User Guide for the Aquarius Celestial Sky Microwave Emission Map product

This is a product developed by NASA Goddard Space Flight Center (GSFC).

Contact Information:
Emmanuel Dinnat – Emmanuel.dinnat@nasa.gov
David M. Le Vine – david.m.levine@nasa.gov

This datasets contains three maps of L-band (wavelength = 21 cm) microwave brightness temperature of the celestial Sky used in the processing of the NASA Aquarius instrument data.

The maps report Sky brightness temperatures (in Kelvin) gridded on the Earth Centered Inertial (ECI) reference frame epoch J2000. They are sampled over 721 Declinations between -90 degrees and +90 degrees and 1441 Right Ascensions between 0 degrees and 360 degrees, all evenly spaced at 0.25 degrees intervals. The brightness temperatures are assumed temporally invariant and polarization has been neglected. They include microwave continuum and atomic hydrogen line (HI) emissions as well as Cassiopeia A (Cas A), which is a supernova remnant in the constellation Cassiopeia and a very strong radio source at frequencies in the L-band.

The three maps differ only in the way the strong radio source Cas A has been included into the whole sky background surveys:

1/ **TB_no_Cas_A** : does not include Cas A and reports only the whole Sky surveys,
2/ **TB_Cas_A_1cell** : spreads Cas A total flux homogeneously over 1 map grid cell (i.e. 9.8572E-6 sr).
3/ **TB_Cas_A_beam** : spreads Cas A over surrounding grid cells using a convolution by a Gaussian beam with HPBW of 35 arcmin (equivalent to the instrument used for the Sky surveys).

More details about the data sources [1]–[7] and data processing to combine the various all-sky surveys can be found in [8].

The Celestial Sky (CS) emission maps reported in this dataset are important for ocean remote sensing at low microwave frequencies in the L-band (e.g. sea surface salinity) because the CS microwave radiations are reflected by the ocean surface into the radiometers and introduce significant regional and seasonal errors in retrieved geophysical parameters if left uncorrected. The Sky is also used to calibrate the sensors because of its temporal stability and large spatial homogeneity away from the galactic plane and strong sources [9]–[11].

The file structure and the dataset names are reported in Figure 1.

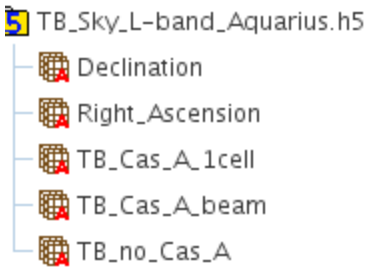

Figure 1 File structure.

Datasets:

Declination : declination in ECI J2000 reference frame [degrees], size = 721, Min = -90°, Max = 90°.
Right_Ascension : right ascension in ECI J2000 reference frame [degrees], size = 1441, Min = 0°, Max = 360°.
TB_Cas_A_1cell : TB map of celestial sky including Cassiopeia A spread over one grid cell [Kelvin], size = 1441x721, Min = 3.17966 K, Max = 2649.45 K.
TB_Cas_A_beam : TB map of celestial sky including Cassiopeia A convolved by gaussian beam [Kelvin], size = 1441x721, Min = 3.17966 K, Max = 214.738 K.
TB_no_Cas_A : TB map celestial sky without Cassiopeia A [Kelvin], size = 1441x721, Min = 3.17966 K, Max = 81.0925 K.

File Name Format:

There is only one data file named **TB_Sky_L-band_Aquarius.h5**.

References

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