International Telecommunication Union

ITU-R
Radiocommunication Sector of ITU

Recommendation ITU-R P.1511-2
(08/2019)

Topography for Earth-space propagation modelling

P Series

Radiowave propagation

International Telecommunication Union

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 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.

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

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

Electronic Publication
Geneva, 2019

RECOMMENDATION ITU-R P.1511-2

Topography for Earth-space propagation modelling

(Question ITU-R 202/3)

(2001-2015-2019)

Scope

This Recommendation provides global topographical data, information on geographic coordinates, and height data for the prediction of propagation effects for Earth-space paths in ITU-R recommendations.

Keywords

Topography, geographic coordinates, height

The ITU Radiocommunication Assembly,

considering

a)   that information on ground topography is needed for the prediction of attenuation and scattering;

b)   that the information is needed for all locations of the globe, especially when regional or continental calculations are necessary,

recommends

1   that the data in Annex 1 should be used to obtain the height above mean sea level when no local data are available or when no data with a better spatial resolution is available;

2   that the data in Annex 1 should be used to convert from the height above mean sea level to height relative to the WGS-84 ellipsoid, or *vice versa*, when no local data is available or when no data with better resolution are available.

Annex 1

1   Topography

The values of topographic height of the surface of the Earth above mean sea level (m) are an integral part of this Recommendation and are available in the form of a digital map provided in the file R15-SG03-C-0121!P1!ZIP-E.zip from supplement file [R-REC-P.1511-2-201908-I!!ZIP-E.zip](R-REC-P.1511-2-201908-I!!ZIP-E.zip).

The data is provided on a 1/12° grid in both latitude and longitude. For a location different from the grid points, the height above mean sea level at the desired location can be obtained by performing a bi-cubic interpolation on the values at the sixteen closest grid points, as described in Recommendation ITU-R P.1144.

Information on coastlines and country borders can be obtained from the ITU Digitized World Map, available from the BR.

2   Geographic coordinates and height

Unless otherwise specified, the latitude and longitude in ITU-R P-series Recommendations are geodetic rather than geocentric; i.e. the latitude and longitude are relative to the WGS-84 ellipsoid (i.e. latitude and longitude usually provided by satellite radionavigation systems).

Unless otherwise specified, the height in ITU-R P-series Recommendations is the height above mean sea level rather than the height relative to the WGS-84 ellipsoid. The height above mean sea level, h_{amsl} (m), can be approximated from the height relative to the WGS-84 ellipsoid, h_{WGS-84} (m), as:

$$h_{amsl}\,(\text{m}) = h_{WGS84}\,(\text{m}) - h_{EGM2008}\,(\text{m})$$

where $h_{EGM2008}$ (m) is defined as the undulation in the 2008 version of the U.S. National Geospatial-Intelligence Agency (NGA) Earth Gravitational Model. Users should note that different sources of height (e.g. GPS receivers, Geographic Information Programs or Geographic Information Systems) may use different height references.

The values of $h_{EGM2008}$ (m) are an integral part of this Recommendation and are available in the form of a digital map provided in the file R15-SG03-C-0121!P2!ZIP-E.zip contained in the supplement file R-REC-P.1511-2-201908-I!!ZIP-E.zip.

The data is provided on a 1/12° grid in both latitude and longitude. For a location different from the grid points, $h_{EGM2008}$ at the desired location can be obtained by performing a bi-cubic interpolation of the values at the sixteen closest grid points, as described in Recommendation ITU-R P.1144.

$h_{EGM2008}$, the difference between h_{WGS84}, the height relative to the WGS-84 ellipsoid and h_{amsl}, the height above mean sea level, is shown in Fig. 1, and the maximum absolute value of $h_{EGM2008}$ is ~100 m.

FIGURE 1

$h_{EGM2008}$ **(m)**

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