[] Dendrochronology Program Library Run OWO Program COF 09:25 Mon 19 Jun 2017 Page 1

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[] P R O G R A M C O F E C H A Version 6.06P 30122

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 QUALITY CONTROL AND DATING CHECK OF TREE-RING MEASUREMENTS

 File of DATED series: owo.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 1830 to 2016 187 years

 Continuous time span is 1830 to 2016 187 years

 Portion with two or more series is 1832 to 2016 185 years

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

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

 \*O\* Master series 1830 2016 187 yrs \*O\*

 \*F\* Total rings in all series 3242 \*F\*

 \*E\* Total dated rings checked 3240 \*E\*

 \*C\* Series intercorrelation .598 \*C\*

 \*H\* Average mean sensitivity .260 \*H\*

 \*A\* Segments, possible problems 7 \*A\*

 \*\*\* Mean length of series 162.1 \*\*\*

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

 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: 09:25 Mon 19 Jun 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

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

 . . . . . . . . . . . . . . . . <=================> . OWO01A 1 1830 2016 187

 . . . . . . . . . . . . . . . . <=================> . OWO01B 2 1833 2016 184

 . . . . . . . . . . . . . . . . .<==============> . OWO02A 3 1863 2016 154

 . . . . . . . . . . . . . . . . <================> . OWO02B 4 1849 2016 168

 . . . . . . . . . . . . . . . . . <=============> . OWO03A 5 1877 2016 140

 . . . . . . . . . . . . . . . . <===============> . OWO03B 6 1855 2016 162

 . . . . . . . . . . . . . . . . <=================> . OWO04A 7 1834 2016 183

 . . . . . . . . . . . . . . . . <================> . OWO04B 8 1840 2016 177

 . . . . . . . . . . . . . . . . . <============> . OWO05A 9 1884 2016 133

 . . . . . . . . . . . . . . . . <=================> . OWO05B 10 1832 2016 185

 . . . . . . . . . . . . . . . . <=================> . OWO06A 11 1838 2016 179

 . . . . . . . . . . . . . . . . <================> . OWO06B 12 1842 2016 175

 . . . . . . . . . . . . . . . . . <=============> . OWO07A 13 1879 2016 138

 . . . . . . . . . . . . . . . . <===============> . OWO07B 14 1851 2016 166

 . . . . . . . . . . . . . . . . <===============> . OWO08A 15 1856 2016 161

 . . . . . . . . . . . . . . . . .<==============> . OWO08B 16 1869 2016 148

 . . . . . . . . . . . . . . . . . <=============> . OWO09A 17 1876 2016 141

 . . . . . . . . . . . . . . . . <===============> . OWO09B 18 1851 2016 166

 . . . . . . . . . . . . . . . . <===============> . OWO10A 19 1859 2016 158

 . . . . . . . . . . . . . . . . . <============> . OWO10B 20 1880 2016 137

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

 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: 09:25 Mon 19 Jun 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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 1850 .814 8 1900 .919 20 1950 .948 20 2000 1.931 20

 1851 1.454 10 1901 -.133 20 1951 .566 20 2001 -.121 20

 1852 -.745 10 1902 1.123 20 1952 -.586 20 2002 -1.149 20

 1853 -.552 10 1903 1.304 20 1953 .307 20 2003 -.338 20

 1854 -.298 10 1904 .791 20 1954 .296 20 2004 2.068 20

 1855 -.188 11 1905 .253 20 1955 1.025 20 2005 -.017 20

 1856 -.795 12 1906 .244 20 1956 -.068 20 2006 -.182 20

 1857 .569 12 1907 -.974 20 1957 -.560 20 2007 -.453 20

 1858 -.622 12 1908 -.255 20 1958 .801 20 2008 .559 20

 1859 -.630 13 1909 -1.977 20 1959 -.754 20 2009 .109 20

 1860 .167 13 1910 -1.696 20 1960 .330 20 2010 -.145 20

 1861 .631 13 1911 -1.485 20 1961 .853 20 2011 1.833 20

 1862 1.500 13 1912 -.915 20 1962 .518 20 2012 -1.352 20

 1863 .503 14 1913 -.134 20 1963 -.188 20 2013 -.608 20

 1864 -.292 14 1914 .672 20 1964 -.195 20 2014 -.699 20

 1865 -1.461 14 1915 1.377 20 1965 .222 20 2015 .440 20

 1866 -.117 14 1916 1.913 20 1966 -2.024 20 2016 .009 20

 1867 -.222 14 1917 1.039 20 1967 -1.056 20

 1868 .253 14 1918 .300 20 1968 .288 20

 1869 1.462 15 1919 .133 20 1969 -.086 20

 1870 .485 15 1920 .521 20 1970 -1.315 20

 1871 .759 15 1921 1.126 20 1971 -.253 20

 1872 .103 15 1922 .271 20 1972 .298 20

 1873 .303 15 1923 .426 20 1973 -.455 20

 1874 -.664 15 1924 .382 20 1974 .953 20

 1875 -.261 15 1925 -.503 20 1975 1.570 20

 1876 -1.121 16 1926 -1.047 20 1976 .920 20

 1877 -.126 17 1927 1.260 20 1977 -.662 20

 1878 -.810 17 1928 -.554 20 1978 .907 20

 1879 -.057 18 1929 -.152 20 1979 .467 20

 1830 .179 1 1880 .339 19 1930 -1.872 20 1980 .954 20

 1831 -.188 1 1881 -.101 19 1931 -.778 20 1981 -1.264 20

 1832 -5.078 2 1882 -.276 19 1932 .327 20 1982 .139 20

 1833 -.316 3 1883 -.830 19 1933 .220 20 1983 -1.440 20

 1834 .028 4 1884 -1.024 20 1934 -.846 20 1984 -.483 20

 1835 1.371 4 1885 -.913 20 1935 .658 20 1985 -.736 20

 1836 1.260 4 1886 -.315 20 1936 -.902 20 1986 .988 20

 1837 .885 4 1887 1.632 20 1937 -.636 20 1987 -.778 20

 1838 .309 5 1888 1.336 20 1938 1.357 20 1988 -.861 20

 1839 -2.460 5 1889 1.191 20 1939 -.508 20 1989 -.687 20

 1840 .532 6 1890 .625 20 1940 -.144 20 1990 .483 20

 1841 .746 6 1891 1.102 20 1941 -.488 20 1991 .163 20

 1842 1.234 7 1892 1.436 20 1942 1.301 20 1992 1.058 20

 1843 .446 7 1893 .707 20 1943 -.926 20 1993 1.256 20

 1844 -1.612 7 1894 .288 20 1944 -.924 20 1994 .272 20

 1845 -1.869 7 1895 -1.462 20 1945 1.882 20 1995 .008 20

 1846 -.486 7 1896 -2.250 20 1946 -.868 20 1996 -.293 20

 1847 .581 7 1897 -2.231 20 1947 1.171 20 1997 -1.610 20

 1848 1.200 7 1898 -1.155 20 1948 -.869 20 1998 .503 20

 1849 .705 8 1899 .310 20 1949 .715 20 1999 -.647 20

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PART 4: Master Bar Plot: 09:25 Mon 19 Jun 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

 1850--------C 1900--------D 1950---------D 2000----------H

 1851----------F 1901----a 1951-------B 2001----@

 1852--c 1902---------D 1952---b 2002-e

 1853---b 1903----------E 1953------A 2003---a

 1854----a 1904--------C 1954------A 2004----------H

 1855----a 1905------A 1955---------D 2005-----@

 1856--c 1906------A 1956-----@ 2006----a

 1857-------B 1907-d 1957---b 2007---b

 1858--b 1908----a 1958--------C 2008-------B

 1859--c 1909h 1959--c 2009-----@

 1860------A 1910g 1960------A 2010----a

 1861-------C 1911f 1961--------C 2011----------G

 1862----------F 1912-d 1962-------B 2012e

 1863-------B 1913----a 1963----a 2013--b

 1864----a 1914--------C 1964----a 2014--c

 1865f 1915----------F 1965------A 2015-------B

 1866----@ 1916----------H 1966h 2016-----@

 1867----a 1917---------D 1967-d

 1868------A 1918------A 1968------A

 1869----------F 1919-----A 1969----@

 1870-------B 1920-------B 1970e

 1871--------C 1921---------E 1971----a

 1872-----@ 1922------A 1972------A

 1873------A 1923-------B 1973---b

 1874--c 1924------B 1974---------D

 1875----a 1925---b 1975----------F

 1876-d 1926-d 1976--------D

 1877----a 1927---------E 1977--c

 1878--c 1928---b 1978--------D

 1879-----@ 1929----a 1979-------B

 1830------A 1880------A 1930g 1980---------D

 1831----a 1881----@ 1931--c 1981-e

 1832t 1882----a 1932------A 1982-----A

 1833----a 1883-c 1933------A 1983f

 1834-----@ 1884-d 1934-c 1984---b

 1835----------E 1885-d 1935--------C 1985--c

 1836---------E 1886----a 1936-d 1986---------D

 1837--------D 1887----------G 1937--c 1987--c

 1838------A 1888----------E 1938----------E 1988-c

 1839j 1889---------E 1939---b 1989--c

 1840-------B 1890-------C 1940----a 1990-------B

 1841--------C 1891---------D 1941---b 1991------A

 1842---------E 1892----------F 1942----------E 1992---------D

 1843-------B 1893--------C 1943-d 1993---------E

 1844f 1894------A 1944-d 1994------A

 1845g 1895f 1945----------H 1995-----@

 1846---b 1896i 1946-c 1996----a

 1847-------B 1897i 1947---------E 1997f

 1848---------E 1898-e 1948-c 1998-------B

 1849--------C 1899------A 1949--------C 1999--c

PART 5: CORRELATION OF SERIES BY SEGMENTS: 09:25 Mon 19 Jun 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 1825 1850 1875 1900 1925 1950 1975

 1874 1899 1924 1949 1974 1999 2024

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

 1 OWO01A 1830 2016 .66 .42 .56 .56 .50 .49 .31A

 2 OWO01B 1833 2016 .47 .66 .50 .42 .55 .56 .50

 3 OWO02A 1863 2016 .69 .69 .58 .54 .47 .45

 4 OWO02B 1849 2016 .40B .42B .68 .61 .46 .29B .45

 5 OWO03A 1877 2016 .77 .79 .62 .52 .66

 6 OWO03B 1855 2016 .45 .64 .72 .57 .42 .49

 7 OWO04A 1834 2016 .52 .56 .73 .57 .41 .47 .63

 8 OWO04B 1840 2016 .48B .46 .67B .67 .54 .44 .63

 9 OWO05A 1884 2016 .75 .76 .71 .66 .73

 10 OWO05B 1832 2016 .50 .56 .72 .78 .65 .54 .73

 11 OWO06A 1838 2016 .70 .72 .78 .87 .71 .62 .72

 12 OWO06B 1842 2016 .58 .58 .71 .71 .65 .72 .68

 13 OWO07A 1879 2016 .77 .69 .55 .54 .69

 14 OWO07B 1851 2016 .42 .68 .62 .64 .67 .66

 15 OWO08A 1856 2016 .45 .62 .63 .59 .70 .77

 16 OWO08B 1869 2016 .56 .58 .70 .64 .65 .74

 17 OWO09A 1876 2016 .52 .69 .53 .56 .71

 18 OWO09B 1851 2016 .50 .72 .76 .74 .61 .68

 19 OWO10A 1859 2016 .73 .84 .74 .63 .53 .53

 20 OWO10B 1880 2016 .85 .82 .68 .40 .18B

 Av segment correlation .54 .54 .69 .68 .60 .54 .60

PART 6: POTENTIAL PROBLEMS: 09:25 Mon 19 Jun 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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 OWO01A 1830 to 2016 187 years Series 1

 [\*] Early part of series cannot be checked from 1830 to 1831 -- 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

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

 1967 2016 0 .03 -.25 .05 .17 .00 -.12 -.03 .15 .02 -.04 .31\* - - - - - - - - - -

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

 Lower 2004< -.022 1968< -.013 2012> -.013 1859> -.012 1959> -.009 1865> -.008 Higher 1832 .087 1839 .010

 1967 to 2016 segment:

 Lower 2004< -.087 1968< -.050 2012> -.043 2014> -.013 1981> -.013 2016> -.010 Higher 1975 .030 1983 .024

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

 1859 +3.3 SD

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 OWO01B 1833 to 2016 184 years Series 2

 [B] Entire series, effect on correlation ( .479) is:

 Lower 1839< -.047 2012> -.012 1859> -.010 1913< -.010 2016> -.007 1922< -.007 Higher 1844 .013 1896 .009

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

 1838 1839 -4.4 SD 1839 1840 4.2 SD

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

 1839 -9.0 SD

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

 OWO02A 1863 to 2016 154 years Series 3

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

 Lower 1981< -.019 1998< -.016 1933< -.011 1926> -.010 1967> -.010 1963> -.009 Higher 1966 .024 2004 .012

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

 1981 -5.9 SD

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 OWO02B 1849 to 2016 168 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

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

 1849 1898 -1 -.21 -.09 -.06 .07 -.08 -.04 -.01 .05 .17 .42\* .40|-.08 -.25 -.21 -.16 .03 .02 -.06 -.21 -.09 .00

 1850 1899 -1 -.24 -.07 -.02 .12 -.07 -.08 -.09 -.01 .14 .42\* .42|-.04 -.24 -.21 -.14 .04 .02 -.07 -.22 -.10 -.06

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

 1950 1999 -1 -.05 -.37 .16 -.01 -.18 -.21 .02 -.02 -.40 .30\* .29| .03 -.03 .15 -.10 -.01 .21 .17 .00 -.17 -.04

 [B] Entire series, effect on correlation ( .465) is:

 Lower 1860< -.044 1980< -.018 1921< -.014 1983> -.013 1982< -.012 1859< -.010 Higher 2004 .016 1916 .011

 1849 to 1898 segment:

 Lower 1860< -.139 1852> -.028 1879< -.023 1859< -.016 1878> -.016 1849< -.015 Higher 1887 .034 1865 .031

 1850 to 1899 segment:

 Lower 1860< -.144 1852> -.027 1879< -.025 1859< -.019 1878> -.015 1882> -.010 Higher 1887 .032 1865 .030

 1950 to 1999 segment:

 Lower 1980< -.067 1983> -.046 1982< -.046 1960< -.033 1958< -.032 1959> -.019 Higher 1966 .043 1975 .042

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

 1860 -5.0 SD

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 OWO03A 1877 to 2016 140 years Series 5

 [B] Entire series, effect on correlation ( .682) is:

 Lower 1998< -.014 1997> -.011 1959< -.011 1943> -.009 1950< -.009 1964< -.009 Higher 1909 .011 1930 .010

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 OWO03B 1855 to 2016 162 years Series 6

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

 Lower 1943> -.015 1997> -.011 1884> -.011 1872< -.011 1889< -.009 1958< -.008 Higher 2000 .013 1945 .012

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

 1884 +3.1 SD

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 OWO04A 1834 to 2016 183 years Series 7

 [B] Entire series, effect on correlation ( .558) is:

 Lower 1963< -.020 1852> -.016 1874> -.010 1942< -.009 1839> -.008 1947< -.008 Higher 1844 .011 2004 .010

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

 1990 +3.4 SD

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 OWO04B 1840 to 2016 177 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

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

 1840 1889 -1 -.04 -.04 -.13 -.01 .22 -.04 -.29 -.29 .00 .50\* .48| .25 .04 -.05 -.31 -.25 -.09 -.04 -.11 -.16 -.04

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

 1875 1924 1 .20 -.14 -.14 -.33 -.33 -.25 -.27 -.25 .06 .23 .67| .68\* .46 .33 -.05 -.19 -.10 -.32 -.32 -.39 -.35

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

 Lower 1852> -.027 1963< -.023 1935< -.013 1897> -.012 1992< -.010 2002> -.009 Higher 2012 .016 2004 .012

 1840 to 1889 segment:

 Lower 1852> -.123 1875< -.030 1874> -.017 1844> -.011 1872> -.008 1886> -.008 Higher 1887 .042 1845 .040

 1875 to 1924 segment:

 Lower 1897> -.055 1875< -.040 1915< -.017 1918> -.011 1886> -.010 1890< -.009 Higher 1909 .034 1887 .025

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

 1852 +3.4 SD

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 OWO05A 1884 to 2016 133 years Series 9

 [B] Entire series, effect on correlation ( .737) is:

 Lower 1952< -.009 1929< -.008 1936> -.008 1912> -.006 1993< -.006 1972< -.005 Higher 2012 .011 1966 .011

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 OWO05B 1832 to 2016 185 years Series 10

 [B] Entire series, effect on correlation ( .629) is:

 Lower 1839> -.030 1844> -.024 1990< -.012 1962< -.012 1924< -.010 1852> -.009 Higher 1832 .058 2012 .012

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

 1839 +4.4 SD; 1844 +3.3 SD

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 OWO06A 1838 to 2016 179 years Series 11

 [B] Entire series, effect on correlation ( .722) is:

 Lower 1839> -.017 1852< -.017 1959> -.013 1951< -.011 1981> -.007 1996> -.006 Higher 1966 .011 1844 .008

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 OWO06B 1842 to 2016 175 years Series 12

 [B] Entire series, effect on correlation ( .661) is:

 Lower 2012> -.016 1868< -.013 1852< -.011 1887< -.009 1959> -.008 1948> -.007 Higher 1966 .011 2004 .006

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 OWO07A 1879 to 2016 138 years Series 13

 [B] Entire series, effect on correlation ( .653) is:

 Lower 1959< -.018 1938< -.010 1977> -.010 1899< -.008 1973> -.007 1957> -.007 Higher 2012 .017 1930 .012

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 OWO07B 1851 to 2016 166 years Series 14

 [B] Entire series, effect on correlation ( .593) is:

 Lower 1949< -.024 1865> -.015 1944< -.011 1852> -.010 1864> -.010 1876> -.007 Higher 1966 .013 1930 .011

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

 1865 +3.1 SD

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 OWO08A 1856 to 2016 161 years Series 15

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

 Lower 1859< -.028 1865> -.009 1980< -.008 1877< -.007 1927< -.007 1891< -.007 Higher 2012 .020 1896 .012

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 OWO08B 1869 to 2016 148 years Series 16

 [B] Entire series, effect on correlation ( .634) is:

 Lower 1877< -.014 1946> -.013 1951< -.011 1963> -.011 1988> -.011 1885> -.010 Higher 2012 .021 1896 .013

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

 1879 +3.2 SD

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 OWO09A 1876 to 2016 141 years Series 17

 [B] Entire series, effect on correlation ( .630) is:

 Lower 1970> -.027 1876> -.015 1887< -.012 1959< -.010 1960< -.008 1926> -.008 Higher 2012 .015 2004 .011

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

 1970 +3.5 SD

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 OWO09B 1851 to 2016 166 years Series 18

 [B] Entire series, effect on correlation ( .630) is:

 Lower 1873< -.054 1872< -.015 1981> -.012 1880< -.008 1937> -.008 1859> -.007 Higher 2012 .018 1896 .009

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

 1873 -5.9 SD

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

 OWO10A 1859 to 2016 158 years Series 19

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

 Lower 1976< -.020 1859> -.014 1974< -.013 1940< -.011 1925> -.010 2005> -.009 Higher 1909 .012 1930 .011

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 OWO10B 1880 to 2016 137 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

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

 1967 2016 -6 -.14 -.04 -.01 .12 .22\* .03 .16 -.17 .00 .12 .18| - - - - - - - - - -

 [B] Entire series, effect on correlation ( .486) is:

 Lower 2003< -.142 1981> -.012 1993< -.010 2002> -.009 2015< -.009 1976< -.009 Higher 1945 .015 1946 .011

 1967 to 2016 segment:

 Lower 2003< -.202 1981> -.021 1993< -.017 2002> -.016 2015< -.015 1976< -.015 Higher 2004 .042 1970 .029

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

 2002 2003 -6.4 SD 2003 2004 4.1 SD

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

 2003 -9.2 SD

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PART 7: DESCRIPTIVE STATISTICS: 09:25 Mon 19 Jun 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 OWO01A 1830 2016 187 7 1 .546 .96 2.40 .402 .494 .290 2.64 .373 .005 3

 2 OWO01B 1833 2016 184 7 0 .479 1.17 3.58 .529 .365 .323 2.56 .286 .008 3

 3 OWO02A 1863 2016 154 6 0 .539 1.31 5.91 .639 .712 .212 2.56 .322 -.055 1

 4 OWO02B 1849 2016 168 7 3 .465 1.16 2.57 .370 .578 .202 3.02 .489 .077 1

 5 OWO03A 1877 2016 140 5 0 .682 1.46 3.19 .555 .638 .266 2.72 .485 .030 1

 6 OWO03B 1855 2016 162 6 0 .524 1.32 3.60 .578 .796 .210 2.66 .370 -.002 1

 7 OWO04A 1834 2016 183 7 0 .558 1.41 3.67 .581 .636 .253 2.93 .446 .014 3

 8 OWO04B 1840 2016 177 7 2 .575 1.18 3.41 .635 .796 .223 2.91 .434 -.041 1

 9 OWO05A 1884 2016 133 5 0 .737 1.33 2.89 .479 .324 .318 2.76 .532 .046 1

 10 OWO05B 1832 2016 185 7 0 .629 1.24 3.03 .580 .569 .288 2.69 .426 .006 1

 11 OWO06A 1838 2016 179 7 0 .722 1.21 2.77 .478 .607 .248 2.77 .449 .011 1

 12 OWO06B 1842 2016 175 7 0 .661 1.27 2.78 .522 .500 .295 2.63 .412 .037 3

 13 OWO07A 1879 2016 138 5 0 .653 2.37 4.56 1.042 .762 .232 2.58 .433 -.025 2

 14 OWO07B 1851 2016 166 6 0 .593 1.71 3.50 .759 .763 .237 2.72 .467 .019 2

 15 OWO08A 1856 2016 161 6 0 .615 1.71 4.80 .977 .759 .275 2.75 .419 -.060 1

 16 OWO08B 1869 2016 148 6 0 .634 1.72 4.97 .950 .718 .296 2.79 .513 .026 1

 17 OWO09A 1876 2016 141 5 0 .630 2.25 5.19 .838 .592 .255 2.62 .375 -.059 1

 18 OWO09B 1851 2016 166 6 0 .630 1.57 3.89 .629 .598 .263 2.64 .456 .020 1

 19 OWO10A 1859 2016 158 6 0 .642 1.08 4.66 .705 .827 .235 2.81 .516 .018 1

 20 OWO10B 1880 2016 137 5 1 .486 1.15 4.50 .727 .804 .276 2.51 .284 -.052 1

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 Total or mean: 3242 123 7 .598 1.41 5.91 .639 .638 .260 3.02 .423 .002

 - = [ COFECHA OWO COF ] = -