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# NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

# GB/T 43997.2-2024

## Surface temperature retrieval from thermal infrared remote sensing data - Part 2: Split-window method

地表温度热红外遥感反演 第2部分：分裂窗法

**Issued on: April 25, 2024** **Implemented on: November 1, 2024**

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**Standardization Administration of the PRC**

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## Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents" Drafting: This document is Part 2 of GB/T 43997 "Surface Temperature Inversion by Thermal Infrared Remote Sensing": GB/T 43997 has been published as follows part:

--- Part 1: Single channel method;

--- Part 2: Split window method: Please note that some of the contents of this document may involve patents: The issuing organization of this document does not assume the responsibility for identifying patents: This document was proposed by the Chinese Academy of Sciences: This document is under the jurisdiction of the National Technical Committee on Remote Sensing Technology Standardization (SAC/TC327): This document was drafted by: Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences, University of Electronic Science and Technology of China, Kunming University of Science and Technology, Suzhou Zhongke Tianqi Remote Sensing Technology Co:, Ltd:, Chengdu Institute of Mountain Hazards and Environment, Chinese Academy of Sciences and Ministry of Water Resources, Hebei University of Geosciences, Guilin University of Technology University of Chinese Academy of Sciences, Institute of Geographic Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing Normal University, Peking University, Sun Yat-sen University, Institute of Aerospace Information Innovation, Dalian Maritime University, Southwest University, National Satellite Meteorological Center, China Resources Satellite Application Center, China Science and Technology STAR CHARTS LIMITED: The main drafters of this document are: Li Zhaoliang, Wu Hua, Tang Bohui, Duan Sibo, Zhou Chenghu, Leng Pei, Zhao Wei, Liu Xiangyang, Shang Guobei, Chen Kunshan, Jiang Xiaoguang, Tang Ronglin, Yan Guangjian, Ren Huazhong, Zheng Xiaopo, Ma Lingling, Qiu Shi, Gao Maofang, Tan Zhihao, Zhao Enyu, Zhang Xia, Huang Liang, Fu Zhitao, Qian Yonggang, Gao Caixia, Wang Ning, Ouyang Xiaoying, Liu Zhaoyan, Wang Xinhong, Yu Wenping, Liu Meng, Fan Jinlong, Han Qijin, and

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GB/T 43997 "Surface Temperature Inversion by Thermal Infrared Remote Sensing" aims to provide the inversion of surface temperature using aerospace or aviation thermal infrared remote sensing data: GB/T 43997 is planned to consist of four parts:

--- Part 1: Single channel method: The purpose is to clarify the process and steps of using a single thermal infrared channel for remote sensing inversion of surface temperature and uncertainty:

--- Part 2: Split Window Method: The purpose is to clarify the process and steps of using two thermal infrared channels for remote sensing inversion of surface temperature: and uncertainty:

--- Part 3: TES separation method: The purpose is to clarify the use of three or more thermal infrared channels to analyze the surface temperature and emission The process, steps and uncertainty of rate co-inversion:

--- Part 4: Day-night method: The purpose is to clarify the use of multiple thermal infrared channels in the day-night dual-phase for remote sensing inversion of land surface temperature: Processes, steps and uncertainties: Thermal infrared remote sensing inversion of land surface temperature Part 2: Split Window Method



## 1 Scope

GB/T 43997.2-2024 is Part 2 of the Chinese series on retrieving land surface temperature from thermal infrared remote sensing, and covers the split-window method. Where the single channel method has to be told what the atmosphere is doing, the split-window method infers it: two adjacent thermal channels are absorbed by water vapour to different degrees, so the difference between the two brightness temperatures carries the atmospheric correction within it, which is why the method is the operational choice for MODIS, the FY series and most modern sensors. The standard sets the principle of the method and the conditions under which it applies, the retrieval workflow and its steps, and the uncertainty analysis, with a normative annex on constructing the split-window model coefficient lookup table and an annex assessing the combined standard uncertainty and the contributions to it from the inversion model, the surface emissivity and the at-sensor brightness temperature. It took effect on 1 November 2024.

This paper describes the principle and applicable conditions of the split window method for inverting land surface temperature using thermal infrared remote sensing data, the inversion process and steps, and and uncertainty analysis: This document applies to the inversion of land surface temperature using two channels in the thermal infrared atmospheric window region:

## 2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document:

GB/T 41534-2022 Authenticity verification of land surface temperature remote sensing products

GB/T 41541-2022 Basic terms of thermal infrared remote sensing

## 3 Terms and definitions

The terms and definitions defined in GB/T 41534-2022, GB/T 41541-2022 and the following apply to this document: 3:

1 Earth's surface temperature Characterizes the integrated temperature of the Earth's surface with a thickness equal to the penetration depth (range 0:1 to 10 times the wavelength):

Note: The surface temperature obtained by inverting remote sensing data is the surface anisotropy after eliminating the influence of atmosphere and emissivity based on the brightness temperature obtained by the remote sensor: The equivalent temperature of the hybrid pixel (i:e:, directional radiometer temperature), including land surface temperature and sea surface temperature, is in Kelvin (K): [Source: GB/T 41534-2022, 3:2] 3:2 split windowsplitwindow The thermal infrared atmospheric window is divided into no less than two atmospheric sub-windows:

Note: Usually, two atmospheric sub-windows are divided in the range of 8μm~14μm of the thermal infrared atmospheric window: The spectral range of the two sub-windows is generally 10:5μm~11:5μm and 11:5μm~12:5μm: 3:

3 The total mass of gaseous water contained in a unit cross-sectional area on the vertical path from the ground to the top of the atmosphere:

Note: The unit is gram per square centimeter (g/cm2): 3:

4 The temperature of a blackbody with the same spectral radiation brightness as the sensor's entrance pupil under the same spectral setting conditions:

Note: The unit is Kelvin (K):