

The vzon1.dat, vzon2.dat, ..., vzon7.dat files contain the variation in zonal velocity as a function of latitude and longitude. The format is:

```
Nplong
Nplat
longperbin
Icaro
Rotperbin
CarringtonStart
CarringtonEnd
HowardDayStart
HowardDayEnd
/
Data1
Data2
.
.
Data(nplat_1)
Data(nplat)
/
```

etc

\*\*\*\*\*

`Nplong` - is the number of longitude bins in the file.

`Nplat` - is the number of bins in  $\sin(\text{long})$  starting in the South.

`longperbin` - is the number of degrees of longitude per bin.

`Icaro` - a flag indicating if the Carrington rotation rate was used, a value of 1 indicates yes.

`Rotperbin` - the number of rotations averaged together. If this is larger than 1 then `longperbin` must be 360.

`CarringtonStart` - number of the Carrington rotation at the start of the sequence.

`CarringtonEnd` - the number for the Carrington rotation at the end of the sequence.

`HowardDayStart` - The Howard day number for the first observation included in the file.

`HowardDayEnd` - The Howard day number for the ending observation included in the file.

For the time keeping functions the following numbers are useful:

For `CarringtonTime = 0.0` the year was: 1853.7865

The Carrington rotation rate in years is: 0.074674475 so that `yr`, the year number, is

$$yr = 0.074674475 * (\text{CarringtonRotation}) + 1853.7865$$

The `HowardDay` number starts from zero on Jan. 1, 1965. To get the `HowardDay` from the `MDI day` add 10227. To get `JulianDate` from `HowardDay` subtract 1238.5 then add 2440000.0

\*\*\*\*\*

A torsional oscillation plot can be found in Ulrich and Boyden (2005ApJ...620L.123U). The torsional oscillation data set is broken into seven parts. The velocity variation versus time can be recombined for each specified latitude.

Note that there are some points which are wild due to poor observing conditions, especially during the winter months. In the publication Ulrich (2001ApJ...560..466U) I removed these by a statistical test. I considered groups of 60 points. With these 60 points I computed the rms and found the most discrepant point. If the removal of the most discrepant point reduced the variance by more than 10 percent, the point was replaced by an interpolated value. This process was continued until no further points were indicated for deletion. This wild point removal has not been applied to the data sets provided here.

Please keep me informed if any of this data is used in a publication.