Description of TCSP HAMSR 2-km HDF data files

Filename: ‘tcsp_hamsr_yyyymmdd __nnnn.hdf’
   ‘yyyymmdd’: date of beginning of data set
   ‘nnnn’: number of data records (see ‘dim3’ below)

Format
   Standard HDF

Content
   Header (single record)
       1. Year
       2. Day of year
       3. Hour  } Time of first data record
       4. Minute
       5. Second
       6. No. of items per record (nominally 390)
       7. Record length in bytes (nominally 780)
       8. dim1: first dimension - no. of channels (nominally 25)
       9. dim2: second dimension - no. of cross-track samples (nominally 15)
      10. dim3: third dimension - no. of along-track records (varies)

Time+Nav (repeats until EOF, for a total of ‘dim3’ records)
       1. Record no. (starting at 1)
       2. Year
       3. Day of year
       4. Hour
       5. Minute
       6. Second
       7. Nav-time – HAMSR-time in seconds
       8. Latitude (deg*100)
       9. Longitude (deg*100)
      10. Altitude (m)
      11. Heading (deg*100)
      12. Pitch (deg*100)
      13. Roll (deg*100)
      14. Ground speed (m/s*100)
      15. Air temperature (°C*100)

Tb (repeats until EOF, for a total of ‘dim3’ records)
       dim1*dim2 array (K*10)
       Note: A value of 0 indicates invalid data

Instrument characteristics

Channels
       1. 50.3 GHz (BW = 0.340 GHz)
       2. 51.76 GHz (BW = 0.400 GHz)
       3. 52.8 GHz (BW = 0.400 GHz)
       4. 53.481 & 53.711 GHz (BW = 2x0.170 GHz)
       5. 54.4 GHz (BW = 0.400 GHz)
       6. 54.94 GHz (BW = 0.400 GHz)
7. 55.5 GHz (BW = 0.330 GHz)
8. 56.02 & 56.67 GHz (BW = 0.270 & 0.330 GHz)
9. 113.25 GHz (BW = 1.0 GHz)
10. 115.25 GHz (BW = 1.0 GHz)
11. 116.20 GHz (BW = 0.500 GHz)
12. 116.70 GHz (BW = 0.500 GHz)
13. 117.15 GHz (BW = 0.400 GHz)
14. 117.55 GHz (BW = 0.400 GHz)
15. 118.75 ± 0.800 GHz (BW = 2x0.400 GHz)
16. 118.75 ± 0.450 GHz (BW = 2x0.300 GHz)
17. 118.75 ± 0.235 GHz (BW = 2x0.130 GHz)
18. 118.75 ± 0.120 GHz (BW = 2x0.100 GHz)
19. 166.0 GHz (2x2.0 GHz)
20. 183.31 ± 10 GHz (2x3.0 GHz)
21. 183.31 ± 7.0 GHz (2x2.0 GHz)
22. 183.31 ± 4.5 GHz (2x2.0 GHz)
23. 183.31 ± 3.0 GHz (2x1.0 GHz)
24. 183.31 ± 1.8 GHz (2x1.0 GHz)
25. 183.31 ± 1.0 GHz (2x0.5 GHz)

**Scanning**
- Scan plane: perpendicular to flight direction
- Scan direction: right to left, through nadir (i.e. scan axis points in the flight direction)
- Swath is approximately symmetric around nadir

**Sampling**
- Beam width: approximately 6° (FWHM) – corresponds to 2 km at nadir (from 20 km)
- Raw sampling:
  - Cross-track: approximately every 3° - corresponds to 1 km at nadir
  - Along-track: approximately every 1.3 sec – corresponds to .27 km (at .21 km/sec)
- Integration time: 11 ms

**Polarization**
- All channels detect a single linear polarization. At nadir, the polarization direction corresponds to V polarization (i.e. the polarization vector lies in the plane of incidence).
- As the beam scans away from nadir, the polarization vector rotates out of the plane of incidence. This results in a mix of V and H polarizations. With V corresponding to a polarization angle of 90° and H to 0°, the polarization angle for a scan angle \( \phi \) is 90° - \( \phi \).

**2-km data characteristics**
- Channels: Full set of 25
- Swath: 15 cross-track samples - subset of raw data
  - Approximately centered around nadir (nadir ≈ center sample, no. 8 of 15)
  - Approximate swath width: ± 42° between sample centers; ±46° between 3-dB edges
- Sampling: Each sample is average of 2 cross-track x 8 along-track raw samples, except for the swath-edge samples #1 and #15 – which consist of 1x8 averages to minimize edge effects
  - Cross-track increment: approximately 6° - 2 km on the ground at nadir (3° and 1 km, respectively, for samples 1 and 15)
  - Along-track increment: 10.4 sec – corresponds to 2.2 km (at .21 km/sec)
Corresponding equivalent integration time: 178 ms
In the 183-GHz band the 166-GHz channel and the rest of the channels, respectively, are sampled during alternate scans, and averaging corresponds to 2 cross-track x 4 along-track raw samples. Effective integration time is 89 ms.

Navigation: Subset of raw nav data
5th of every 8 samples
Corresponds to near-center of averaged sample cell
Header data copied from first nav data record

Contact information
Bjorn Lambrigtsen; lambrigtsen@jpl.nasa.gov; (818)354-8932