

IPPW-11 Short Course

Data Analysis Exercise

Ralph D. Lorenz

*Johns Hopkins University Applied Physics
Laboratory, Laurel, MD. USA*

[*Ralph.lorenz@jhuapl.edu*](mailto:Ralph.lorenz@jhuapl.edu)

[*http://www.lpl.arizona.edu/~rlorenz*](http://www.lpl.arizona.edu/~rlorenz)

Matt Sorgenfrei

NASA Ames Research Center



JOHNS HOPKINS
APPLIED PHYSICS LABORATORY

Goal –

To engage IPPW students in a more interactive experience at the short course

To familiarize attendees with real data from planetary probe missions and what it can show

To expose students to philosophies and methods of data exploration

Encourage further investigation, and diligent archiving!

Format

Example datasets (formatted for convenience) online

Some example analyses offered. Approaches to examining data given.

Then you are on your own! (you are encouraged NOT to do a literature search to find what has been published on these data, but to look for what you can find yourself)

Poke around – if you find something interesting make a slide ! We'll talk about them tomorrow

Datasets

Dataset_1 Pioneer Venus Descent Temperature

Dataset_2 Huygens Receiver AGC

Dataset_3 Pathfinder Accelerometer

Dataset_4 Huygens Temperature

Dataset_1 Pioneer Venus Descent Temperature

Time in s. Temperature in K.

This dataset is not, in fact, archived on the PDS. Data was generated by digitizing points on a graph in a published paper (the data were acquired in 1979, before PDS existed)

Dataset_2 Huygens Receiver AGC

Time in (s) Received Signal Strength (dB)
measured by Huygens receiver on Cassini

Data are on PDS, but in a very ugly form (8 LSB in one file, 8 MSB in another. Calibration data elsewhere). Have made working version available – undergoing peer review at PDS, presently online at

<http://pds-atmospheres.nmsu.edu/~itrejo/Huygens/Huygens.html>

Dataset – 3

Mars Pathfinder entry accelerometer record

Time (s) Z-axis deceleration (g)

(a subset of 3-axis record at 'MPFL-M-ASIMET-2/3-EDR/RDR-EDL-V1.0' on the PDS atmospheres node)

File is s_sacc_s.tab (see description in [s_sacc_s.lbl](#))

http://pds-atmospheres.nmsu.edu/cgi-bin/getdir.pl?dir=edl_erdr&volume=mpam_0001

See if you can find it by googling !

Dataset 4 - Huygens descent temperatures

Time (s) Temperature (K)

Originally HASI_L3_TEMD_FINE2.TAB
dataset at PDS atmospheres node

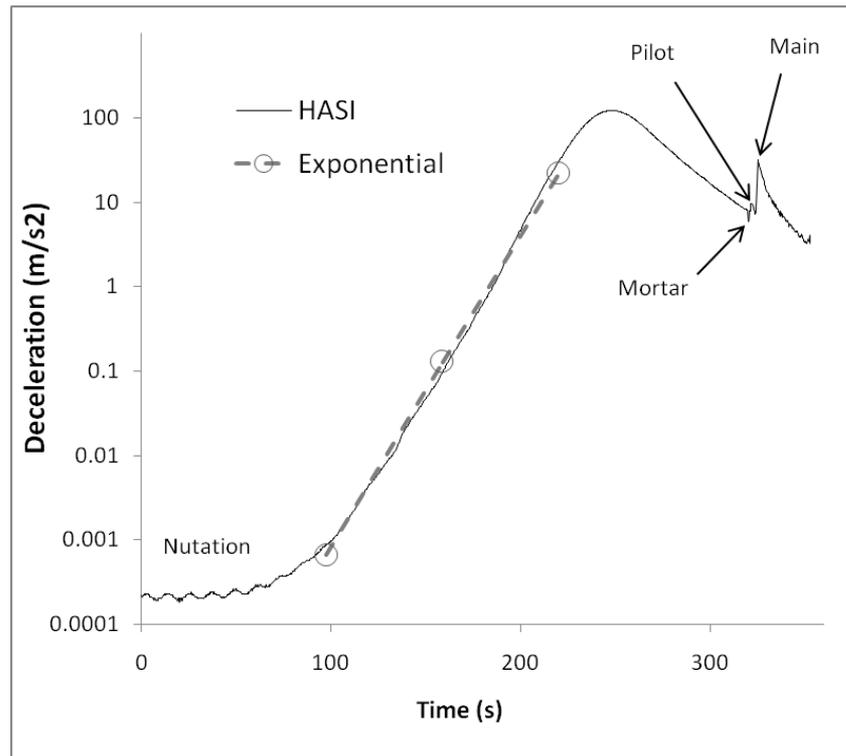
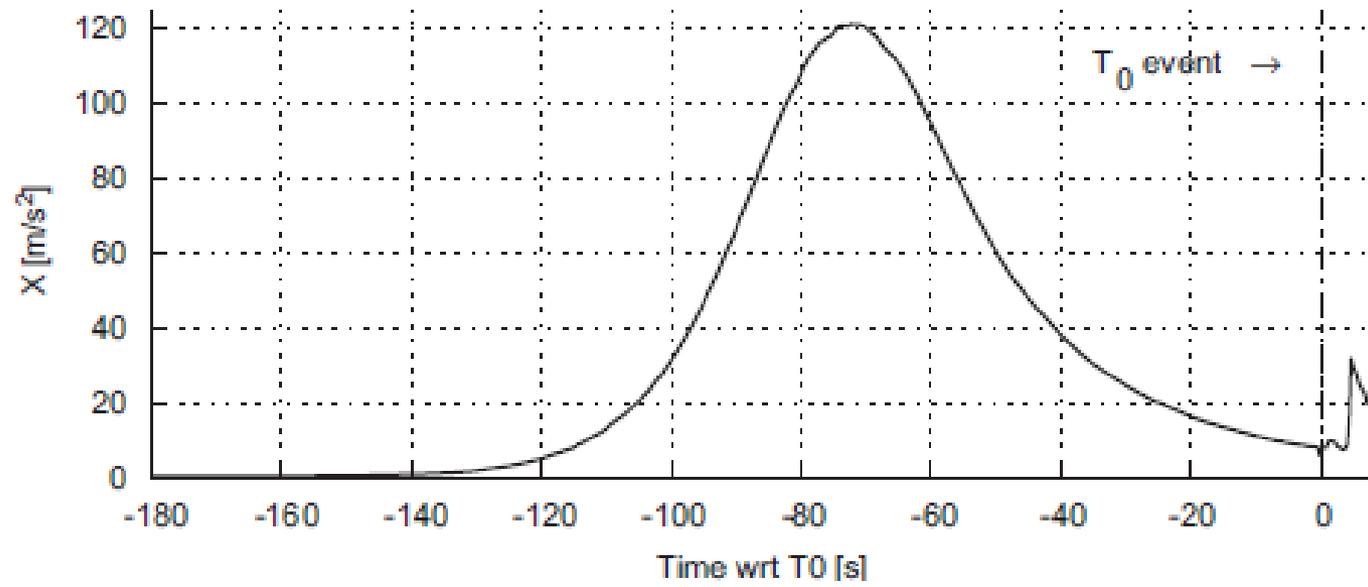
http://pds-atmospheres.nmsu.edu/cgi-bin/getdir.pl?dir=index&volume=hphasi_0001

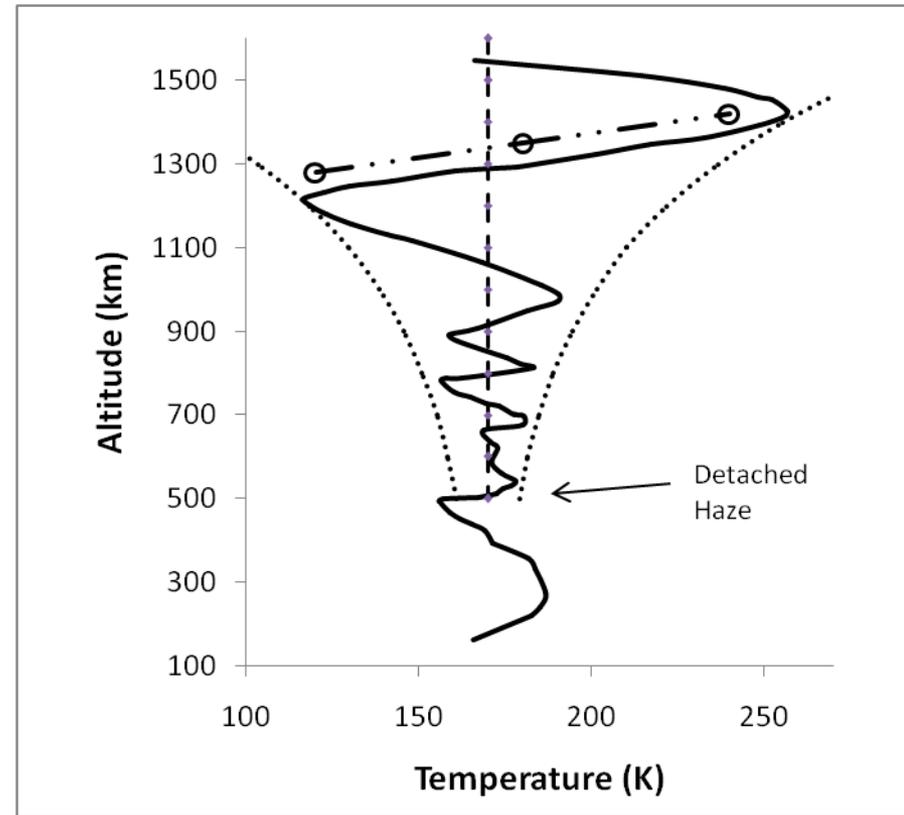
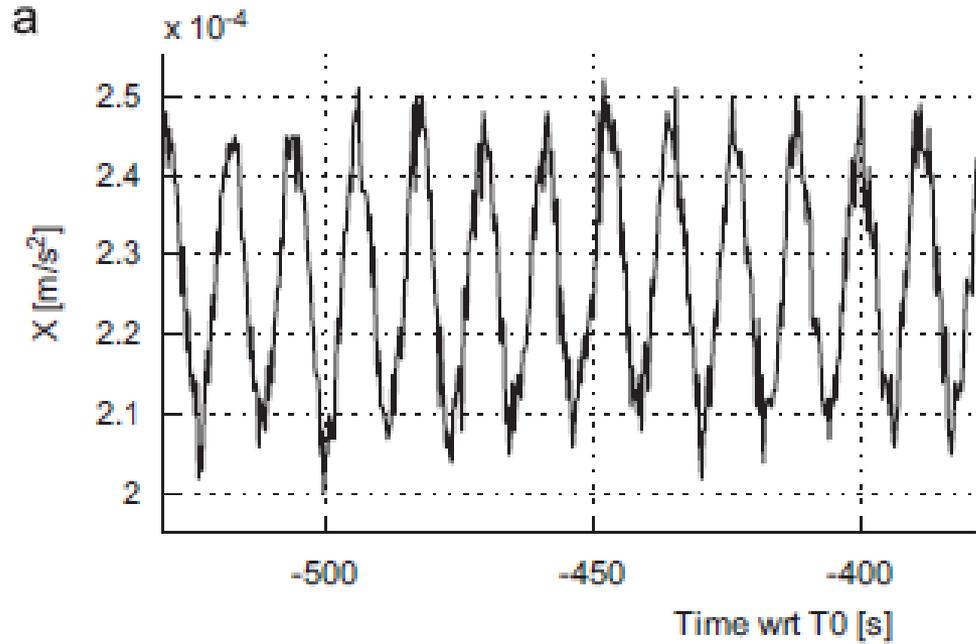
(Broadly-speaking:

level 1 – raw readings. Level 2 – physical units, time-ordered. Level 3,4 - physical coordinates (profile vs altitude, data selected, possibly resampled, bad data omitted/flagged)

Some things to try

- 1) Imagine what is happening. Put your mind on the probe.
- 2) Zoom in on small time windows – what is happening ?
- 3) Zoom out – logarithmic axes can be good
- 4) Detrend (high-pass filter, Unsharp masking, etc.)
- 5) History of statistics like kurtosis
- 6) Periodograms/ Wavelet transforms/ Power Spectra / Autocorrelation, etc. etc.





Slight deviations from zero, and from straight line, inform key aspects of the vehicle dynamics and of Titan's atmospheric structure.

Products

If you have something you'd like to show, prepare a single slide (pdf, ppt, PNG). Name the file N_lastname_X.pdf where N is the dataset number 1-4, and optional X is 1,2 if you do more than one graph for a single dataset (no more than 2 graphs per person total, please)

I will pass around a USB datastick tomorrow in my talk at 10.30.

We will discuss what you've found in the closing session. (No guarantee we can discuss everyone's contribution – we'll try!)