

GCS Procedure

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1. Make sure that python, git and pip is installed.

```
python3 --version
git--version
pip --version
```

If any of the above is not installed, run the necessary code from the following to install the same.

```
sudo apt update
sudo apt install python3
sudo apt install git
sudo apt install python3-pip
```

2. Run the code:

```
pip install git+https://github.com/johan12345/gcs\_python.git
```

This will install the Graduate Cylindrical Shell software.

3. Run the following code

```
gcs_gui "2010-04-03 11:00" STA SOHO STB
```

4. Superimpose the grid and note the apex height.
5. Run the code again (for 30 mins later or 1 hr later). Fit the grid and note the value of apex height. Estimate the time taken for the CME to arrive at Earth.

6. Open

<https://cdaweb.gsfc.nasa.gov/>

7. Select

- ACE
- Magnetic fields(balloon)
- Particles (Space)
- Plasma
- Ground based magnetometer

Submit.

8. Select all checkboxes

Submit.

9. Select date and time such that it encompasses the estimated time at which the CME reaches earth.

10. Under **OMNI_HRO_1MIN**, select the following options:

- Magnitude of avg. field vector (nT)
- Bx (nT), GSE
- By (nT), GSE
- Bz (nT), GSE
- Bz (nT), GSM
- Flow Speed (km/s), GSE
- Proton density (n/cc)
- Temperature (K)
- SYM/H - 1-minute SYM/H index from WDC Kyoto

Submit.

Analyze the plot obtained to verify the estimation.