 63

1950 102 208 184 102 144 163 143 102 130 146

1960 144 165 121 125 229 152 81 139 159 177

1970 178 181 181 155 174 150 124 165 173 212

1980 282 243 193 140 81 119 65 30 25 59

1990 78 90 95 68 64 50 90 81 82 67

2000 90 48 41 15 38 57 46 79 15 147

2010 146 130 87 82 139 0

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

290B 1895 to 2015 121 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

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

1895 1944 9 .23 .03 -.24 -.19 -.07 .14 -.16 -.06 .18 .15 .31|-.12 -.12 -.37 -.04 -.12 .10 -.03 .03 .35\* .08

1900 1949 9 .28 .04 -.21 -.19 -.10 .16 -.15 .03 .12 .05 .27|-.19 .08 -.31 -.01 -.20 .05 .00 .02 .36\* .04

1925 1974 9 .02 .13 .02 -.02 -.31 .28 .02 .04 -.20 .02 .25|-.29 -.01 -.02 .01 -.13 .02 -.05 -.15 .32\* .02

[B] Entire series, effect on correlation ( .477) is:

Lower 1939< -.030 1948> -.028 1944< -.025 1974< -.023 1913> -.022 1969< -.013 Higher 2015 .048 1923 .014

1895 to 1944 segment:

Lower 1939< -.056 1944< -.053 1913> -.048 1942< -.020 1903> -.019 1926< -.017 Higher 1923 .079 1934 .045

1900 to 1949 segment:

Lower 1939< -.056 1944< -.051 1948> -.044 1913> -.034 1942< -.021 1926< -.018 Higher 1923 .069 1934 .046

1925 to 1974 segment:

Lower 1948> -.067 1944< -.054 1939< -.050 1969< -.025 1974< -.022 1942< -.020 Higher 1962 .049 1934 .048

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

2015 -2.645 24 14

>> WARNING: Last ring in series is ABSENT

290B Ring measurements

Annual values

Date 0 1 2 3 4 5 6 7 8 9

1895 87 106 126 172 159

1900 116 111 116 162 144 105 131 156 145 122

1910 204 168 150 134 122 93 96 116 123 145

1920 164 153 115 38 44 91 68 84 81 74

1930 90 119 90 116 61 44 89 71 85 35

1940 80 111 65 56 41 89 58 139 120 111

1950 105 162 168 67 83 117 111 98 96 99

1960 82 97 67 72 117 99 154 168 195 108

1970 119 162 190 227 84 183 210 198 204 155

1980 261 284 205 98 80 89 79 108 120 169

1990 129 83 67 68 75 65 76 96 57 49

2000 58 53 46 38 64 76 39 72 75 137

2010 137 107 126 120 134 0

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PART 7: DESCRIPTIVE STATISTICS: VMC1235\_Corr3-50 15:58 Mon 16 Oct 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 262A 1936 2015 80 3 1 .626 1.14 3.65 .835 .883 .324 2.75 .510 .059 1

2 262B 1936 2015 80 3 0 .584 1.11 2.96 .781 .883 .317 2.67 .458 .086 1

3 263A 1938 2015 78 3 0 .539 1.69 5.53 1.334 .809 .337 2.72 .438 -.021 1

4 263B 1936 2015 80 3 0 .739 1.32 3.63 .917 .845 .371 2.53 .356 -.046 2

5 268A 1960 2015 56 2 2 .333 2.01 4.38 1.269 .903 .368 2.61 .493 .007 1

6 268B 1959 2015 57 2 1 .412 1.84 4.20 .990 .858 .266 2.83 .616 .015 1

7 269A 1959 2015 57 2 0 .645 1.28 3.65 .866 .862 .295 2.58 .452 .004 1

8 269B 1952 2015 64 2 0 .542 1.63 4.75 1.166 .912 .298 2.88 .550 .042 1

9 270A 1925 2015 91 3 0 .739 1.19 3.16 .790 .788 .308 2.50 .394 -.004 2

10 270B 1906 2015 110 4 0 .560 2.05 4.64 1.135 .858 .258 2.57 .372 -.030 2

11 271A 1894 2015 122 5 0 .595 .95 3.31 .579 .867 .260 2.63 .387 .015 1

12 271B 1885 2015 131 5 0 .581 1.48 5.06 .841 .877 .235 2.65 .414 .010 1

13 273A 1965 2015 51 2 0 .672 2.09 6.00 1.547 .911 .263 2.65 .601 .141 1

14 273B 1955 2015 61 2 0 .546 2.83 6.00 1.383 .837 .257 2.49 .444 .018 1

15 279A 1926 2015 90 3 0 .723 1.19 3.07 .667 .731 .314 2.71 .507 .028 1

16 279B 1926 2015 90 3 0 .605 1.54 3.96 .897 .743 .353 2.68 .524 .030 1

17 280A 1886 2015 130 5 0 .564 1.22 3.56 .707 .881 .237 2.65 .427 -.054 1

18 280B 1871 2015 145 5 1 .641 1.37 3.60 .896 .907 .286 2.51 .415 -.018 1

19 290A 1896 2015 120 5 0 .595 .90 2.14 .451 .753 .264 2.58 .454 -.038 2

20 294A 1952 2015 64 2 0 .626 1.66 3.90 1.056 .891 .287 2.76 .507 .010 1

21 294B 1952 2015 64 2 1 .280 1.77 4.27 .982 .848 .295 2.69 .462 .032 1

22 299A 1877 2015 139 5 0 .628 .96 2.58 .549 .699 .373 2.75 .503 .052 1

23 299B 1877 2015 139 5 0 .576 1.00 2.82 .573 .733 .333 2.78 .405 .015 2

24 290B 1895 2015 121 5 3 .477 1.11 2.84 .491 .659 .282 2.73 .491 -.059 2

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Total or mean: 2220 81 9 .584 1.38 6.00 .839 .821 .297 2.88 .455 .006

- = [ COFECHA BEAL COF ] = -