[] Dendrochronology Program Library Run 169\_3 Program COF 11:37 Mon 28 Mar 2011 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 27847

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: 169\_HUB

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 N

8 Parts printed 1234567

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

Time span of Master dating series is 1901 to 2010 110 years

Continuous time span is 1901 to 2010 110 years

Portion with two or more series is 1907 to 2010 104 years

>> 140A 1964 absent in 1 of 12 series, but is not usually narrow: master index is -.180

>> 140A 1989 absent in 1 of 12 series, but is not usually narrow: master index is .247

>> 140A 1990 absent in 1 of 12 series, but is not usually narrow: master index is .918

>> 140A 1991 absent in 1 of 12 series, but is not usually narrow: master index is 1.329

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

\*C\* Number of dated series 12 \*C\*

\*O\* Master series 1901 2010 110 yrs \*O\*

\*F\* Total rings in all series 974 \*F\*

\*E\* Total dated rings checked 968 \*E\*

\*C\* Series intercorrelation .557 \*C\*

\*H\* Average mean sensitivity .284 \*H\*

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

\*\*\* Mean length of series 81.2 \*\*\*

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

139B 2 absent rings: 2003 2004

140A 4 absent rings: 1964 1989 1990 1991

140B 3 absent rings: 1982 1983 1984

9 absent rings .924%

PART 2: TIME PLOT OF TREE-RING SERIES: 11:37 Mon 28 Mar 2011 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

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

. . . . . . . . . . . . . . . . . .<=========> . 136A 1 1912 2010 99

. . . . . . . . . . . . . . . . . . <========> . 136B 2 1922 2010 89

. . . . . . . . . . . . . . . . . <==========> . 137A 3 1907 2010 104

. . . . . . . . . . . . . . . . . <==========> . 137B 4 1901 2010 110

. . . . . . . . . . . . . . . . . . <========> . 138A 5 1925 2010 86

. . . . . . . . . . . . . . . . . . <=======> . 138B 6 1937 2010 74

. . . . . . . . . . . . . . . . . . <========> . 139A 7 1922 2010 89

. . . . . . . . . . . . . . . . . . <=======> . 139B 8 1932 2010 79

. . . . . . . . . . . . . . . . . . <======> . 140A 9 1944 2010 67

. . . . . . . . . . . . . . . . . . <======> . 140B 10 1947 2010 64

. . . . . . . . . . . . . . . . . . <=====> . 898A 11 1956 2010 55

. . . . . . . . . . . . . . . . . . <=====> . 898B 12 1953 2010 58

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

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: 11:37 Mon 28 Mar 2011 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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1950 -.334 10 2000 -1.095 12

1901 -.581 1 1951 1.236 10 2001 -.828 12

1902 .741 1 1952 .304 10 2002 .194 12

1903 1.819 1 1953 -1.535 11 2003 -1.531 12 1

1904 .773 1 1954 .362 11 2004 -1.786 12 1

1905 1.826 1 1955 .176 11 2005 -1.336 12

1906 .318 1 1956 .527 12 2006 -.427 12

1907 -1.420 2 1957 1.411 12 2007 .593 12

1908 -2.537 2 1958 1.148 12 2008 .472 12

1909 -.935 2 1959 .602 12 2009 .747 12

1910 -.839 2 1960 .503 12 2010 1.610 12

1911 -.610 2 1961 .584 12

1912 .326 3 1962 -.444 12

1913 1.025 3 1963 .346 12

1914 .220 3 1964 -.180 12 1<<

1915 1.107 3 1965 .097 12

1916 -.436 3 1966 -.842 12

1917 -1.458 3 1967 -.102 12

1918 1.847 3 1968 -.659 12

1919 .728 3 1969 .302 12

1920 .820 3 1970 .236 12

1921 -.033 3 1971 1.265 12

1922 .214 5 1972 .022 12

1923 -1.131 5 1973 -.858 12

1924 .285 5 1974 -.474 12

1925 .871 6 1975 .064 12

1926 -.030 6 1976 1.260 12

1927 .692 6 1977 .599 12

1928 .340 6 1978 -1.206 12

1929 .339 6 1979 -.291 12

1930 1.351 6 1980 .816 12

1931 .375 6 1981 -1.253 12

1932 1.308 7 1982 -1.912 12 1

1933 .024 7 1983 -1.121 12 1

1934 -1.169 7 1984 -.949 12 1

1935 -.409 7 1985 -.954 12

1936 .807 7 1986 -.885 12

1937 -.002 8 1987 -.346 12

1938 .439 8 1988 .234 12

1939 -.101 8 1989 .247 12 1<<

1940 -1.939 8 1990 .918 12 1<<

1941 -1.326 8 1991 1.329 12 1<<

1942 -2.032 8 1992 2.384 12

1943 -2.297 8 1993 1.764 12

1944 -1.426 9 1994 1.377 12

1945 -.454 9 1995 .583 12

1946 -.393 9 1996 .194 12

1947 .355 10 1997 .418 12

1948 -1.177 10 1998 .073 12

1949 .676 10 1999 -.533 12

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PART 4: Master Bar Plot: 11:37 Mon 28 Mar 2011 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

1950---a 2000-d

1901---b 1951---------E 2001--c

1902--------C 1952------A 2002-----A

1903----------G 1953f 2003f

1904--------C 1954------A 2004g

1905----------G 1955-----A 2005-e

1906------A 1956-------B 2006---b

1907-f 1957---------F 2007-------B

1908j 1958---------E 2008-------B

1909--d 1959-------B 2009--------C

1910--c 1960-------B 2010----------F

1911---b 1961-------B

1912------A 1962---b

1913---------D 1963------A

1914-----A 1964----a

1915---------D 1965-----@

1916---b 1966--c

1917-f 1967----@

1918----------G 1968--c

1919--------C 1969------A

1920--------C 1970-----A

1921----@ 1971---------E

1922-----A 1972----@

1923-e 1973--c

1924------A 1974---b

1925--------C 1975----@

1926----@ 1976---------E

1927--------C 1977-------B

1928------A 1978-e

1929------A 1979---a

1930---------E 1980--------C

1931------B 1981-e

1932---------E 1982h

1933----@ 1983-d

1934-e 1984--d

1935---b 1985--d

1936--------C 1986--d

1937----@ 1987---a

1938-------B 1988-----A

1939----@ 1989-----A

1940h 1990--------D

1941-e 1991---------E

1942h 1992----------J

1943i 1993----------G

1944-f 1994---------F

1945---b 1995-------B

1946---b 1996-----A

1947------A 1997-------B

1948-e 1998----@

1949--------C 1999---b

PART 5: CORRELATION OF SERIES BY SEGMENTS: 11:37 Mon 28 Mar 2011 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 136A 1912 2010 .32A .31A .51 .59

2 136B 1922 2010 .61 .66 .56 .49

3 137A 1907 2010 .51 .68 .67 .60

4 137B 1901 2010 .63 .65 .59 .51

5 138A 1925 2010 .68 .78 .74

6 138B 1937 2010 .53 .54 .56

7 139A 1922 2010 .49 .52 .72 .70

8 139B 1932 2010 .75 .73 .63

9 140A 1944 2010 .21B .23B .38

10 140B 1947 2010 .63 .62 .59

11 898A 1956 2010 .51 .52

12 898B 1953 2010 .29B .46

Av segment correlation .51 .56 .56 .57

PART 6: POTENTIAL PROBLEMS: 11:37 Mon 28 Mar 2011 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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136A 1912 to 2010 99 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

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

1912 1961 0 -.08 -.07 .03 .00 .14 .12 -.05 .11 .03 -.37 .32\*-.02 .14 .08 -.07 .04 .02 .19 -.15 .02 .06

1925 1974 0 .01 -.01 .27 -.02 .10 .00 -.07 -.09 .28 -.31 .31\*-.01 .00 .17 -.11 .12 .02 .14 .02 -.01 .03

[B] Entire series, effect on correlation ( .430) is:

Lower 1916> -.058 1962> -.021 1966> -.019 1944> -.016 1912< -.015 1953> -.012 Higher 1981 .058 1918 .024

1912 to 1961 segment:

Lower 1916> -.094 1944> -.031 1912< -.025 1917> -.019 1936< -.018 1922< -.013 Higher 1918 .056 1949 .022

1925 to 1974 segment:

Lower 1962> -.043 1966> -.039 1944> -.032 1936< -.026 1970< -.022 1953> -.019 Higher 1949 .029 1957 .024

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

1917 +3.1 SD; 1966 +3.4 SD; 1982 -4.6 SD

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

136B 1922 to 2010 89 years Series 2

[B] Entire series, effect on correlation ( .562) is:

Lower 1999> -.044 1924< -.019 1937> -.016 1962> -.015 1959< -.011 2003> -.011 Higher 1981 .042 1953 .027

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

1978 -4.8 SD; 1999 +4.0 SD

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

137A 1907 to 2010 104 years Series 3

[B] Entire series, effect on correlation ( .548) is:

Lower 1916< -.067 1917< -.021 1907> -.018 1948> -.009 1910> -.009 1960< -.008 Higher 1918 .012 1953 .012

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

1917 -5.7 SD

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137B 1901 to 2010 110 years Series 4

[\*] Early part of series cannot be checked from 1901 to 1906 -- not matched by another series

[B] Entire series, effect on correlation ( .578) is:

Lower 1939< -.025 1981> -.021 1986> -.013 1910< -.008 2005> -.008 1965< -.008 Higher 1953 .022 1940 .016

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

138A 1925 to 2010 86 years Series 5

[B] Entire series, effect on correlation ( .715) is:

Lower 1940> -.023 1962> -.016 1973> -.011 1927< -.011 1937< -.010 1943> -.008 Higher 1981 .017 1953 .012

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138B 1937 to 2010 74 years Series 6

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

Lower 1939> -.047 1994< -.022 1962> -.021 1954< -.021 1978> -.019 1964< -.019 Higher 1981 .031 1953 .024

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

1939 +3.3 SD

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139A 1922 to 2010 89 years Series 7

[B] Entire series, effect on correlation ( .615) is:

Lower 1925< -.026 1923> -.025 1927< -.020 1972> -.017 1933> -.013 1934> -.013 Higher 1981 .044 1953 .035

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

1923 +3.3 SD

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139B 1932 to 2010 79 years Series 8

[B] Entire series, effect on correlation ( .735) is:

Lower 1969< -.034 1962> -.025 1990< -.017 1933> -.015 2006< -.007 1934> -.007 Higher 1953 .029 1981 .028

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

2003 -1.531 12 1

2004 -1.786 12 1

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140A 1944 to 2010 67 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

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

1944 1993 9 -.08 .05 .18 -.33 .05 -.19 .07 -.09 .13 .01 .21| .07 -.02 .02 .10 .24 .07 -.15 -.16 .32\* .02

1950 1999 5 -.10 .03 .18 -.31 .09 -.16 .09 -.02 .18 .02 .23| .07 -.02 .06 .03 .23\* .00 -.16 -.16 .23 .03

[B] Entire series, effect on correlation ( .302) is:

Lower 1961< -.044 1981> -.020 1953> -.015 1949< -.014 1951< -.014 1976< -.012 Higher 1992 .070 2003 .039

1944 to 1993 segment:

Lower 1961< -.050 1981> -.023 1953> -.017 1949< -.013 1951< -.012 1960> -.011 Higher 1992 .104 1971 .026

1950 to 1999 segment:

Lower 1961< -.054 1981> -.019 1951< -.018 1976< -.015 1954< -.014 1953> -.013 Higher 1992 .103 1971 .026

[D] 4 Absent rings: Year Master N series Absent

1964 -.180 12 1 >> WARNING: Ring is not usually narrow

1989 .247 12 1 >> WARNING: Ring is not usually narrow

1990 .918 12 1 >> WARNING: Ring is not usually narrow

1991 1.329 12 1 >> WARNING: Ring is not usually narrow

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

1992 +3.3 SD

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140B 1947 to 2010 64 years Series 10

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

Lower 1971< -.059 1986< -.018 1989< -.017 1985> -.015 1966> -.011 1968> -.010 Higher 1981 .057 1953 .046

[D] 3 Absent rings: Year Master N series Absent

1982 -1.912 12 1

1983 -1.121 12 1

1984 -.949 12 1

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898A 1956 to 2010 55 years Series 11

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

Lower 1962< -.097 1981> -.055 1964> -.023 1982> -.017 1965< -.015 1958< -.012 Higher 1978 .047 2003 .023

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898B 1953 to 2010 58 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

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

1953 2002 -9 .00 .30\*-.08 .03 -.04 -.10 -.04 .01 -.10 .01 .29| .00 .09 -.06 .23 .03 .09 -.25 .04 - -

[B] Entire series, effect on correlation ( .368) is:

Lower 1962< -.169 1953> -.078 1980< -.010 1966> -.008 1958< -.007 2009< -.006 Higher 2003 .039 1992 .029

1953 to 2002 segment:

Lower 1962< -.171 1953> -.080 1980< -.011 1958< -.009 1966> -.008 1960< -.006 Higher 1992 .037 1976 .024

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

1961 1962 -4.3 SD 1962 1963 4.3 SD

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

1962 -8.4 SD

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PART 7: DESCRIPTIVE STATISTICS: 11:37 Mon 28 Mar 2011 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 136A 1912 2010 99 4 2 .430 1.37 4.67 1.048 .888 .248 2.88 .417 .042 1

2 136B 1922 2010 89 4 0 .562 1.21 3.16 .802 .814 .295 3.00 .512 .064 1

3 137A 1907 2010 104 4 0 .548 .82 1.84 .402 .706 .299 2.50 .395 .063 1

4 137B 1901 2010 110 4 0 .578 1.01 3.16 .655 .801 .306 2.79 .557 .028 1

5 138A 1925 2010 86 3 0 .715 1.28 2.92 .649 .878 .194 2.74 .387 -.092 1

6 138B 1937 2010 74 3 0 .576 1.79 4.04 .811 .850 .189 2.83 .609 .034 1

7 139A 1922 2010 89 4 0 .615 .82 2.41 .534 .895 .249 2.58 .415 -.074 1

8 139B 1932 2010 79 3 0 .735 1.33 3.53 .961 .912 .320 2.89 .526 -.031 1

9 140A 1944 2010 67 3 2 .302 .85 2.67 .793 .881 .472 4.22 .675 -.101 1

10 140B 1947 2010 64 3 0 .665 1.26 4.08 1.237 .920 .392 2.80 .564 -.058 2

11 898A 1956 2010 55 2 0 .517 1.37 3.51 .722 .835 .228 2.39 .395 .011 1

12 898B 1953 2010 58 2 1 .368 1.95 4.53 .887 .698 .240 2.37 .323 -.046 1

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Total or mean: 974 39 5 .557 1.22 4.67 .772 .838 .284 4.22 .480 -.008

- = [ COFECHA 169\_3COF ] = -