---------- _README.docx ----------

2023-06-22: New Procedure for updating F10Kp-68.ddd and IG-RZ.DDD

The instructions are now in the file:

FLIP-IRI-F107-Kp-Sunspot-Indices-Updater.xlsx

OLD PROCEDURE

- The procedure below still works as long as the IRI files exist and are up-to-date.
- The file **F10Kp-Update.bat** runs the program that updates the F10.7 and Kp data file for the FLIP model. It takes the IRI F10.7 and Ap data, calculates Kp from Ap, and outputs to the **F10KP-68.DDD** data file.
- It is a good idea to check out the **F10Kp-Update.bat** file to see how it works

PROCEDURE TO UDPATE THE FLIP FILE: F10Kp-68.ddd

1. Retrieve the latest indices in the APF107.Data file from the IRI website http://irimodel.org/indices/apf107.dat
2. Copy all the data off the screen and overwrite all the previous data in ApF107-IRI.ddd
3. Run **F107Kp-Update.bat** to create the new version of the data file F10Kp-68.ddd.
4. Update the F10Kp-68.ddd file in all your FLIPEXE folders (you may have multiple folders for different types of FLIP runs, each with a FLIPEXE folder.)
5. If the IRIMODEL indices are not up to date, open the file Day-Month-converter.xlsx and follow the instructions in the Indices-Update TAB. This will update using Potsdam indices.

PROGRAM INFORMATION

- This update program was reworked by Phil Richards in May 2019 to use the data in the IRI model data file APF107. Data instead of the data from NGDC.
- Everything you need is in this Update folder. Source files are here too.
- FLIP converts Ap to Kp using a lookup conversion table.
- There is a sample from the F10Kp-68.DDD file below. NOTE: There is no need to update the F10Kp-68.DDD file unless you are simulating recent dates for which there are no data in the file.
- Note that there may be a few bad data values in the web file. The known bad values up to the year 2019 are taken care of by the program. They are listed at the bottom of this file.
- If you find bad values after 2019, you will need to find the correct value or make an appropriate guess based on days before and after. Be sure to note these dates and values in the ApF107-IRI.ddd header so you can replace them next time.
- **The IRI Kp values in the last 13 lines may be all zeros and are not output by the updater.**

- Below is a sample of the IRI model file format, which is in the web file **APF107.Data** and stored in this folder as the file ApF107-IRI.ddd.

```
 YY MM DD Ap Ap Ap Ap Ap Ap Ap Ap DAp??F107JF107AF107Y
 58  1  1 80 94 56 27 18 22 56 27 48-11257.0262.5241.9
 58  1  2 32 32 27 27 22  9  9  6 21-11263.0261.7241.8
 58  1  3  7  4  2  6  4  4  3  3  4-11262.0261.0241.8
 58  1  4  3  3  2  4  3  2  3  7  3-11261.0260.3241.8
 58  1  5 15  9  5  5  7  6  3  2  7-11246.0259.5241.8
 58  1  6  4  6  7  7 12  9  5  6  7-11254.0258.8241.9
 58  1  7  7  7  6  6 12  4  5  4  6-11255.0257.9241.9
 58  1  8  5  4  7  7  7  7  3  2  5-11255.0257.0242.0
```

The values are as follows

YY = Year
MM = month
DD = day of month
Ap = 3-hour Ap values
DAp = daily average Ap
?? Not sure what the -11 is for and it is ignored
F107J = F10.7 adjusted to 1AU
F107A = 81-day average used by MSIS
F107Y = 12-month average

Conversion to observed F10.7

The FLIP and MSIS models use the observed values (F10.7OBS). The Update program converts the F107J to F107OBS

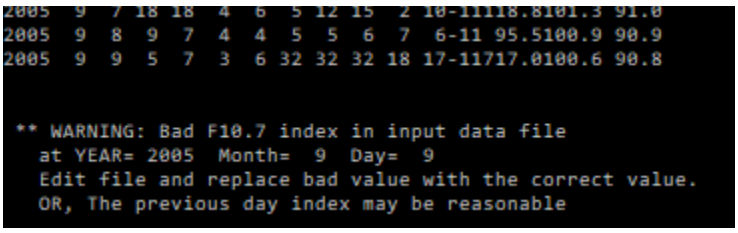
```
          !.. factor to adjust F10.7 for the Sun-Earth distance
          SEDIST(K)=(1.0+0.0167*COS(6.283185*REAL(DoY-3)/365.25))/
     >       (1.0-0.0167*0.0167)

          F107OBS(K)=F107ADJ(K)*SEDIST(K)**2  !.. observed F10.7
```

```
! ************************* F10KP-68.DDD *************************
! DO NOT PUT <BLANK LINES> OR <TABS> IN THIS FILE.
! This file contains Kp indices and the OBSERVED F10.7 values
! These indices cover the period from 1958 to present for the FLIP model.
! *** Note: previously this file only contained data from 1968. That changed
! with the use of the indices from the IRI model website
! the batch file F107Kp-Update.bat is used to produce this data file
! A few IRI F10.7 values are obviously too big. For the 5 dates below
! the F10.7 values have been automatically corrected by the update program
! using the previous data from NGDC. The Kp values in the last 13 lines of
! the IRI data file are all zeros and not output by the updater.
! YY MM DD Ap Ap Ap Ap Ap Ap Ap Ap Apve?F107J F107A F107Y
!  5  8 22  9 18  5  5  9  9  5 12  9-11160.9102.4 91.3
!  5  9  9  5  7  3  6 32 32 32 18 17-11717.6100.6 90.8
!  5  9 13 67 39 27 80 67  7 39 22 44-11305.6 98.6 90.4
!  6 12  6 22 22 18 39 27 18 39 22 26-11556.6 89.0 79.4
! 11  3  7  7  7  4  6  9  6 22 15 10-11924.4113.5 96.4
! Each data line contains  year, month, day, eight 3-hour Kp indices (x10),
! the observed F10.7, and 81 day average F10.7 values.
```

```
! Note that the Kp values are multiplied by ten for storage efficiency but the
! FLIP model will convert them back. FLIP converts the Kp to Ap for the MSIS
model.
! If you wish to simulate more recent periods, you can either add data to
! this file or create a separate file with the same format and different name.
! NOTE that MSIS requires daily F10.7 for 40 days into the future. Therefore,
! this file should only be used up to 40 days before the last date line.
! YYYY MM DD  -- KP INDICES (*10) -- F10.7 F10.7A  <- header for data
1.0    !  SENTINEL value - read with F4.1 format
1958  1  1 60 63 53 40 33 37 53 40 266 271
1958  1  2 43 43 40 40 37 23 23 17 272 271
1958  1  3 20 10  3 17 10 10  7  7 271 270
1958  1  4  7  7  3 10  7  3  7 20 270 269
1958  1  5 30 23 13 13 20 17  7  3 254 268
1958  1  6 10 17 20 20 27 23 13 17 263 268
1958  1  7 20 20 17 17 27 10 13 10 264 267
1958  1  8 13 10 20 20 20 20  7  3 264 266
1958  1  9 17 13 13 27 33 30 33 33 268 265
```

---------- Bad Values in IRI Data File ----------

The IRI Kp values in the last 13 lines are all zeros and are not output by the updater.
The other known bad values up to 2019 are taken care of by the program. If the program encounters a bad value in the future, it will stop and give an error message like this:



Below are known bad data values in the IRI APF107.Data file on the web. Some values are obviously too big. Others are just bigger than the surrounding values.
If the actual values are not known, you can usually replace bad values with the previous day value.

```
  5  8 20  6  3  0  2  4  3  4  2  3-11100.4103.0 91.4
  5  8 21  3  4  3  3  7 39  9  7  9-11100.8102.7 91.3
  5  8 22  9 18  5  5  9  9  5 12  9-11160.9102.4 91.3 higher than surrounding
  5  8 23  7  5  6  6 12  9  6  6  7-11114.8102.1 91.2  Maybe suspect?
  5  8 24 12 18 94300154111 94 32102-11100.7101.9 91.2

  5  9  7 18 18  4  6  5 12 15  2 10-11118.8101.3 91.0
  5  9  8  9  7  4  4  5  5  6  7  6-11 95.5100.9 90.9
  5  9  9  5  7  3  6 32 32 32 18 17-11717.6100.6 90.8   F10ADJ=717.6
  5  9 10  9 12 27 18 27 67 56 48 33-11117.6100.1 90.8
  5  9 11 94132179 94132 56 80 39101-11111.1 99.6 90.7
  5  9 12 39 32132 67 39 80 80132 75-11119.5 99.1 90.5
  5  9 13 67 39 27 80 67  7 39 22 44-11305.6 98.6 90.4   F10ADJ=305.6
  5  9 14 18 12 27 18 27 18 18  7 18-11117.9 98.2 90.3
  5  9 15 15  6 18 67 94132 48 32 52-11120.6 97.8 90.3
  5  9 16 22 22 22 27 18  9 18  9 18-11135.5 97.5 90.2
  5  9 17  3  7  5 15 15 22 15 15 12-11104.9 97.2 90.1
```

6	12	1	4	3	3	4	3	4	12	6	5-11	81.8	88.7	79.3	
6	12	2	3	3	3	0	2	3	2	3	2-11	84.8	88.7	79.3	
6	12	3	4	6	3	0	2	3	4	5	3-11	89.7	88.8	79.3	
6	12	4	0	0	0	0	0	0	2	2	1-11	94.5	88.9	79.4	
6	12	5	0	0	0	9	3	4	3	6	3-11	99.4	88.9	79.4	
6	12	6	22	22	18	39	27	18	39	22	26-11	556.6	89.0	79.4	F10ADJ=556.6
6	12	7	48	27	32	22	22	22	9	18	25-11	121.0	89.1	79.4	??
6	12	8	18	48	32	22	18	15	22	15	24-11	93.1	89.1	79.4	
6	12	9	6	7	5	2	0	12	12	22	8-11	89.6	89.1	79.4	
11	3	4	6	12	12	12	12	15	18	15	13-11	124.7	111.9	96.1	
11	3	5	5	9	3	5	6	5	6	7	6-11	132.5	112.3	96.2	
11	3	6	2	5	2	2	9	7	6	15	6-11	140.3	113.0	96.3	
11	3	7	7	7	4	6	9	6	22	15	10-11	924.4	113.5	96.4	F10ADJ=924.4
11	3	8	7	6	6	3	4	4	4	5	5-11	164.3	113.9	96.5	
11	3	9	7	3	5	3	4	3	5	6	5-11	141.1	114.4	96.6	
11	3	10	7	9	32	22	12	7	27	39	19-11	129.5	114.8	96.7	
11	3	11	48	56	32	7	6	32	48	67	37-11	121.5	115.3	96.8	