Huygens Integrated Timeline

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This data product is a fusion of several existing datasets spread across the original Huygens archive: these data would take some time to compile, and use very different time bases (milliseconds from switch-on, descent time in seconds from T0, Earth receive time in UTC, etc.). Here they have been extracted and resampled to a common one-second timeline (seconds from T0). The original datasets should be consulted in the investigation of any anomaly or significant finding, in that higher resolution may be available (the HASI, AGC and VLBI records in particular have a higher native resolution, and have been averaged to yield the 1-second values here). Two additional datasets beyond the original Huygens archive are included. One is the AGC record on the Huygens receiver developed by M. Perez (this full dataset is being archived separately at the same time as this integrated timeline: the original uncalibrated data are in the Housekeeping archive, with different bytes in different files.) The other dataset is a set of frequency measurements made by high-performance receivers used for the VLBI tracking of the Huygens probe: these give a higher time resolution than the Doppler Wind experiment archive product. These two datasets are also being archived separately at their full time resolution.

The timeline product's principal application is anticipated to be a convenient look-up of time/altitude and dynamical conditions of the probe. A summary plot is also provided.

In all fields, -999 denotes that data are not present (e.g. before that system began operating, or during calibration periods of the Doppler measurement).

Col 1 is time in (s) from T0 "T0 is the official start of the descent. Its UTC value is The T0 time, official start of the descent, is known with an accuracy of 0.125 seconds. Its official UTC value is 2005-014T09:10:20.828 ."

Col 2 is the Descent Trajectory Working Group (DTWG) Pressure in Pa (this represents a smoothed model pressure profile). From HUY_DTWG_DESCENT_VEL.TAB

Col 3 is DTWG Altitude in km. This is referenced to a 2575km sphere. In fact a 14-th order spherical harmonic fit to radar data shows that the planetary radius of the Huygens landing site appears to be within 200m of this value. Given that errors in the radius determination and spherical harmonic fit are ~140m, the discrepancy is not significant and is comparable with other unmodeled factors such as atmospheric tide. From HUY_DTWG_DESCENT_VEL.TAB

Col 4 is DTWG VERTICAL VELOCITY. Note that this is lower than the actual probe flight speed until about 120s. This is because the vehicle has a substantial horizontal velocity component at chute deployment and is still completing a gravity turn until about a minute after the DTWG data begin. HUY_DTWG_DESCENT_VEL.TAB

Col 5 is the Radio AGC value at the start of the specified second, in dBm. See the AGC dataset documentation

Col 6 is the slope of the radio AGC value in dB/s over the following second (typically ~8 data points). See the AGC dataset documentation

Col 7 is the Mean output of the HASI X-servo accelerometer (m/s2) from the HASI PDS archive, files HASI_L3_ACCD_SERVO.TAB (descent) and HASI_L3_ACCS_SERVO.TAB (surface). Note that there is a gap in this dataset from just prior to just after impact.

Col 8 is the Standard deviation (m/s2) of the HASI X-servo readings over 1 second. This shows some spurious periodicity owing to the nonintegral sample rate so that there is a periodic variation in the number of samples per second. This may be best plotted after some smoothing. Note that gravitational acceleration on Titan increases slightly with mission time due to the decreasing altitude, and is 1.35 m/s2 at the surface.

Col 9 is the SSP Til X reading in degrees from a dataset communicated by M. Leese (essentially the SSP PDS archive file SSP_TIL_123456_0_R_ATMOS.TAB with a minor timing correction).

Col 10 is the SSP Til Y reading, as above. This is believed to have a spurious offset of about -9 degrees

Col 11 is the HASI temperature in K, corrected for known dynamic effects. Original data were sampled at about once per 5s. From HASI PDS archive file HASI_L4_TEMP_TAB.txt

Col 12 is the HASI pressure reading in Pa corrected for known dynamic effects. Original data were sampled at about once per 5s. Note that this differs from the DTWG pressure in that the HASI pressure is the raw sensor reading. HASI_L4_PRESSURE_TAB.txt

Col 13 is the Radial accelerometer reading in mm/s2 (averaged over 1 s intervals). The raw data has between 2 and 4 samples per second. Note that the raw reading is highly quantized. The data are extracted from the Housekeeping PDS archive, filename HK_CDMS_RASU_D8005A_TAB.txt

Col 14 is a detrended sky frequency from the DWE dataset, measured over 3s and 5s periods. These are extracted from the DWE PDS archive, data files CARRFREQ_PARKES_TAB.txt and CARRFREQ_GBT_TAB.txt. The Doppler shift is measured over ~100s periods, with similar gaps (when the telescopes were steered to calibration sources). Because of the detrending applied (since the range-rate varied due to Earth rotation etc.) there is little physical significance to Doppler between periods; the data portray the Doppler variation within a measurement period.

Col 15 is a detrended sky frequency sampled at a much higher rate recorded by the VLBI receivers. These data were generated by the VLBI team and communicated to R. Lorenz by S. Pogrobenko and L. Gurvits. Because of the detrending applied (since the range-rate varied due to Earth rotation etc.) there is little physical significance to Doppler between periods; the data portray the Doppler variation within a measurement period.