1. First file: mayg\_2022avg.txt. Note that the file mayg\_2022avg.txt has columns separated by single space, making a total of 14 columns. The headings are not included in the mayg\_2022avg.txt file, but, in order, they are: Column 1=Year, 2=Doy (Day of Year), 3=ZTD, 4=ZWD, 5=SigZTD, 6=PWV, 7=SigPWV, **8=Ps**, **9=Ts**, **10=ZHD**, 11=GradNS, 12=SigNS, 13=GradEW, 14=SigEW. Please note that the columns of interest in the mayg\_2022avg.txt file are 8th, 9th and 10th columns!
2. Second file: ZTD\_mayg.dat. The ZTD\_mayg.dat file is columns that are tab-separated data. If my English makes sense. Making a total of 8 columns. Column headings are also not included in the file, but, in order, they are: Column 1= Year, 2=Doy, 3=Hour (starting from 0 – meaning 12 am of Doy 1), 4=Measure, **5=ZTD**, 6=ZTDex, 7=ZTDerror, 8=Sats. If you investigate the file, it has data for the whole year but then there are days missing from the file meaning that there are #hours that are also skipped. Say for example Doy 1 has 0-23 hours (12am to 11pm – just roll with it. We would like to do the average of columns 4,5,6,7,8 for each day. So, we do average 0-23 hours, considering column 3 (Hour). Then Doy 2 average is from 24-47 (12 am to 11pm of the second Doy). Note that you should write a script where you consider the Doy and Hour, But we don’t automatically assume that the number of rows of data for a random Doy is 24. NO! Just average the data available. I hope average means the sum divided by the number of data. Say a day has 12 rows of data – you do the sum of each column of interest separately and divide by 12 separately. Not 24! Then output the daily averages to ZTD\_daily\_mayg.dat. NAMING IS IMPORTANT for me! I have so many files, deciding on the names brings some order in this world. Haha. You can laugh.

ZTD\_daily\_mayg.dat file will have new columns as follows: Column 1= Year, 2=Doy, 3=Measure, **4=ZTD**, 5=ZTDex, 6=ZTDerror, 7=Sats. NB: Hour column in the original file is not important here.

1. Third file: ZTD\_daily\_mayg.dat file. This one you generate yourself.
2. Compute (a) – (c): Write a single script to compute ZWD, Tm and PWV.
3. ZWD: Equation ZWD=(ZTD\*1000)-ZHD. ZWD is equal to ZTD\*1000 minus ZHD.

* ZHD source: Column **10=ZHD** of mayg\_2022avg.txt file.
* ZTD source: Column **4=ZTD** of ZTD\_daily\_mayg.dat. NB: DON’T CONFUSE THE FILES!

YOUR task here is to write another script where you check if the Doy is the same, then you do the math ZWD = ZTD\*1000 – ZHD. We multiply by 1000 because ZTD is in meters while ZHD is in millimeters. Therefore, the resulting ZWD is in mm.

1. Weighted mean temperature, **Tm**, is computed from surface temperature **Ts** using equation **Tm** = 70.2 + 0.72**Ts**.

Source of **Ts** is column **9** of mayg\_2022avg.txt file.

1. PWV (in mm).

Where k3=3.776×105, k2’=16.52, Rv=461.495. The only variables are Tm and ZWD, and of course the PWV. Do not mind the units. I am expecting PWV to be in the range 10-100 mm.

SUMMARY of (a) – (c): Write the data to a new file PWV\_daily\_mayg.dat file. It will be like adding new columns to ZTD\_daily\_mayg.dat file, where the first 7 columns are: Column 1=Year, 2=Doy, 3=Measure, **4=ZTD**, 5=ZTDex, 6=ZTDerror, 7=Sats. NB: You only write data for Doy that are both in the original files, as you did while computing for ZWD – you checked if a specific Doy was in both files, then you did ZWD=ZTD-ZHD. Next columns that you write to PWV\_daily\_mayg.dat file are: Column 8= ZWD, 9= **Tm**, 10=PWV.