[] Dendrochronology Program Library Run OWT Program COF 17:32 Mon 31 Jul 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30164

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QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

File of DATED series: owt.txt

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 1888 to 2016 129 years

Continuous time span is 1888 to 2016 129 years

Portion with two or more series is 1889 to 2016 128 years

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

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

\*O\* Master series 1888 2016 129 yrs \*O\*

\*F\* Total rings in all series 2182 \*F\*

\*E\* Total dated rings checked 2181 \*E\*

\*C\* Series intercorrelation .749 \*C\*

\*H\* Average mean sensitivity .290 \*H\*

\*A\* Segments, possible problems 0 \*A\*

\*\*\* Mean length of series 109.1 \*\*\*

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

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

No ring measurements of zero value

PART 2: TIME PLOT OF TREE-RING SERIES: 17:32 Mon 31 Jul 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

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

. . . . . . . . . . . . . . . . . <===========> . OWT01A 1 1891 2016 126

. . . . . . . . . . . . . . . . . <==========> . OWT01B 2 1902 2016 115

. . . . . . . . . . . . . . . . . . <========> . OWT02A 3 1923 2016 94

. . . . . . . . . . . . . . . . . .<=========> . OWT02B 4 1919 2016 98

. . . . . . . . . . . . . . . . . <===========> . OWT03A 5 1897 2016 120

. . . . . . . . . . . . . . . . . <===========> . OWT03B 6 1891 2016 126

. . . . . . . . . . . . . . . . . . <========> . OWT04A 7 1921 2016 96

. . . . . . . . . . . . . . . . . . <========> . OWT04B 8 1929 2016 88

. . . . . . . . . . . . . . . . . <===========> . OWT05A 9 1896 2016 121

. . . . . . . . . . . . . . . . . <============> . OWT05B 10 1888 2016 129

. . . . . . . . . . . . . . . . . <===========> . OWT06A 11 1897 2016 120

. . . . . . . . . . . . . . . . . <===========> . OWT06B 12 1891 2016 126

. . . . . . . . . . . . . . . . . . <======> . OWT07A 13 1941 2016 76

. . . . . . . . . . . . . . . . . . <=======> . OWT07B 14 1937 2016 80

. . . . . . . . . . . . . . . . . <==========> . OWT08A 15 1908 2016 109

. . . . . . . . . . . . . . . . . <===========> . OWT08B 16 1894 2016 123

. . . . . . . . . . . . . . . . . <===========> . OWT09A 17 1893 2016 124

. . . . . . . . . . . . . . . . . <============> . OWT09B 18 1889 2016 128

. . . . . . . . . . . . . . . . . .<=========> . OWT010A 19 1912 2016 105

. . . . . . . . . . . . . . . . . . <=======> . OWT010B 20 1939 2016 78

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

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: 17:32 Mon 31 Jul 2017 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 1.411 10 1950 .448 20 2000 -.284 20

1901 -1.122 10 1951 .810 20 2001 .867 20

1902 1.241 11 1952 2.079 20 2002 -1.160 20

1903 .753 11 1953 -.219 20 2003 .435 20

1904 -.122 11 1954 .585 20 2004 1.119 20

1905 1.318 11 1955 .621 20 2005 .127 20

1906 1.017 11 1956 -1.247 20 2006 .107 20

1907 .058 11 1957 .242 20 2007 -.342 20

1908 -.271 12 1958 .032 20 2008 .282 20

1909 -.780 12 1959 .116 20 2009 -.467 20

1910 -2.108 12 1960 -.080 20 2010 1.543 20

1911 -.856 12 1961 1.413 20 2011 .785 20

1912 -.540 13 1962 .228 20 2012 -2.823 20

1913 .312 13 1963 .058 20 2013 .540 20

1914 -.339 13 1964 -.437 20 2014 -.798 20

1915 1.444 13 1965 -1.752 20 2015 .903 20

1916 1.078 13 1966 -1.408 20 2016 -.209 20

1917 1.354 13 1967 -2.582 20

1918 .090 13 1968 -.607 20

1919 -.483 14 1969 .479 20

1920 -.565 14 1970 .222 20

1921 .051 15 1971 -.092 20

1922 -.418 15 1972 -.121 20

1923 -1.667 16 1973 .757 20

1924 .488 16 1974 .274 20

1925 -.966 16 1975 1.049 20

1926 -.412 16 1976 .363 20

1927 1.079 16 1977 -1.010 20

1928 1.507 16 1978 -.291 20

1929 .412 17 1979 -.287 20

1930 -.280 17 1980 1.930 20

1931 -.539 17 1981 1.047 20

1932 1.289 17 1982 .318 20

1933 .182 17 1983 .364 20

1934 -2.044 17 1984 -2.040 20

1935 -.039 17 1985 -.725 20

1936 -1.911 17 1986 .840 20

1937 -.510 18 1987 .771 20

1888 -.389 1 1938 1.071 18 1988 -3.268 20

1889 1.266 2 1939 .701 19 1989 -.055 20

1890 .584 2 1940 .025 19 1990 .842 20

1891 .053 5 1941 -.886 20 1991 .142 20

1892 .526 5 1942 .351 20 1992 -.010 20

1893 -.369 6 1943 .862 20 1993 1.397 20

1894 -.806 7 1944 -1.118 20 1994 -.399 20

1895 -2.645 7 1945 .293 20 1995 .410 20

1896 -.786 8 1946 -.093 20 1996 -1.112 20

1897 -.029 10 1947 -.777 20 1997 -.070 20

1898 .575 10 1948 -.477 20 1998 1.539 20

1899 1.069 10 1949 .986 20 1999 -1.290 20

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PART 4: Master Bar Plot: 17:32 Mon 31 Jul 2017 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----------F 1950-------B 2000---a

1901-d 1951--------C 2001--------C

1902---------E 1952----------H 2002-e

1903--------C 1953---a 2003-------B

1904----@ 1954-------B 2004---------D

1905----------E 1955-------B 2005-----A

1906---------D 1956-e 2006-----@

1907-----@ 1957------A 2007---a

1908---a 1958-----@ 2008------A

1909-c 1959-----@ 2009--b

1910h 1960----@ 2010----------F

1911-c 1961----------F 2011--------C

1912--b 1962------A 2012k

1913------A 1963-----@ 2013-------B

1914---a 1964---b 2014-c

1915----------F 1965g 2015--------D

1916---------D 1966-f 2016----a

1917----------E 1967j

1918-----@ 1968--b

1919--b 1969-------B

1920--b 1970------A

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

1922---b 1972----@

1923g 1973--------C

1924-------B 1974------A

1925-d 1975---------D

1926---b 1976------A

1927---------D 1977-d

1928----------F 1978---a

1929-------B 1979---a

1930---a 1980----------H

1931--b 1981---------D

1932----------E 1982------A

1933------A 1983------A

1934h 1984h

1935----@ 1985--c

1936h 1986--------C

1937--b 1987--------C

1888---b 1938---------D 1988m

1889----------E 1939--------C 1989----@

1890-------B 1940-----@ 1990--------C

1891-----@ 1941-d 1991-----A

1892-------B 1942------A 1992-----@

1893---a 1943--------C 1993----------F

1894-c 1944-d 1994---b

1895k 1945------A 1995-------B

1896-c 1946----@ 1996-d

1897----@ 1947-c 1997----@

1898-------B 1948--b 1998----------F

1899---------D 1949---------D 1999-e

PART 5: CORRELATION OF SERIES BY SEGMENTS: 17:32 Mon 31 Jul 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 OWT01A 1891 2016 .78 .79 .78 .85 .83

2 OWT01B 1902 2016 .72 .70 .84 .82

3 OWT02A 1923 2016 .72 .77 .77 .85

4 OWT02B 1919 2016 .63 .64 .80 .88

5 OWT03A 1897 2016 .59 .59 .62 .74 .79

6 OWT03B 1891 2016 .68 .65 .63 .73 .80

7 OWT04A 1921 2016 .70 .75 .77 .84

8 OWT04B 1929 2016 .68 .71 .76

9 OWT05A 1896 2016 .67 .67 .71 .78 .86

10 OWT05B 1888 2016 .72 .78 .74 .78 .83

11 OWT06A 1897 2016 .80 .83 .83 .80 .83

12 OWT06B 1891 2016 .74 .73 .71 .72 .71

13 OWT07A 1941 2016 .61 .72 .85

14 OWT07B 1937 2016 .51 .71 .79

15 OWT08A 1908 2016 .85 .85 .87 .90

16 OWT08B 1894 2016 .75 .70 .70 .84 .84

17 OWT09A 1893 2016 .73 .70 .73 .84 .83

18 OWT09B 1889 2016 .61 .74 .54 .54 .66

19 OWT010A 1912 2016 .80 .61 .67 .71

20 OWT010B 1939 2016 .70 .68 .57

Av segment correlation .71 .73 .69 .76 .80

PART 6: POTENTIAL PROBLEMS: 17:32 Mon 31 Jul 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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OWT01A 1891 to 2016 126 years Series 1

[B] Entire series, effect on correlation ( .807) is:

Lower 2000< -.017 1990< -.006 1938< -.006 1891> -.005 1970< -.005 1997> -.005 Higher 1988 .029 2012 .021

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

OWT01B 1902 to 2016 115 years Series 2

[B] Entire series, effect on correlation ( .771) is:

Lower 2012> -.010 1999> -.009 1966> -.009 1904< -.008 2000> -.006 1935< -.006 Higher 1988 .040 1984 .012

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

OWT02A 1923 to 2016 94 years Series 3

[B] Entire series, effect on correlation ( .796) is:

Lower 1924< -.016 1987< -.013 1956< -.012 1954< -.009 2009< -.005 1937> -.005 Higher 2012 .034 1934 .010

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

OWT02B 1919 to 2016 98 years Series 4

[B] Entire series, effect on correlation ( .772) is:

Lower 1970< -.014 1944> -.011 1926< -.010 1950< -.008 1922> -.008 1951< -.008 Higher 2012 .038 1988 .030

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

OWT03A 1897 to 2016 120 years Series 5

[B] Entire series, effect on correlation ( .690) is:

Lower 1999> -.021 1923> -.015 2005< -.015 1965> -.011 1947> -.008 1899< -.006 Higher 1988 .049 2012 .035

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

1913 +3.1 SD

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OWT03B 1891 to 2016 126 years Series 6

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

Lower 1972< -.012 1965> -.010 1929< -.010 1914> -.008 1893> -.006 1899< -.005 Higher 2012 .031 1967 .014

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

OWT04A 1921 to 2016 96 years Series 7

[B] Entire series, effect on correlation ( .780) is:

Lower 1964< -.020 1923> -.015 1968> -.010 1960< -.007 2007> -.007 1948< -.006 Higher 2012 .029 1988 .023

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

1968 +3.5 SD

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

OWT04B 1929 to 2016 88 years Series 8

[B] Entire series, effect on correlation ( .727) is:

Lower 1960< -.023 1973< -.015 1948< -.011 2004< -.008 2009> -.007 1956> -.007 Higher 1984 .017 1934 .015

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

OWT05A 1896 to 2016 121 years Series 9

[B] Entire series, effect on correlation ( .751) is:

Lower 1977> -.014 1955< -.012 1913< -.011 1950< -.011 1915< -.010 1965> -.008 Higher 1988 .038 2012 .015

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

OWT05B 1888 to 2016 129 years Series 10

[\*] Early part of series cannot be checked from 1888 to 1888 -- not matched by another series

[B] Entire series, effect on correlation ( .768) is:

Lower 1890< -.032 1977> -.012 1955< -.010 1936> -.007 1953< -.005 1996> -.005 Higher 2012 .031 1988 .015

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

OWT06A 1897 to 2016 120 years Series 11

[B] Entire series, effect on correlation ( .821) is:

Lower 1919< -.013 1898< -.012 1988> -.008 1980< -.006 1972> -.005 1992> -.004 Higher 2012 .024 1984 .008

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OWT06B 1891 to 2016 126 years Series 12

[B] Entire series, effect on correlation ( .710) is:

Lower 1923< -.014 1974< -.009 2011< -.009 1891> -.008 1916< -.008 1928< -.006 Higher 1967 .010 1934 .008

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OWT07A 1941 to 2016 76 years Series 13

[B] Entire series, effect on correlation ( .691) is:

Lower 1959< -.034 1944< -.029 1953> -.013 1945< -.013 1941> -.010 1956> -.009 Higher 2012 .027 1999 .013

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OWT07B 1937 to 2016 80 years Series 14

[B] Entire series, effect on correlation ( .712) is:

Lower 1945< -.029 1943< -.018 1967> -.014 1953> -.013 2011< -.012 1954< -.011 Higher 2012 .060 1988 .037

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OWT08A 1908 to 2016 109 years Series 15

[B] Entire series, effect on correlation ( .866) is:

Lower 1965< -.007 1977> -.007 1942< -.007 1983< -.007 1912> -.005 1970< -.005 Higher 1988 .022 1934 .004

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OWT08B 1894 to 2016 123 years Series 16

[B] Entire series, effect on correlation ( .796) is:

Lower 1932< -.019 1993< -.007 1940< -.006 1939< -.005 1945> -.005 1960> -.004 Higher 1988 .028 2012 .013

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

OWT09A 1893 to 2016 124 years Series 17

[B] Entire series, effect on correlation ( .792) is:

Lower 1942< -.037 1912> -.008 1978> -.007 2002> -.006 2007< -.006 1999> -.006 Higher 1988 .031 2012 .015

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

OWT09B 1889 to 2016 128 years Series 18

[B] Entire series, effect on correlation ( .618) is:

Lower 1890> -.028 1891< -.019 1977< -.017 1967> -.010 1970< -.009 1955< -.009 Higher 2012 .044 1895 .016

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

1890 +3.1 SD

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OWT010A 1912 to 2016 105 years Series 19

[B] Entire series, effect on correlation ( .726) is:

Lower 1973< -.038 1972< -.033 2001< -.011 1977> -.009 1966> -.008 1996> -.006 Higher 1988 .034 2012 .034

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

1973 -5.0 SD

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OWT010B 1939 to 2016 78 years Series 20

[B] Entire series, effect on correlation ( .597) is:

Lower 2012> -.096 2001< -.011 1996> -.011 1953> -.011 2008< -.010 1966> -.009 Higher 1967 .035 1999 .018

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

2012 +4.8 SD

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[\*] All segments correlate highest as dated with correlation with master series over .3281

PART 7: DESCRIPTIVE STATISTICS: 17:32 Mon 31 Jul 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 OWT01A 1891 2016 126 5 0 .807 2.85 6.92 1.190 .570 .311 2.59 .393 -.069 1

2 OWT01B 1902 2016 115 4 0 .771 3.17 7.46 1.481 .645 .300 2.67 .377 -.017 1

3 OWT02A 1923 2016 94 4 0 .796 2.94 5.74 1.002 .395 .317 2.62 .472 -.040 1

4 OWT02B 1919 2016 98 4 0 .772 2.89 5.80 1.057 .472 .267 2.71 .463 -.021 1

5 OWT03A 1897 2016 120 5 0 .690 3.17 5.50 .882 .122 .305 2.63 .440 -.007 1

6 OWT03B 1891 2016 126 5 0 .723 3.64 6.98 1.041 .272 .278 2.55 .462 -.027 3

7 OWT04A 1921 2016 96 4 0 .780 4.16 8.81 1.519 .441 .291 2.73 .578 -.016 1

8 OWT04B 1929 2016 88 3 0 .727 4.15 8.40 1.237 .308 .290 2.62 .516 -.080 1

9 OWT05A 1896 2016 121 5 0 .751 3.25 7.43 1.200 .599 .243 2.62 .454 -.034 2

10 OWT05B 1888 2016 129 5 0 .768 2.89 6.08 .997 .570 .243 2.67 .419 -.013 1

11 OWT06A 1897 2016 120 5 0 .821 3.96 9.42 1.702 .453 .336 2.76 .474 -.033 1

12 OWT06B 1891 2016 126 5 0 .710 3.84 8.88 1.806 .501 .350 2.78 .466 .014 1

13 OWT07A 1941 2016 76 3 0 .691 4.67 9.91 1.626 .357 .275 2.64 .476 .066 1

14 OWT07B 1937 2016 80 3 0 .712 3.66 6.71 1.318 .429 .286 2.54 .471 .019 1

15 OWT08A 1908 2016 109 4 0 .866 3.40 5.98 1.070 .360 .291 2.62 .479 .010 1

16 OWT08B 1894 2016 123 5 0 .796 3.42 6.78 1.291 .554 .283 2.59 .357 -.032 1

17 OWT09A 1893 2016 124 5 0 .792 2.69 6.83 1.240 .635 .268 2.81 .439 -.014 1

18 OWT09B 1889 2016 128 5 0 .618 2.44 6.30 1.163 .765 .267 2.65 .459 -.029 1

19 OWT010A 1912 2016 105 4 0 .726 3.92 7.86 1.486 .482 .307 2.64 .555 .033 1

20 OWT010B 1939 2016 78 3 0 .597 5.15 10.87 2.118 .567 .290 2.65 .465 -.005 1

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Total or mean: 2182 86 0 .749 3.44 10.87 1.303 .482 .290 2.81 .457 -.017

- = [ COFECHA OWT COF ] = -