

## **NOAA/NWS/CPC Merged 4 Km IR Tb dataset documentation extracted from**

### **Integrated Multi-satellitE Retrievals for GPM (IMERG) Technical Documentation**

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The *\*Merged 4-Km IR Tb data set\** is produced by the Climate Prediction Center (CPC), NOAA National Centers for Environmental Prediction, Washington, DC under the direction of P. Xie. Each cooperating geostationary (geo) satellite operator (the Geosynchronous Operational Environmental Satellites [GOES], United States; the Geosynchronous Meteorological Satellite [GMS], followed by the Multi-functional Transport Satellite [MTSat] and then Himawari, Japan; and the Meteorological Satellite [Meteosat], European Community) forwards infrared (IR) imagery to CPC. Then global geo-IR are zenith-angle corrected (Joyce et al. 2001), re-navigated for parallax, and merged on a global grid. In the event of duplicate data in a grid box, the value with the smaller zenith angle is taken. The data are provided on a 4-km-equivalent latitude/longitude grid over the latitude band 60°N-S, with a total grid size of 9896×3298.

The dataset was first produced in late 1999, but the current uniformly processed record is available starting 17 February 2000. CPC is working to extend the record back to January 1998.

All 5 geo-IR satellites are used, with essentially continuous coverage. GMS-5 was replaced by GOES-9 starting 01 UTC 22 May 2003, which introduced slightly different instrument characteristics. Then starting 19 UTC 17 November 2005 the new Japanese MTSat-1R took over, followed by MTSat-2 on 1 July 2010. Himawari 8 took over effective 0200 UTC on 7 July 2015. There is an extended data dropout in the presently available IR dataset for Japanese sector from late on 17 November 2005 to the middle of 22 March 2006 due to issues in NOAA coping with the format of the then-newly introduced MTSat-1. Consequently, during that period a small sector over Japan lacks all data, and the adjacent IR are entirely based on high-zenith-angle data from the METEOSAT to the west and GOES-W to the east.

Each UTC hour file contains 2 data fields. All geo-IR images with start times within 15 minutes of the UTC hour are accumulated in the "on-hour" field. Images with start times within 15 minutes of the UTC hour plus 30 minutes are accumulated in the "half-hour" field. The nominal image start times for the various satellites and their assignment to half-hour fields are shown in Table 10.

Table 10. Nominal sub-satellite longitude (in degrees longitude) and image start time (in minutes past the hour) for the various geosynchronous satellites. The start times are displayed according to their assignment to either the on-hour or half-hour fields in the CPC Merged 4-Km IR Tb data set. Full-disc views are guaranteed only at 00, 03, ..., 21 UTC. These appear in the on-hour field except MTSat appears in the previous half-hour for all hours. For images not at these times, a satellite's "image" may be assembled from various operator-specified regional sectors. MTSat provides N. Hemisphere sectors (only) on-hour, except S. Hemisphere sectors (only) at 00, 06, 12, 18 UTC.

Satellite	Sub-sat. Lon.	on-hour	half-hour
Himawari-8 (formerly MTSAT-2, MTSat-1R, GMS)	140°E	00	30
GOES-E (8, 12, 13, now 16)	75°W	45	15
GOES-W (10, 11, 15, 17, now 18)	135°W	00	30
Meteosat-11 (formerly 5, 7, 8, 9, 10)	9.5°E	00	30
Meteosat-9 (formerly 5, 7, 8)	45.5°E (63°E for 5, 7; 41.5°E for 8)	00	30

Table 11. Geo-IR satellites contained in the Merged 4-km IR Tb dataset provided by NOAA/NWS/CPC.

	GMS	GOES- WEST	GOES- EAST	METEOSAT	INDOEX
1998	GMS-5	GOES-10	GOES-8	MET-7	MET-5
1999	GMS-5	GOES-10	GOES-8	MET-7	MET-5
2000	GMS-5	GOES-10	GOES-8	MET-7	MET-5
2001	GMS-5	GOES-10	GOES-8	MET-7	MET-5
2002	GMS-5	GOES-10	GOES-8	MET-7	MET-5
2003	GMS-5/ GOES9	GOES-10	GOES-8/ GOES-12	MET-7	MET-5
2004	GOES-9	GOES-10	GOES-12	MET-7/ MSG-1	MET-5
2005	GOES- 9/MTSAT-1R*	GOES-10	GOES-12	MSG-1	MET-5
2006	MTSAT-1R*	GOES-10/ GOES-11	GOES-12	MSG-1	MET-5
2007	MTSAT-1R	GOES-11	GOES-12	MSG- 1/MSG-2	MET-5/ MET-7
2008	MTSAT-1R	GOES-11	GOES-12	MSG-2	MET-7
2009	MTSAT-1R	GOES-11	GOES-12	MSG-2	MET-7
2010	MTSAT-1R	GOES-11	GOES-12/ GOES13	MSG-2	MET-7
2011	MTSAT-1R	GOES-11/ GOES-15	GOES-13	MSG-2	MET-7
2012	MTSAT-1R	GOES-15	GOES-13	MSG-2/ MSG-3	MET-7
2013	MTSAT-1R	GOES-15	GOES-13	MSG-3	MET-7
2015	MTSAT-1R/H- 8	GOES-15	GOES-13	MSG-3	MET-7
2016	H-8	GOES-15	GOES-13	MSG-3	MET-7
2017	H-8	GOES-15	GOES-13/ GOES-16	MSG-3	MET-7/ MSG-1
2018	H-8	GOES-15	GOES-16	MSG-3	MSG-1
2019	H-8	GOES-15/ GOES-17	GOES-16	MSG-3	MSG-1
2020	H-8	GOES-17	GOES-16	MSG-3	MSG-1
2021	H-8	GOES-17	GOES-16	MSG-3	MSG-1
2022	H-8	GOES-17	GOES-16	MSG-3	MSG-2
2023	H-8	GOES-18	GOES-16	MSG-3	MSG-2

- \* The beginning of the MTSat-1 record, 19 UTC on 17 November 2005 to the middle of 22 March 2006 is not available in the current IR record due to format issues at the time the data were introduced.