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| **Recommendation ITU-R P.1510-1**  **(06/2017)** |
| **Mean surface temperature** |
| **P Series**  **Radiowave propagation** |

Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

# Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU‑T/ITU‑R/ISO/IEC and the ITU-R patent information database can also be found.

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| Series of ITU-R Recommendations  (Also available online at <http://www.itu.int/publ/R-REC/en>) | |
| **Series** | Title |
| **BO** | Satellite delivery |
| **BR** | Recording for production, archival and play-out; film for television |
| **BS** | Broadcasting service (sound) |
| **BT** | Broadcasting service (television) |
| **F** | Fixed service |
| **M** | Mobile, radiodetermination, amateur and related satellite services |
| P | Radiowave propagation |
| **RA** | Radio astronomy |
| **RS** | Remote sensing systems |
| **S** | Fixed-satellite service |
| **SA** | Space applications and meteorology |
| **SF** | Frequency sharing and coordination between fixed-satellite and fixed service systems |
| **SM** | Spectrum management |
| **SNG** | Satellite news gathering |
| **TF** | Time signals and frequency standards emissions |
| **V** | Vocabulary and related subjects |

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| ***Note***: *This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.* |

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RECOMMENDATION ITU-R P.1510-1

Mean surface temperature

(Question ITU-R 201/3)

(2001-2017)

Scope

Recommendation ITU-R P.1510 contains monthly and annual maps of mean surface temperature that are recommended for the prediction of statistics of different propagation effects such as rainfall rate, rain attenuation and gaseous attenuation due to water vapour and oxygen.

Keywords

Temperature, digital maps, ERA Interim

The ITU Radiocommunication Assembly,

considering

*a)* that information on annual and monthly mean surface temperatures is needed for propagation modelling purposes;

*b)* that the information is needed for all locations on the surface of the Earth,

recommends

**1** that the data in Annex 1 be used to obtain the annual and monthly mean surface temperatures when no local data are available.

Annex 1

# 1 Surface mean temperature

The monthly mean surface temperature data, *Tii* (K), where *ii* = {01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, and 12}, at 2 m above the surface of the Earth, are an integral part of this Recommendation and are available as digital maps. The latitude grid is from −90° N to +90° N in 0.75° steps, and the longitude grid is from −180° E to +180° E in 0.75° steps.

The annual mean surface temperature data, *TAnnual* (K) at 2 m above the surface of the Earth are also an integral part of this Recommendation and are available as digital maps. The latitude grid is from −90° N to +90° N in 0.75° steps, and the longitude grid is from −180° E to +180° E in 0.75° steps.

These digital maps are available in the file [R-REC-P.1510-1-201706-I!!ZIP-E.zip](https://www.itu.int/rec/R-REC-P.1510-1-201706-I/en).

The annual mean surface temperature or the monthly mean surface temperature at any desired location at 2 m above the surface of the Earth can be derived according to the following steps:

a) determine the four grid points (*Lat*1, *Lon*1), (*Lat*2, *Lon*2), (*Lat*3, *Lon*3) and (*Lat*4, *Lon*4) surrounding the desired location (*Lat, Lon*);

b) determine the monthly or annual mean surface temperature at 2 m above the surface of the Earth, , , , and  at the four surrounding grid points. The latitude grid is from 90 N to +90 N in 0.75° steps, and the longitude grid is from −180 E to +180 E in 0.75 steps;

c) determine at the desired location (*Lat*, *Lon*) by performing a bi-linear interpolation using the four surrounding grid points as described in Annex 1 Paragraph 1b of Recommendation ITU-R P.1144.

The monthly mean surface temperature maps have been derived from 36 years (1979-2014) of European Centre of Medium-range Weather Forecast (ECMWF) ERA Interim data, and the annual mean surface temperature map is the average of the monthly mean surface temperature maps weighted by the relative number of days in each calendar month.

For reference, a global map of annual mean surface temperature is shown in Fig. 1.

FIGURE 1

Annual mean surface temperature (K)

