

International Telecommunication Union

ITU-R
Radiocommunication Sector of ITU

Recommendation ITU-R P.2148-0
(08/2022)

**Digital maps related to surface
wind speed statistics**

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.

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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

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.2148-0

Digital maps related to surface wind speed statistics

(2022)

Scope

This Recommendation provides methods to predict wind speed statistics at any location on the surface of the Earth and at any exceedance probability within the range from 0.01% to 99%.

Keywords

Wind speed

Related ITU-R Recommendations

Recommendation ITU-R P.2146

NOTE – The latest revision/edition of the Recommendation should be used.

The ITU Radiocommunication Assembly,

considering

- a) that surface wind speed statistics are needed to predict scattering from the sea surface;
- b) that worldwide fifth generation reanalysis data from the European Centre for Medium-Range Weather Forecasts (ECMWF) are available;
- c) that ten years of worldwide reanalysis data have been post-processed to provide wind speed statistics,

recommends

that the method in Annex 1 should be used to predict wind speed statistics at any location on the surface of the Earth and at any exceedance probability within the range from 0.01% to 99%, when more accurate local statistical data are not available.

Annex 1**List of symbols**

W	wind speed (m/s)
p	exceedance probability (%)

1 Wind speed statistical maps

Digital maps of the worldwide average annual statistics of wind speed at a height of 10 m above the surface of the Earth are an integral part of this Recommendation with the characteristics shown in Table 1. The association between exceedance probability and the associated map file name is shown in Table 2.

The annual values of wind speed, W , in m/s, exceeded for 0.01, 0.02, 0.03, 0.05, 0.1, 0.2, 0.3, 0.5, 1, 2, 3, 5, 10, 20, 50, 60, 70, 80, 90, 95 and 99% of an average year at a height of 10 m above the surface

of the Earth are an integral part of this Recommendation and are available in the form of digital maps provided in the file R-REC-P.2148-0-202208-!!ZIP.

2 Spatial and statistical interpolation

The wind speed at any location on the surface of the Earth and at any exceedance probability within the range from 0.01% to 99% can be predicted by the following method:

- a) determine the two probabilities, p_{above} and p_{below} , above and below the desired exceedance probability, p , from the set: 0.01, 0.02, 0.03, 0.05, 0.1, 0.2, 0.3, 0.5, 1, 2, 3, 5, 10, 20, 50, 60, 70, 80, 90, 95 and 99%;
- b) for the probability, p_{above} , determine the wind speed, $W_{1,above}$, $W_{2,above}$, $W_{3,above}$, and $W_{4,above}$ at the four closest grid points;
- c) for the probability, p_{below} , determine the wind speed, $W_{1,below}$, $W_{2,below}$, $W_{3,below}$, and $W_{4,below}$ at the four closest grid points;
- d) for the probability, p_{above} , determine the wind speed W_{above} at the location on the surface of the Earth by performing a bi-linear interpolation of the four values of wind speed $W_{1,above}$, $W_{2,above}$, $W_{3,above}$, and $W_{4,above}$ as described in Annex 1 of Recommendation ITU-R P.1144;
- e) for the probability, p_{below} , determine the wind speed W_{below} at the location on the surface of the Earth by performing a bi-linear interpolation of the four values of wind speed $W_{1,below}$, $W_{2,below}$, $W_{3,below}$, and $W_{4,below}$ as described in Annex 1 of Recommendation ITU-R P.1144;
- f) determine the wind speed, W , at the desired location and exceedance probability, p , by interpolating W_{above} and W_{below} vs p_{above} and p_{below} to exceedance probability, p , on a linear W vs $\log_{10} p$ scale.

TABLE 1

Map file characteristics

Parameter	Value
Format	ASCII
Upper left corner latitude	90° N
Latitude increment	-0.25°
Upper left corner longitude	0° E
Longitude increment	+0.25°
Number of rows	721
Number of columns	1 440
Column separator	Space
Row separator	Windows (CR LF)

TABLE 2

Map file name vs. exceedance probability

Exceedance probability	Map file name
0.01%	W_001.txt
0.02%	W_002.txt
0.03%	W_003.txt
0.05%	W_005.txt
0.1%	W_01.txt
0.2%	W_02.txt
0.3%	W_03.txt
0.5%	W_05.txt
1.0%	W_1.txt
2.0%	W_2.txt
3.0%	W_3.txt
5.0%	W_5.txt
10.0%	W_10.txt
20.0%	W_20.txt
50.0%	W_50.txt
60.0%	W_60.txt
70.0%	W_70.txt
80.0%	W_80.txt
90.0%	W_90.txt
95.0%	W_95.txt
99.0%	W_99.txt
