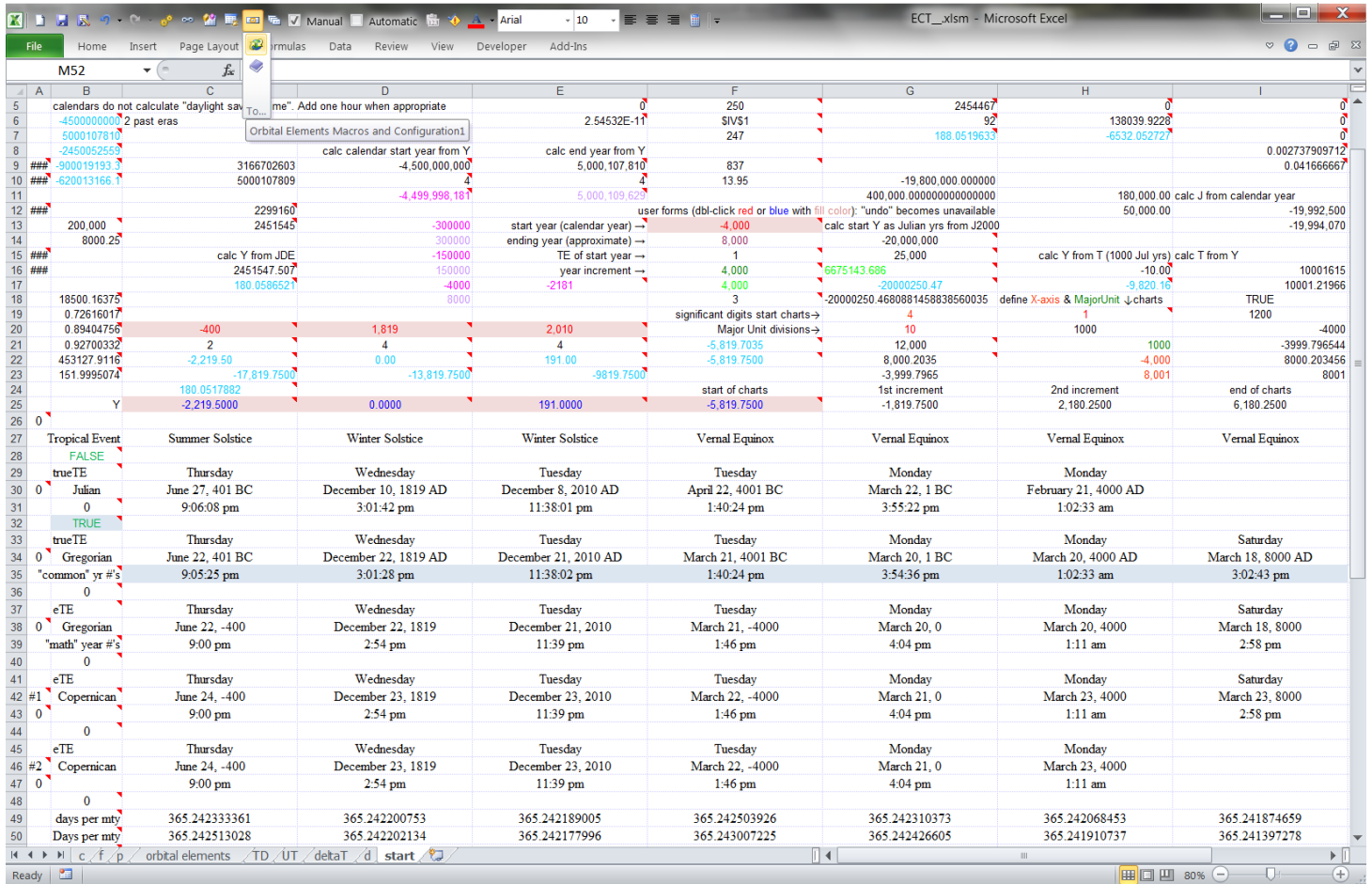
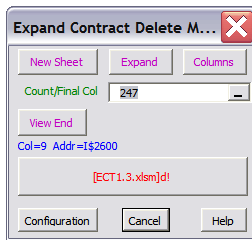
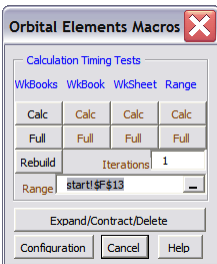


To calculate approximate times of solstices and equinoxes from -20M to +10M, start with the "start" sheet:



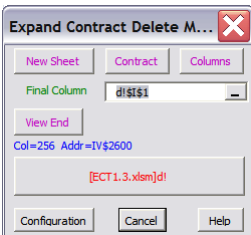
Enter in cell F13 the start year for the charts. In cell F14 enter the approximate ending year. In cell F15 enter the Tropical Event you wish to study: 1 for Vernal Equinox, 2 for Summer Solstice, 3 for Autumnal Equinox, 4 for Winter Solstice. Columns C, D, and E are for single years. Enter the year in row 20, and the Tropical Event in row 21. Cell A26 is for the time zone of the calendars (the comment contains a list). Daylight savings time is not accounted for. An estimation of ΔT is included. Set any of the 4 True/False cells in column B to TRUE to use [Espanak and Meeus \$\Delta T\$ polynomials](#) from -404 to +2003.5, FALSE uses current spreadsheet settings. The difference in time of day for the Julian calendar in Row 31 (set to FALSE) and the Gregorian calendar in Row 35 (set to TRUE) shows the difference between the "Sum of Sines" and the Espanak and Meeus polynomials for ΔT . The difference in the time of day in Row 31 and Row 39, 43, or 47 shows the difference between the "true Tropical Event" (calculated from Planetary Programs and Tables, valid from -4000 to +8000) and the "eccentric Tropical Event" (calculated from an unperturbed elliptical orbit). The data for the charts is on sheet "d" and currently has 4 data points, columns F thru I.



To expand the data on sheet "d", Run the Workbook Macro named "expand_d_IV", or click the OE Add-In icon in the toolbar to open the "Orbital Elements Macros" form, and click "Expand/Contract/Delete", which opens another user form. Make sure the middle button says **Expand**, the right-hand button says **Columns**, and that the **Count/Final Col** box shows "247". Using 247 will expand to Column IV, creating 250 increments of data. Entering 497 (247+250) creates 500 increments, etc. Use cell \$F\$5 to calculate this in cell \$F\$7.

To run the macro click on the large button towards the bottom, making sure it says **[ECT1.6.xls*]d!**! It simply moves column I (currently the "end" column) to column IV, and then copies column IV and pastes to columns I thru IU. The charts are in the sheets "orbital elements", "TD", and "UT". Format the charts to your desires. Define X-axis & MajorUnit of most charts in cells start!H21:H23, or each chart sheet

separately in AX1:AX3. To find the data being charted from sheet d right-click the chart and select data. The main parameters that can be changed are on sheet p! B120:C152. Some different scenarios are in rows 157 thru 189. To use "scenario 1" select p!E157:F189 and "copy". Select cell p!B120 and "paste special", "values", then hit escape (Esc). For a new "custom scenario" also copy and paste the "extra loadup" into p!G269:G277. The custom formulae for scenario 10a (currently loaded up) are in p!BA203:BB272 and are pasted into p!I300:J369.



To contract column IV back to column I (on sheet d!), Run the Workbook Macro named "contract_d_IV_I", or open the "Expand/Contract/Delete" macro form, making sure that the middle button says **Contract**, the right-hand button says **Columns**, and that the box labelled **Final Column** shows "d!\$I\$3". This allows you to save changes you've made while expanded, in a reasonably smaller file. Otherwise simply close the workbook and don't save the changes. Sheet p contains a study of ΔT and is charted on sheet "deltaT". Either Run the Workbook Macro named "expand_p_Row503_840", or open the "Expand/Contract/Delete" macro form and select sheet p, click the **New Sheet** button so that the large button that runs this macro says **[ECT1.6.xls*]p!**, make sure the middle button says **Expand**, the right-hand button says **Rows**, and enter "337" into the box labelled **Count/Final Row**.

I hope that you can find some useful tools in creating your own spreadsheets. Good luck, Steve

For any questions or comments email to steve@thetropicalevents.com