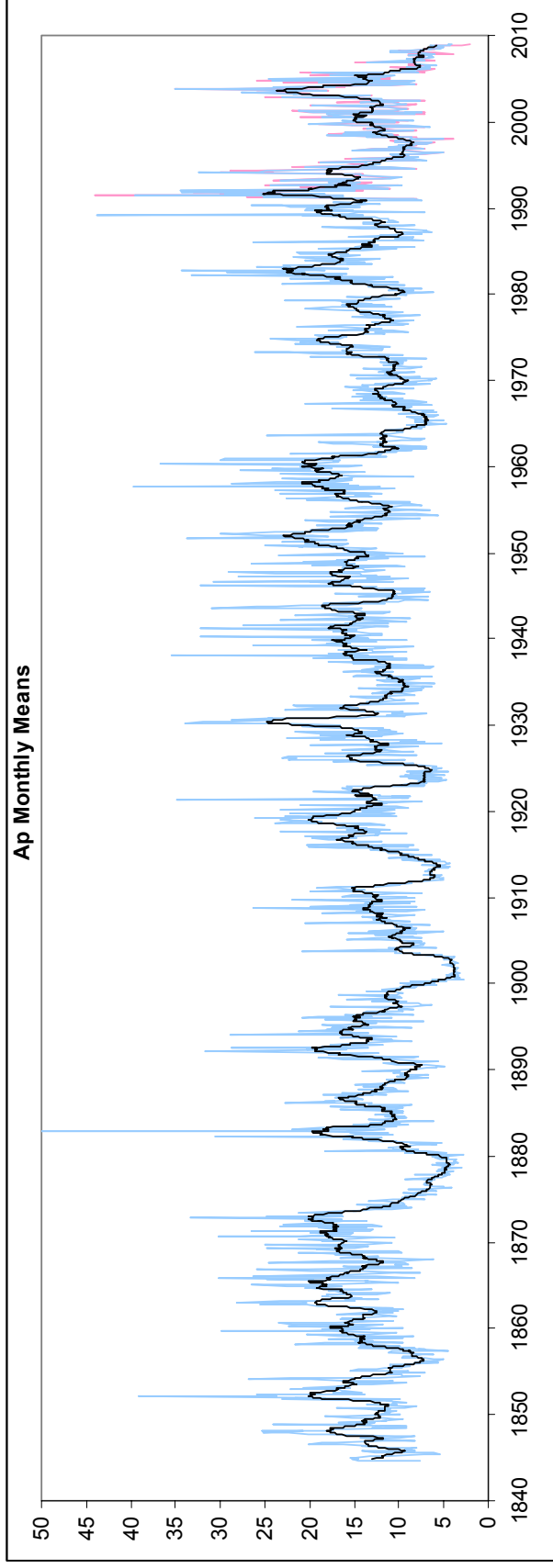
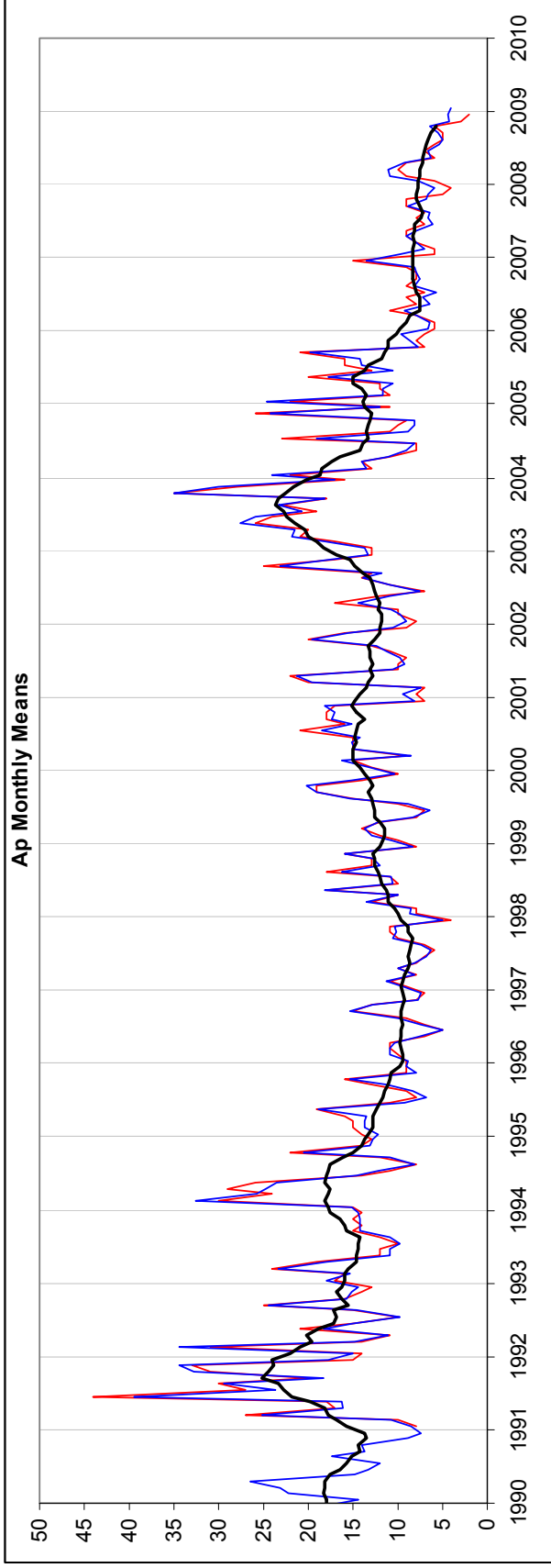


We can reconstruct the *ap*-index back to 1844:

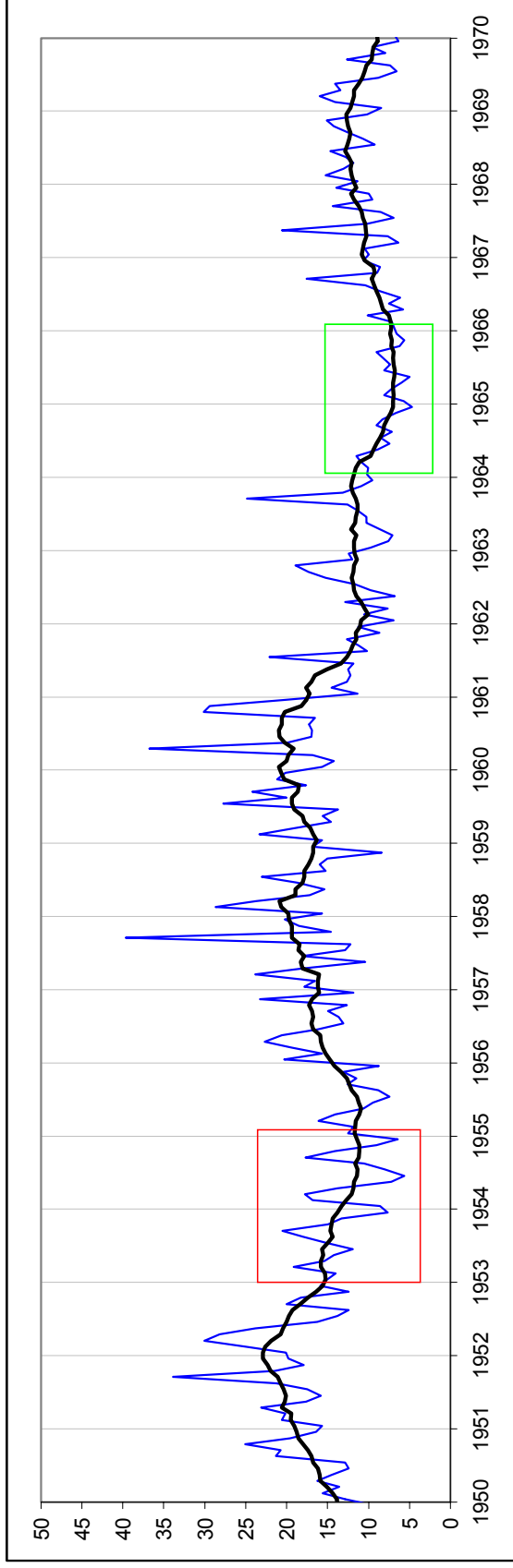


The black line is a 1-yr running mean. Presently [2009], *ap* is approaching values it had in 1878-79 and 1901-1902.

The reconstruction is based on the corrected *aa*-index back to 1868, the *IHV*-index back to 1844, and the *am*-index from 1959. The derivation of and relationships between these indices are described in <http://www.leif.org/research/2007JA012437.pdf>

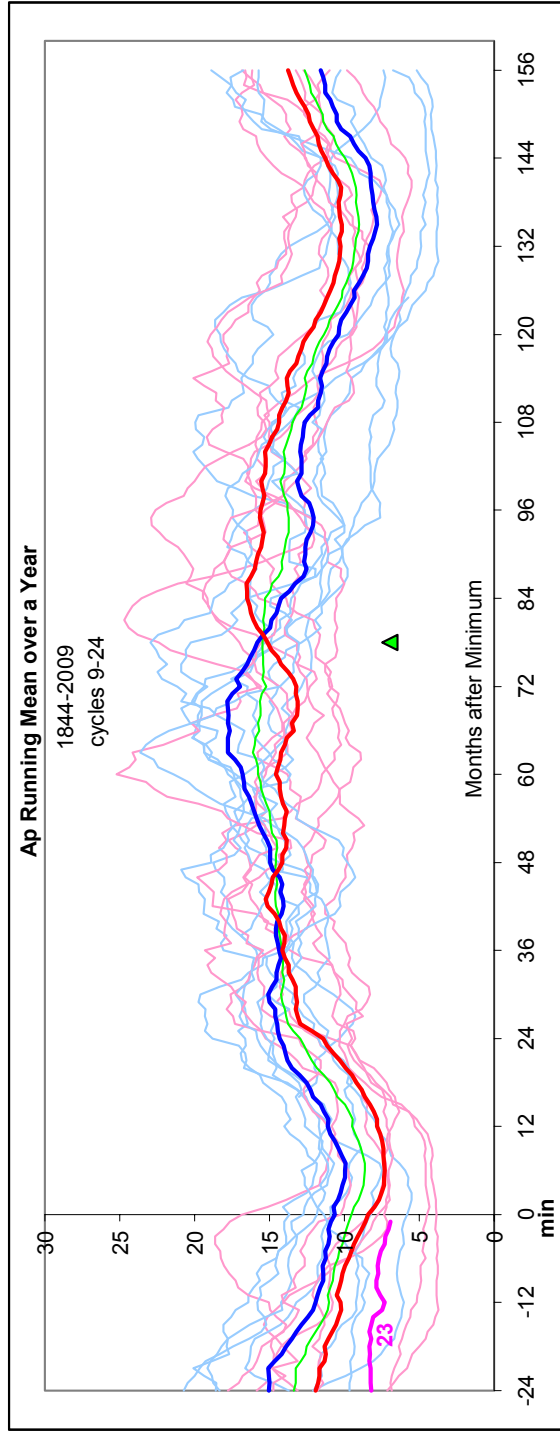
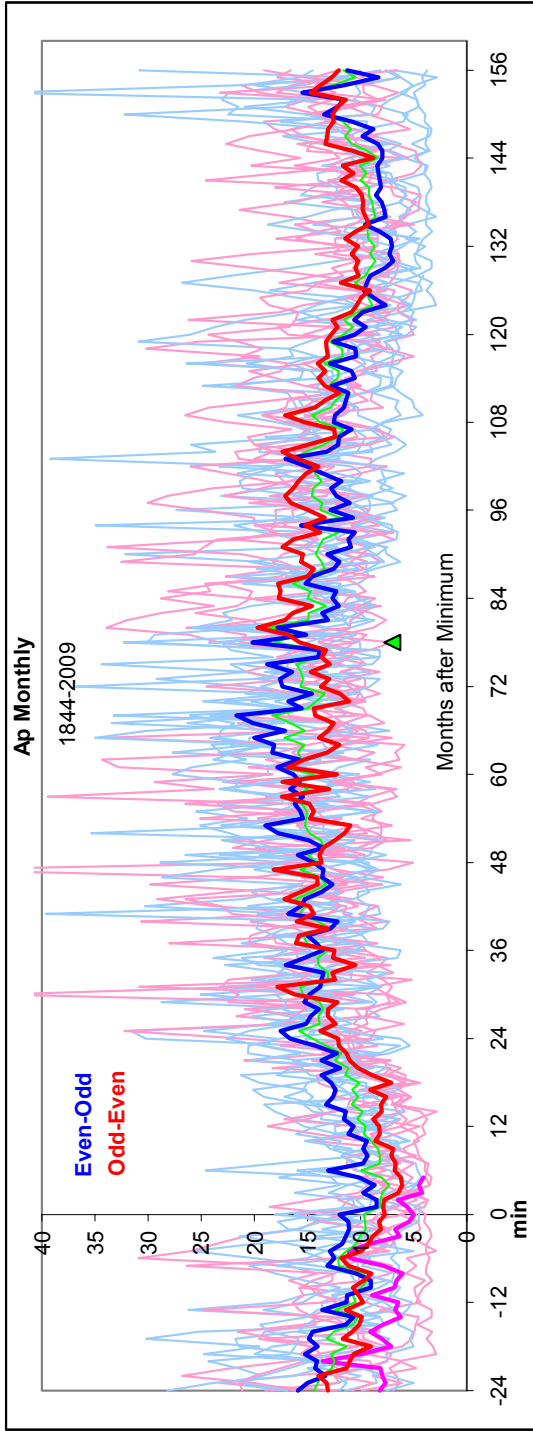


The red line is *ap* from <http://www.swpc.noaa.gov/ftpdir/weekly/RecentIndices.txt> The very latest values from that source are in error [too low], but otherwise the reconstruction matches quite well.



There is a semiannual variation that is not related to the Sun, but to the geometry of the interaction between the solar wind and the Earth's magnetic field. For transition between even and odd solar cycles, this variation is particularly large [red box], but for transitions between odd and even cycles, the variation is much smaller. The reason for this is well-understood [see for example: <http://www.leif.org/research/Semiannual%20Variation%201954%20and%201996.pdf>]

One can remove the semiannual variation by calculating running 6-month or 12-month means. The following Figure shows the monthly means lined up on solar cycle minimum for cycles 9 to 24. Weak blue lines are for Even-Odd cycle transitions [e.g. from 18 to 19] and weak red lines are for Odd-Even transitions. The heavy blue and red lines are averages for Even-Odd and Odd-Even transitions. The current transition [23->24] is shown as a heavy pink line:



Geomagnetic activity on average reaches a minimum 6 months after solar minimum, but the spread is large. Since cycle 23 is much like cycle 13, one might surmise [‘predict’ is too pretentious] that *ap* this current transition will reach values of 5 or 4, before heading back up again.

The different levels of geomagnetic activity for E-O and O-E transitions are clearly seen in the run of the heavy blue and red lines. They change at about the time of solar polar field reversals [green triangle] as predicted from the theory explaining their cause.