[] Dendrochronology Program Library Run RUN3 Program COF 15:20 Tue 09 Jul 2013 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 28681

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

Title of run: Run3

File of DATED series: BLTLow\_ACRU\_3

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 30 years lagged successively by 15 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 .4226

6 Master dating series saved N

7 Ring measurements listed N

8 Parts printed 1234567

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

Time span of Master dating series is 1892 to 2012 121 years

Continuous time span is 1892 to 2012 121 years

Portion with two or more series is 1899 to 2012 114 years

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

\*C\* Number of dated series 20 \*C\*

\*O\* Master series 1892 2012 121 yrs \*O\*

\*F\* Total rings in all series 2028 \*F\*

\*E\* Total dated rings checked 2021 \*E\*

\*C\* Series intercorrelation .528 \*C\*

\*H\* Average mean sensitivity .241 \*H\*

\*A\* Segments, possible problems 45 \*A\*

\*\*\* Mean length of series 101.4 \*\*\*

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

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

472A 1 absent rings: 1982

472B 1 absent rings: 1982

476C 1 absent rings: 1982

3 absent rings .148%

PART 2: TIME PLOT OF TREE-RING SERIES: Run3 15:20 Tue 09 Jul 2013 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

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

. . . . . . . . . . . . . . . . . <==========> . 460A 1 1901 2012 112

. . . . . . . . . . . . . . . . . <===========> . 460B 2 1899 2012 114

. . . . . . . . . . . . . . . . . <==========> . 461A 3 1902 2012 111

. . . . . . . . . . . . . . . . . .<=========> . 461B 4 1912 2012 101

. . . . . . . . . . . . . . . . . . <========> . 462A 5 1921 2012 92

. . . . . . . . . . . . . . . . . . <=======> . 462B 6 1935 2012 78

. . . . . . . . . . . . . . . . . <==========> . 468A 7 1900 2012 113

. . . . . . . . . . . . . . . . . .<=========> . 468B 8 1918 2012 95

. . . . . . . . . . . . . . . . . <==========> . 469A 9 1901 2012 112

. . . . . . . . . . . . . . . . . .<=========> . 469B 10 1916 2012 97

. . . . . . . . . . . . . . . . . <==========> . 471A 11 1902 2012 111

. . . . . . . . . . . . . . . . . <==========> . 471B 12 1901 2012 112

. . . . . . . . . . . . . . . . . <==========> . 472A 13 1900 2012 113

. . . . . . . . . . . . . . . . . <==========> . 472B 14 1902 2012 111

. . . . . . . . . . . . . . . . . . <======> . 476C 15 1943 2012 70

. . . . . . . . . . . . . . . . . . <======> . 476D 16 1947 2012 66

. . . . . . . . . . . . . . . . . <===========> . 478A 17 1892 2012 121

. . . . . . . . . . . . . . . . . <==========> . 480A 18 1908 2012 105

. . . . . . . . . . . . . . . . . .<=========> . 481A 19 1919 2012 94

. . . . . . . . . . . . . . . . . .<=========> . 481B 20 1913 2012 100

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

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

PART 3: Master Dating Series: Run3 15:20 Tue 09 Jul 2013 Page 3

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Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab Year Value No Ab

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1900 .915 4 1950 -.051 20 2000 -1.147 20

1901 1.903 7 1951 .440 20 2001 -.913 20

1902 -1.959 10 1952 -.643 20 2002 .656 20

1903 -.996 10 1953 -.412 20 2003 1.131 20

1904 .751 10 1954 .246 20 2004 -.379 20

1905 .960 10 1955 2.069 20 2005 -.480 20

1906 .571 10 1956 1.459 20 2006 -.032 20

1907 .334 10 1957 1.510 20 2007 -.456 20

1908 1.258 11 1958 1.312 20 2008 .081 20

1909 .721 11 1959 .751 20 2009 -.549 20

1910 .140 11 1960 -.157 20 2010 -1.330 20

1911 -.449 11 1961 .175 20 2011 -.027 20

1912 -.695 12 1962 -1.725 20 2012 2.094 20

1913 -1.461 13 1963 .521 20

1914 -.084 13 1964 1.049 20

1915 .129 13 1965 .223 20

1916 -.744 14 1966 -1.317 20

1917 .480 14 1967 -.180 20

1918 -.986 15 1968 -2.979 20

1919 -.796 16 1969 -.647 20

1920 .609 16 1970 .523 20

1921 1.246 17 1971 .216 20

1922 .794 17 1972 .475 20

1923 -.509 17 1973 -1.030 20

1924 1.024 17 1974 -.456 20

1925 .354 17 1975 .314 20

1926 -.236 17 1976 .635 20

1927 .134 17 1977 .803 20

1928 -.746 17 1978 .593 20

1929 -.888 17 1979 .338 20

1930 -.658 17 1980 1.132 20

1931 .558 17 1981 .827 20

1932 .024 17 1982 -2.056 20 3

1933 -1.252 17 1983 -1.800 20

1934 1.330 17 1984 -.516 20

1935 1.374 18 1985 -.330 20

1936 -.830 18 1986 -1.438 20

1937 1.439 18 1987 -.239 20

1938 .550 18 1988 1.315 20

1939 .733 18 1989 1.018 20

1940 -1.045 18 1990 .600 20

1941 -.054 18 1991 -.114 20

1892 1.914 1 1942 -.183 18 1992 1.009 20

1893 -2.999 1 1943 -.053 19 1993 -.151 20

1894 -1.276 1 1944 .185 19 1994 .652 20

1895 -.465 1 1945 .402 19 1995 1.317 20

1896 .194 1 1946 -1.393 19 1996 .791 20

1897 -1.058 1 1947 -.511 20 1997 -.707 20

1898 -.542 1 1948 -2.434 20 1998 .518 20

1899 .416 2 1949 -.751 20 1999 .082 20

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PART 4: Master Bar Plot: Run3 15:20 Tue 09 Jul 2013 Page 4

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Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value Year Rel value

1900---------D 1950----@ 2000-e

1901----------H 1951------B 2001-d

1902h 1952--c 2002--------C

1903-d 1953---b 2003---------E

1904--------C 1954------A 2004---b

1905---------D 1955----------H 2005---b

1906-------B 1956----------F 2006-----@

1907------A 1957----------F 2007---b

1908----------E 1958----------E 2008-----@

1909--------C 1959--------C 2009---b

1910-----A 1960----a 2010-e

1911---b 1961-----A 2011-----@

1912--c 1962g 2012----------H

1913f 1963-------B

1914----@ 1964---------D

1915-----A 1965------A

1916--c 1966-e

1917-------B 1967----a

1918-d 1968l

1919--c 1969--c

1920-------B 1970-------B

1921---------E 1971------A

1922--------C 1972-------B

1923---b 1973-d

1924---------D 1974---b

1925------A 1975------A

1926----a 1976-------C

1927-----A 1977--------C

1928--c 1978-------B

1929-d 1979------A

1930--c 1980---------E

1931-------B 1981--------C

1932-----@ 1982h

1933-e 1983g

1934----------E 1984---b

1935----------E 1985---a

1936--c 1986f

1937----------F 1987----a

1938-------B 1988----------E

1939--------C 1989---------D

1940-d 1990-------B

1941----@ 1991----@

1892----------H 1942----a 1992---------D

1893l 1943----@ 1993----a

1894-e 1944-----A 1994--------C

1895---b 1945------B 1995----------E

1896-----A 1946-f 1996--------C

1897-d 1947---b 1997--c

1898---b 1948j 1998-------B

1899------B 1949--c 1999-----@

PART 5: CORRELATION OF SERIES BY SEGMENTS: Run3 15:20 Tue 09 Jul 2013 Page 5

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Correlations of 30-year dated segments, lagged 15 years

Flags: A = correlation under .4226 but highest as dated; B = correlation higher at other than dated position

Seq Series Time\_span 1890 1905 1920 1935 1950 1965 1980 1995

1919 1934 1949 1964 1979 1994 2009 2024

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

1 460A 1901 2012 .42A .43 .76 .75 .63 .63 .67 .58

2 460B 1899 2012 .73 .70 .75 .73 .68 .64 .53 .47B

3 461A 1902 2012 .48 .42A .42B .39A .22B .40A .72 .62

4 461B 1912 2012 .37A .54 .66 .51 .53 .71 .58

5 462A 1921 2012 .63 .66 .56 .46 .37A .42A

6 462B 1935 2012 .65 .43 .37A .22B .21B

7 468A 1900 2012 .65 .51 .61 .74 .64 .63 .60 .49

8 468B 1918 2012 .44 .54 .64 .49 .18B .24B .30B

9 469A 1901 2012 .65 .55 .61 .55 .69 .84 .60 .50

10 469B 1916 2012 .28B .41A .55 .53 .57 .69 .65

11 471A 1902 2012 .40A .32B .54 .68 .55 .27B .22B .50

12 471B 1901 2012 .44 .40A .64 .72 .68 .32A .20B .33B

13 472A 1900 2012 .33B .07B .42 .72 .79 .74 .61 .67

14 472B 1902 2012 .38B .12B .32A .42B .56 .60 .31B .39A

15 476C 1943 2012 .44 .46 .55 .38A .42A

16 476D 1947 2012 .62 .64 .85 .72 .63

17 478A 1892 2012 .72 .62 .74 .77 .60 .40A .22B .34B

18 480A 1908 2012 .45B .48 .50B .53 .50 .45 .38A

19 481A 1919 2012 .57 .59 .71 .53 .53 .57 .51

20 481B 1913 2012 .55 .52 .55 .36A .36B .40B .60

Av segment correlation .52 .42 .56 .62 .55 .52 .47 .48

PART 6: POTENTIAL PROBLEMS: Run3 15:20 Tue 09 Jul 2013 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 30-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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460A 1901 to 2012 112 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

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

1901 1930 0 - .06 -.25 .04 -.11 -.18 -.04 .00 .13 .16 .42\*-.15 -.12 .30 -.27 .11 -.05 -.12 -.26 -.16 .26

[B] Entire series, effect on correlation ( .575) is:

Lower 1913< -.100 1974< -.011 1983> -.008 1970< -.007 1998< -.007 1994< -.006 Higher 1968 .033 1982 .023

1901 to 1930 segment:

Lower 1913< -.282 1904< -.013 1919> -.011 1912> -.009 1911> -.009 1918> -.006 Higher 1924 .033 1908 .024

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

1912 1913 -4.7 SD

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

1913 -7.4 SD

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460B 1899 to 2012 114 years Series 2

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

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

1983 2012 -4 -.16 .09 .23 -.03 -.34 .15 .47\*-.02 -.32 .02 .47| - - - - - - - - - -

[B] Entire series, effect on correlation ( .666) is:

Lower 1966> -.017 1990< -.017 2009< -.015 1964< -.010 1987< -.009 1904< -.008 Higher 1968 .030 1902 .015

1983 to 2012 segment:

Lower 1990< -.067 2009< -.039 1987< -.034 1999> -.019 2003< -.018 1994< -.014 Higher 2012 .064 1992 .034

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461A 1902 to 2012 111 years Series 3

[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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1905 1934 0 .13 -.18 -.09 .28 -.03 .21 .03 -.06 -.10 -.03 .42\*-.27 -.34 .22 -.11 -.16 -.18 .09 -.13 -.10 .30

1920 1949 10 .37 -.28 -.01 .23 .04 .08 -.17 -.07 -.07 -.27 .42|-.32 .11 .02 .08 -.12 -.02 -.13 -.04 -.23 .48\*

1935 1964 0 .07 -.15 .09 -.02 .04 -.29 -.15 -.13 -.02 -.18 .39\*-.12 .34 -.40 .01 -.06 .28 -.10 .34 -.22 .15

1950 1979 2 -.11 .06 -.05 -.17 .15 -.37 -.04 -.05 -.15 -.07 .22|-.16 .31\*-.17 -.05 .02 .14 .01 .31 -.21 -.08

1965 1994 0 -.07 .39 -.07 -.24 .09 -.08 -.02 .00 -.19 .10 .40\*-.23 .19 .22 .03 -.28 -.34 -.07 -.10 -.12 .07

[B] Entire series, effect on correlation ( .448) is:

Lower 1960< -.039 1938< -.025 1968> -.017 1940> -.014 1973> -.014 1966> -.013 Higher 1982 .036 1902 .022

1905 to 1934 segment:

Lower 1913> -.053 1924< -.051 1912> -.037 1911> -.035 1923< -.022 1910> -.019 Higher 1933 .069 1918 .062

1920 to 1949 segment:

Lower 1938< -.111 1940> -.059 1924< -.028 1946> -.014 1923< -.011 1925< -.008 Higher 1937 .051 1936 .049

1935 to 1964 segment:

Lower 1960< -.077 1938< -.054 1940> -.052 1946> -.017 1955< -.014 1961< -.008 Higher 1962 .042 1936 .041

1950 to 1979 segment:

Lower 1960< -.040 1973> -.039 1966> -.037 1968> -.034 1971< -.021 1965> -.011 Higher 1962 .069 1952 .022

1965 to 1994 segment:

Lower 1971< -.062 1968> -.042 1973> -.039 1966> -.037 1986> -.029 1979< -.028 Higher 1982 .176 1992 .030

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

1967 +3.0 SD

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

461B 1912 to 2012 101 years Series 4

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

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

1912 1941 0 -.04 -.05 -.13 .22 .14 .01 -.06 .10 -.05 -.31 .37\*-.21 -.10 .20 .28 -.28 -.23 -.08 .32 -.16 .31

[B] Entire series, effect on correlation ( .532) is:

Lower 1912> -.017 1973> -.014 1913> -.012 1938< -.011 2009> -.009 1915< -.009 Higher 1982 .040 1955 .015

1912 to 1941 segment:

Lower 1912> -.066 1913> -.044 1938< -.043 1915< -.036 1925< -.029 1939< -.014 Higher 1934 .068 1936 .047

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

462A 1921 to 2012 92 years Series 5

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

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1980 2009 0 .00 -.07 .19 .01 -.09 -.33 -.02 -.04 -.43 .01 .37\* .21 -.06 .15 - - - - - - -

1983 2012 0 .07 -.07 .00 .04 .02 -.31 .02 -.05 -.44 .16 .42\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .510) is:

Lower 1981< -.024 2004> -.021 2009> -.019 1966> -.015 1960> -.012 1986> -.012 Higher 1948 .022 1955 .016

1980 to 2009 segment:

Lower 1981< -.066 2004> -.059 2009> -.050 1986> -.034 1984> -.013 2001> -.010 Higher 1988 .056 1982 .038

1983 to 2012 segment:

Lower 2004> -.074 2009> -.063 1986> -.044 1984> -.019 2011< -.016 2001> -.013 Higher 1988 .054 2010 .029

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462B 1935 to 2012 78 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

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1965 1994 0 .01 -.05 .04 .07 -.35 .25 .02 .02 -.19 -.20 .37\* .09 -.18 -.09 .13 -.06 .09 -.03 .17 .33 .01

1980 2009 -10 .23\*-.02 .18 -.09 -.15 -.15 -.08 -.04 -.34 -.05 .22| .01 -.32 -.06 - - - - - - -

1983 2012 -10 .23\*-.03 .10 .01 -.12 -.20 -.10 -.13 -.40 -.01 .21| - - - - - - - - - -

[B] Entire series, effect on correlation ( .424) is:

Lower 2004> -.023 1996< -.020 2009> -.015 1968> -.015 2000> -.015 1986> -.013 Higher 1948 .048 1973 .022

1965 to 1994 segment:

Lower 1968> -.040 1986> -.032 1982> -.025 1978< -.023 1970< -.020 1984> -.016 Higher 1973 .061 1988 .060

1980 to 2009 segment:

Lower 2004> -.054 1996< -.053 2009> -.033 2000> -.032 1986> -.024 1984> -.013 Higher 1988 .082 1980 .041

1983 to 2012 segment:

Lower 2004> -.065 1996< -.049 2009> -.041 2000> -.040 1986> -.031 2010> -.020 Higher 2012 .091 1988 .085

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468A 1900 to 2012 113 years Series 7

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

Lower 1980< -.023 1966> -.016 1997> -.015 2010> -.015 1976< -.008 1993> -.008 Higher 1968 .038 1982 .034

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468B 1918 to 2012 95 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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1965 1994 -1 .02 .30 .16 -.13 .14 -.18 -.37 -.17 -.18 .37\* .18|-.05 -.07 .17 .06 .21 .00 -.15 .33 .02 -.19

1980 2009 -1 .24 .32 .16 .16 -.12 -.13 -.03 -.22 -.37 .33\* .24| .04 -.05 .15 - - - - - - -

1983 2012 -1 .28 .33 .14 .13 -.11 -.14 -.02 -.24 -.40 .34\* .30| - - - - - - - - - -

[B] Entire series, effect on correlation ( .417) is:

Lower 1986> -.022 1997> -.018 1931< -.017 1966> -.016 1918> -.016 1922< -.012 Higher 1962 .040 1968 .032

1965 to 1994 segment:

Lower 1986> -.057 1966> -.041 1977< -.026 1992< -.023 1973> -.019 1974< -.016 Higher 1968 .146 1983 .043

1980 to 2009 segment:

Lower 1986> -.065 1997> -.053 1992< -.037 1994< -.021 1988< -.014 1984> -.014 Higher 1983 .053 2000 .044

1983 to 2012 segment:

Lower 1986> -.077 1997> -.062 1992< -.042 1994< -.022 1988< -.021 1984> -.019 Higher 2012 .078 1983 .058

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

1987 +3.5 SD

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469A 1901 to 2012 112 years Series 9

[B] Entire series, effect on correlation ( .640) is:

Lower 1962> -.029 1935< -.021 1998< -.017 1995< -.013 1938< -.010 1934< -.007 Higher 1968 .038 1948 .020

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469B 1916 to 2012 97 years Series 10

[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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1916 1945 10 .16 -.22 .33 .36 .01 -.12 .01 .15 -.13 -.42 .28|-.37 -.14 -.22 .32 .16 .01 .01 .20 -.04 .41\*

1920 1949 0 .31 -.40 .39 .20 .09 -.15 .07 .09 -.05 -.42 .41\*-.35 .08 -.22 .30 .06 .15 -.13 .12 -.14 .25

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

Lower 1986> -.024 1935< -.022 1977< -.022 1962> -.021 1966> -.020 1933> -.015 Higher 1968 .067 1948 .028

1916 to 1945 segment:

Lower 1935< -.067 1933> -.049 1921< -.038 1916> -.035 1928> -.032 1929> -.028 Higher 1936 .122 1940 .064

1920 to 1949 segment:

Lower 1935< -.062 1933> -.048 1921< -.035 1928> -.030 1929> -.025 1944< -.018 Higher 1948 .111 1946 .053

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

1936 -5.3 SD

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471A 1902 to 2012 111 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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1902 1931 0 .33 .14 -.15 .09 -.23 .36 .21 -.02 -.33 .26 .40\*-.05 -.04 -.23 -.17 -.34 .08 -.03 -.37 .09 .32

1905 1934 -10 .35\*-.14 -.22 .21 -.26 .31 .28 .02 -.08 .19 .32|-.05 -.16 -.14 -.19 -.37 .12 .07 -.28 .10 .24

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

1965 1994 -4 -.25 -.29 -.24 .02 .03 -.07 .47\*-.09 .04 -.10 .27| .03 .21 -.25 -.25 .07 -.23 .28 .01 .05 -.08

1980 2009 -4 -.15 -.26 -.02 -.05 -.04 -.17 .40\* .27 .20 -.13 .22| .09 -.33 -.47 - - - - - - -

[B] Entire series, effect on correlation ( .444) is:

Lower 1982> -.052 1968> -.023 1983> -.020 1917< -.015 1940> -.011 1999< -.011 Higher 1962 .022 1948 .020

1902 to 1931 segment:

Lower 1917< -.096 1920< -.052 1913> -.044 1925> -.032 1907< -.021 1910> -.015 Higher 1902 .075 1908 .048

1905 to 1934 segment:

Lower 1917< -.094 1913> -.061 1920< -.050 1925> -.039 1910> -.022 1911> -.020 Higher 1933 .067 1908 .062

1965 to 1994 segment:

Lower 1982> -.143 1968> -.061 1983> -.049 1989< -.008 1977< -.008 1975< -.005 Higher 1966 .092 1986 .062

1980 to 2009 segment:

Lower 1982> -.197 1983> -.069 1999< -.024 2004> -.023 2007> -.022 1989< -.012 Higher 1986 .122 2000 .038

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

1982 +3.3 SD; 1983 +3.9 SD

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471B 1901 to 2012 112 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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1905 1934 0 .31 .22 -.22 -.09 -.02 .28 -.24 -.27 .06 .08 .40\* .17 -.14 .03 .05 -.02 -.08 .03 -.02 -.21 .02

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

1965 1994 0 -.14 -.24 -.16 -.08 .06 -.25 .32 -.04 .06 -.15 .32\* .14 -.08 -.16 -.05 .25 -.19 .23 .08 -.11 -.16

1980 2009 -4 -.13 -.19 -.05 -.13 -.04 -.26 .38\* .09 .12 -.09 .20| .06 -.17 -.09 - - - - - - -

1983 2012 -4 -.08 -.11 -.15 -.15 .00 -.27 .39\* .07 .05 -.05 .33| - - - - - - - - - -

[B] Entire series, effect on correlation ( .442) is:

Lower 1983> -.026 1982> -.015 1986< -.014 1913> -.011 1936> -.011 1912< -.010 Higher 1966 .017 2012 .016

1905 to 1934 segment:

Lower 1913> -.072 1912< -.045 1908< -.039 1926> -.029 1920< -.022 1916> -.016 Higher 1918 .064 1934 .051

1965 to 1994 segment:

Lower 1983> -.064 1982> -.044 1981< -.027 1973> -.013 1975< -.010 1988< -.009 Higher 1966 .059 1968 .026

1980 to 2009 segment:

Lower 1983> -.073 1982> -.046 2002< -.024 2004> -.023 1981< -.022 2000> -.021 Higher 1986 .120 1997 .041

1983 to 2012 segment:

Lower 1983> -.091 2002< -.031 2004> -.030 2000> -.029 1991> -.015 1988< -.014 Higher 1986 .099 2012 .065

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

1912 1913 4.2 SD

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

1912 -5.1 SD; 1983 +3.8 SD

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472A 1900 to 2012 113 years Series 13

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

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

1900 1929 10 - - .03 -.17 -.16 -.06 .12 .07 -.26 -.41 .33| .10 -.33 -.08 -.02 .19 .11 .24 .02 -.28 .41\*

1905 1934 -10 .52\* .13 .02 .06 -.14 -.26 .09 .17 -.38 -.35 .07| .02 -.18 .10 .05 .09 .28 .22 -.01 -.44 .46

[B] Entire series, effect on correlation ( .607) is:

Lower 1933> -.022 1918> -.021 1922< -.020 1947< -.014 1906< -.012 1929> -.008 Higher 1982 .042 1902 .029

1900 to 1929 segment:

Lower 1918> -.074 1922< -.061 1906< -.037 1929> -.028 1911> -.020 1921< -.019 Higher 1902 .259 1924 .034

1905 to 1934 segment:

Lower 1918> -.075 1933> -.074 1922< -.055 1906< -.041 1929> -.027 1921< -.022 Higher 1924 .061 1934 .045

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

1982 -2.056 20 3

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

1923 -5.0 SD

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472B 1902 to 2012 111 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

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

1902 1931 -9 -.24 .45\* .02 .10 -.07 -.13 .18 -.02 -.29 -.49 .38| .23 -.26 .25 -.04 -.16 .12 .12 .01 -.33 .27

1905 1934 3 -.01 .07 .05 .13 .04 -.19 .18 -.05 -.38 -.21 .12|-.09 -.12 .34\*-.13 -.23 .29 .23 .00 -.36 .28

1920 1949 0 .31 -.29 -.30 .14 .16 -.07 .13 .03 -.06 -.11 .32\*-.03 .08 .29 -.11 -.20 .28 .00 -.18 -.49 .04

1935 1964 2 .14 -.35 -.06 -.10 .05 -.04 -.13 .13 .10 -.08 .42| .18 .51\* .01 -.09 .04 .15 -.27 .16 -.38 -.37

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1980 2009 -3 -.20 -.29 -.26 -.29 -.03 -.15 .09 .46\* .15 .12 .31| .42 -.07 -.30 - - - - - - -

1983 2012 0 -.08 -.07 -.27 -.37 .08 -.10 .02 .38 .00 .08 .39\* - - - - - - - - - -

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

Lower 1922< -.029 1934< -.026 1936> -.017 1913> -.016 2003< -.016 1962> -.011 Higher 1982 .052 1902 .034

1902 to 1931 segment:

Lower 1922< -.136 1913> -.063 1903> -.033 1905< -.021 1908< -.019 1919> -.018 Higher 1902 .244 1921 .045

1905 to 1934 segment:

Lower 1934< -.112 1922< -.096 1913> -.068 1919> -.022 1905< -.017 1928> -.016 Higher 1921 .078 1933 .068

1920 to 1949 segment:

Lower 1922< -.097 1934< -.088 1936> -.068 1940> -.022 1928> -.018 1943< -.011 Higher 1946 .107 1937 .063

1935 to 1964 segment:

Lower 1936> -.062 1951< -.037 1952> -.036 1962> -.026 1943< -.018 1945< -.016 Higher 1946 .097 1955 .066

1980 to 2009 segment:

Lower 2003< -.071 2004> -.040 1993> -.036 1985< -.024 2001> -.022 1988< -.017 Higher 1982 .269 1995 .022

1983 to 2012 segment:

Lower 2003< -.078 2004> -.041 1993> -.039 2001> -.024 1985< -.017 1988< -.013 Higher 2010 .083 2000 .045

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

1933 1934 -4.0 SD

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

1982 -2.056 20 3

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

476C 1943 to 2012 70 years Series 15

[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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1980 2009 0 .24 -.20 .03 -.08 -.42 -.26 -.15 .01 -.22 .07 .38\* .05 -.09 .15 - - - - - - -

1983 2012 0 .31 -.17 -.14 -.05 -.30 -.23 -.10 -.01 -.23 .20 .42\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .502) is:

Lower 2004> -.023 1947> -.023 1962> -.020 1996< -.018 2011< -.018 1973> -.017 Higher 1982 .098 1955 .034

1980 to 2009 segment:

Lower 2004> -.063 1996< -.043 1986> -.030 1994< -.027 2006> -.018 2001> -.016 Higher 1982 .254 1988 .020

1983 to 2012 segment:

Lower 2004> -.077 1996< -.063 2011< -.061 1994< -.039 2006> -.025 2001> -.018 Higher 2012 .064 1988 .044

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

1982 -2.056 20 3

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

1947 +3.2 SD

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476D 1947 to 2012 66 years Series 16

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

Lower 1956< -.040 2000> -.017 1960> -.017 1998< -.014 1952> -.013 1950< -.013 Higher 1968 .051 1982 .048

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478A 1892 to 2012 121 years Series 17

[\*] Early part of series cannot be checked from 1892 to 1898 -- not matched by another series

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

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1965 1994 0 -.27 -.23 -.08 -.09 .03 .00 .34 .26 .01 -.12 .40\* .20 -.09 -.08 -.32 -.07 -.28 .04 .12 .15 .20

1980 2009 -3 -.12 -.31 -.26 -.10 -.31 .00 .37 .41\*-.12 -.11 .22| .27 -.34 -.10 - - - - - - -

1983 2012 -3 -.11 -.20 -.23 -.12 -.32 -.04 .32 .35\*-.22 -.17 .34| - - - - - - - - - -

[B] Entire series, effect on correlation ( .570) is:

Lower 1982> -.031 1993> -.014 1996< -.013 2003< -.012 2002< -.011 1983> -.009 Higher 1902 .034 1948 .017

1965 to 1994 segment:

Lower 1982> -.078 1993> -.039 1965< -.035 1975< -.029 1972< -.027 1983> -.022 Higher 1968 .088 1986 .049

1980 to 2009 segment:

Lower 1982> -.094 1993> -.048 1996< -.041 2003< -.036 2002< -.033 1983> -.033 Higher 1986 .096 2004 .050

1983 to 2012 segment:

Lower 1993> -.059 1996< -.044 2003< -.043 1983> -.040 2002< -.039 2005> -.031 Higher 1986 .093 2012 .076

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480A 1908 to 2012 105 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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1908 1937 7 -.05 .01 .04 .08 -.16 .07 .07 .06 -.40 .06 .45|-.31 .12 .11 -.08 -.04 -.30 .46\*-.11 -.13 .10

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1935 1964 6 .10 -.10 -.12 -.16 .01 -.27 .09 -.20 .06 -.14 .50|-.21 -.17 -.13 .06 -.20 .60\* .06 .32 .00 -.04

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1983 2012 0 .25 .06 .15 .05 -.12 -.03 .19 .02 -.16 .22 .38\* - - - - - - - - - -

[B] Entire series, effect on correlation ( .446) is:

Lower 1966> -.018 1948> -.017 1913> -.016 1911< -.012 1946> -.011 2012< -.010 Higher 1962 .035 1973 .017

1908 to 1937 segment:

Lower 1913> -.072 1911< -.053 1912> -.043 1930> -.025 1918> -.021 1936> -.012 Higher 1933 .076 1937 .032

1935 to 1964 segment:

Lower 1948> -.077 1946> -.049 1947> -.018 1936> -.017 1954< -.013 1949> -.011 Higher 1962 .118 1940 .044

1983 to 2012 segment:

Lower 2005> -.045 2004> -.043 1989< -.041 2012< -.041 2000> -.028 1997> -.019 Higher 2010 .069 1983 .051

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481A 1919 to 2012 94 years Series 19

[B] Entire series, effect on correlation ( .566) is:

Lower 1968> -.021 2000> -.010 1972< -.009 1940> -.008 1923> -.007 1919> -.007 Higher 1982 .040 1966 .017

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481B 1913 to 2012 100 years Series 20

[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 1979 0 -.26 -.11 -.46 -.18 -.01 .14 .06 .13 -.30 .08 .36\* .16 .35 .12 -.18 -.11 -.16 .11 .11 -.05 -.21

1965 1994 -4 -.17 -.17 -.53 -.27 -.21 -.02 .36\* .12 -.17 .19 .36| .00 .29 .05 -.06 -.12 -.33 .10 .03 -.22 -.10

1980 2009 -1 -.01 -.26 -.21 -.26 -.31 -.03 .45 .10 .16 .52\* .40|-.26 -.23 .15 - - - - - - -

[B] Entire series, effect on correlation ( .462) is:

Lower 1968> -.047 1982> -.023 2002< -.021 1922< -.014 1951< -.011 1973> -.011 Higher 1966 .021 2012 .017

1950 to 1979 segment:

Lower 1968> -.135 1951< -.038 1952> -.022 1973> -.021 1960> -.017 1965< -.017 Higher 1966 .114 1955 .060

1965 to 1994 segment:

Lower 1968> -.127 1982> -.055 1973> -.024 1965< -.018 1987< -.015 1993> -.009 Higher 1966 .075 1986 .049

1980 to 2009 segment:

Lower 1982> -.110 2002< -.075 1993> -.018 1987< -.016 2009> -.014 2004> -.011 Higher 1986 .070 1995 .033

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

1968 +3.4 SD

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

PART 7: DESCRIPTIVE STATISTICS: Run3 15:20 Tue 09 Jul 2013 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 460A 1901 2012 112 8 1 .575 1.02 2.99 .590 .761 .283 2.49 .317 -.045 1

2 460B 1899 2012 114 8 1 .666 1.13 3.14 .649 .765 .264 2.66 .370 -.013 1

3 461A 1902 2012 111 8 5 .448 1.82 3.38 .558 .684 .194 2.55 .414 .015 1

4 461B 1912 2012 101 7 1 .532 1.57 4.22 .624 .692 .226 2.52 .330 .035 1

5 462A 1921 2012 92 6 2 .510 1.62 4.75 .696 .620 .247 2.66 .436 -.080 1

6 462B 1935 2012 78 5 3 .424 1.33 4.37 .664 .699 .269 2.92 .528 -.046 1

7 468A 1900 2012 113 8 0 .614 1.21 2.71 .570 .768 .231 2.75 .367 -.021 1

8 468B 1918 2012 95 7 3 .417 1.35 2.99 .538 .708 .197 2.94 .486 .036 1

9 469A 1901 2012 112 8 0 .640 1.26 3.64 .598 .717 .278 2.50 .427 .008 1

10 469B 1916 2012 97 7 2 .524 1.72 3.24 .624 .767 .216 2.46 .401 -.024 1

11 471A 1902 2012 111 8 4 .444 1.86 4.70 .942 .830 .245 2.44 .380 .008 1

12 471B 1901 2012 112 8 4 .442 1.47 3.33 .616 .777 .224 2.48 .361 -.051 1

13 472A 1900 2012 113 8 2 .607 1.50 2.99 .721 .710 .341 2.41 .380 .038 1

14 472B 1902 2012 111 8 6 .487 1.32 2.86 .667 .857 .268 2.75 .500 -.046 2

15 476C 1943 2012 70 5 2 .502 1.70 3.88 .761 .805 .260 2.84 .402 .094 2

16 476D 1947 2012 66 5 0 .678 1.90 4.04 .625 .527 .273 2.48 .535 -.011 1

17 478A 1892 2012 121 8 3 .570 1.40 3.75 .619 .813 .178 2.76 .421 -.040 1

18 480A 1908 2012 105 7 3 .446 1.08 2.26 .521 .864 .226 2.57 .454 -.020 1

19 481A 1919 2012 94 7 0 .566 1.44 3.24 .513 .739 .196 2.65 .466 -.032 1

20 481B 1913 2012 100 7 3 .462 1.35 2.71 .590 .826 .212 2.64 .522 .028 1

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Total or mean: 2028 143 45 .528 1.44 4.75 .633 .752 .241 2.94 .420 -.010

- = [ COFECHA RUN3 COF ] = -