Interpolation service

Introduction

The interpolation service was implemented to interpolate pixel values based on the longitude and latitude provided. Returned values are provided as bilinearly or bicubically interpolated values, or nearest neighbour values according to the specification in the relevant ITU-R P-series recommendation.

The information on the API can be found here:

https://www.itu.int/ITU-R/BR-GeoApi/api.html#/default/get_interpolation_value_interpolate__item_id__get

In general, the format of a URL request for a recommendation with a dataset that is not a series, is as follows:

https://www.itu.int/ITU-R/BR-GeoApi/interpolate/recommendation and item ID?lat=decimal degrees&lon=decimal degrees

For recommendations with datasets that form a series, e.g. percentage of time or month, the request is as follows:

https://www.itu.int/ITU-R/BR-GeoApi/interpolate/recommendation and item ID?lat=decimal degrees&lon=decimal degrees&asset=parameter

Finally, for recommendations with datasets that are from an asset and have a series, e.g. standard deviation and month the format of the request is as follows:

https://www.itu.int/ITU-R/BR-GeoApi/interpolate/recommendation and item ID?lat=decimal degrees&lon=decimal degrees&asset=asset parameter&month=parameter

Examples of interpolation queries

The service works only with the data that are published in the ITU-R Geospatial Catalogue (https://www.itu.int/ITU-R/BR-GeoCatalogue).

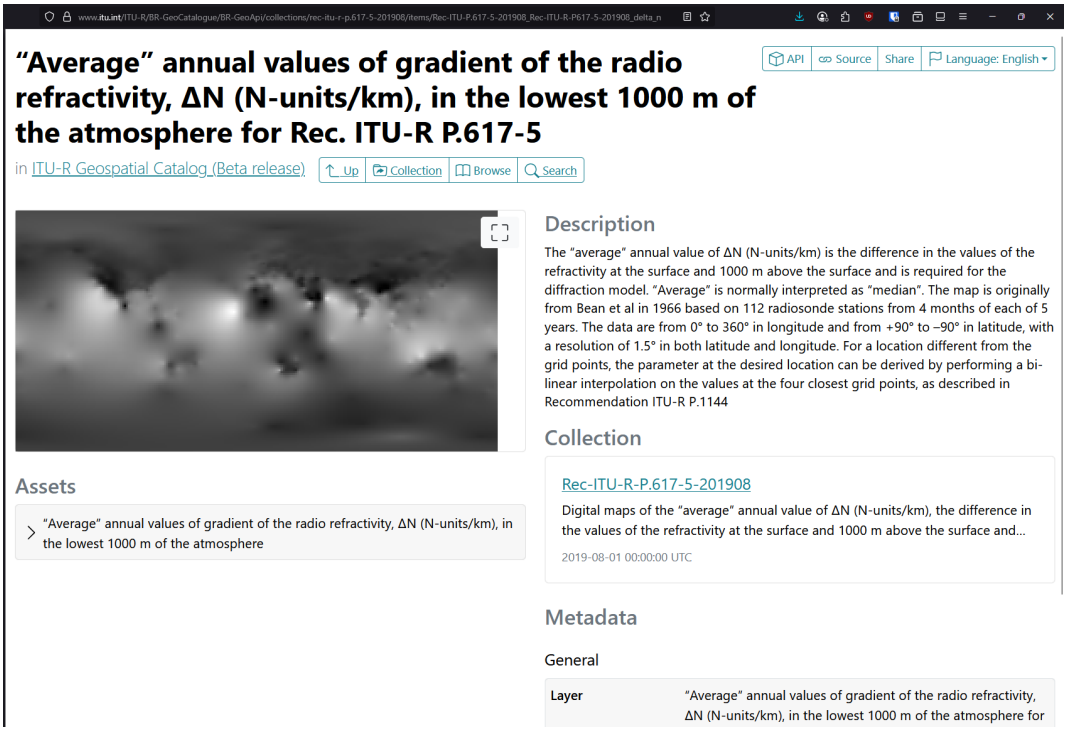
Each collection can have one or multiple items, therefore, items have a unique Item_ID. The interpolation service[1] only works based on the **item_id.** A list of item identifiers is provided in the annex to this document. The **item_id** is the last part of the URL when the item is opened. For example:

1. **Single asset in the item (no series)**

For **ΔN of Rec. ITU-R P.617-5** which has the following link:

[1] The specific interpolation method is applied automatically, i.e. bilinear or bicubic as specified in the relevant recommendation. For Recommendation ITU-R P.1511, the topographical heights and the geoid undulation values are returned as bicubically interpolated. For Recommendations ITU-R P.836 and P.2145, the nearest neighbour of the parameter is returned for the specified geographical coordinates.

https://www.itu.int/ITU-R/BR-GeoCatalogue/BR-GeoApi/collections/rec-itu-r-p.617-5-201908/items/Rec-ITU-P.617-5-201908_Rec-ITU-R-P617-5-201908_delta_n?.language=en&.asset=asset-default-wcs



The last part after /items/ is the **item_id: Rec-ITU-P.617-5-201908_Rec-ITU-R-P617-5-201908_delta_n**

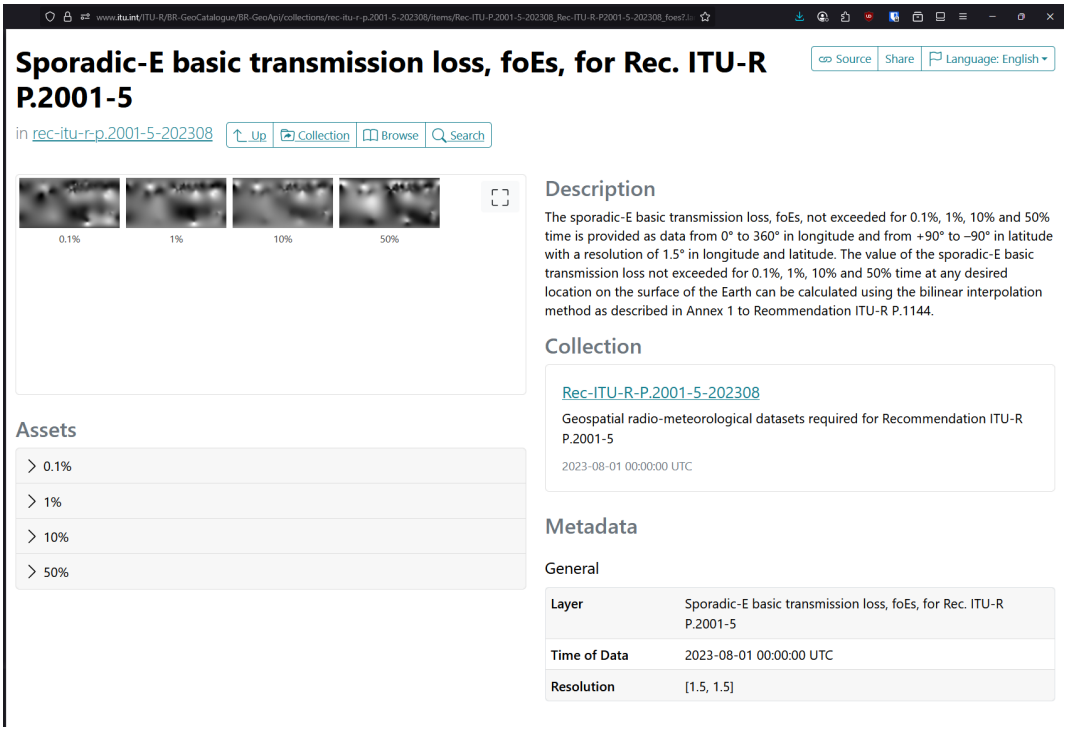
Therefore, the format of the interpolation service with latitude and longitude -27.341° S and 27.451° E is as follows:

https://www.itu.int/ITU-R/BR-GeoApi/interpolate/Rec-ITU-P.617-5-201908_Rec-ITU-R-P617-5-201908_delta_n?lat=-27.341&lon=27.451

2. **Multiple assets (series)**

For the **foEs** parameter of **Rec. ITU-R P.2001-5** which has the following link:

https://www.itu.int/ITU-R/BR-GeoCatalogue/BR-GeoApi/collections/rec-itu-r-p.2001-5-202308/items/Rec-ITU-P.2001-5-202308_Rec-ITU-R-P2001-5-202308_foes



The figure above shows that the parameter **foEs** in **Rec. ITU-R P.2001-5** has multiple assets (series), namely:

1. foEs 0.1 %
2. foEs 1 %
3. foEs 10 %
4. foEs 50 %

As names of assets show the % symbol, this item has the asset filter available and requires the percentage asset value as a parameter. Therefore, the request must include the asset, e.g.:

https://www.itu.int/ITU-R/BR-GeoApi/interpolate/Rec-ITU-P.2001-5-202308_Rec-ITU-R-P2001-5-202308_foes?lat=48.013&lon=8.147&asset=0.1

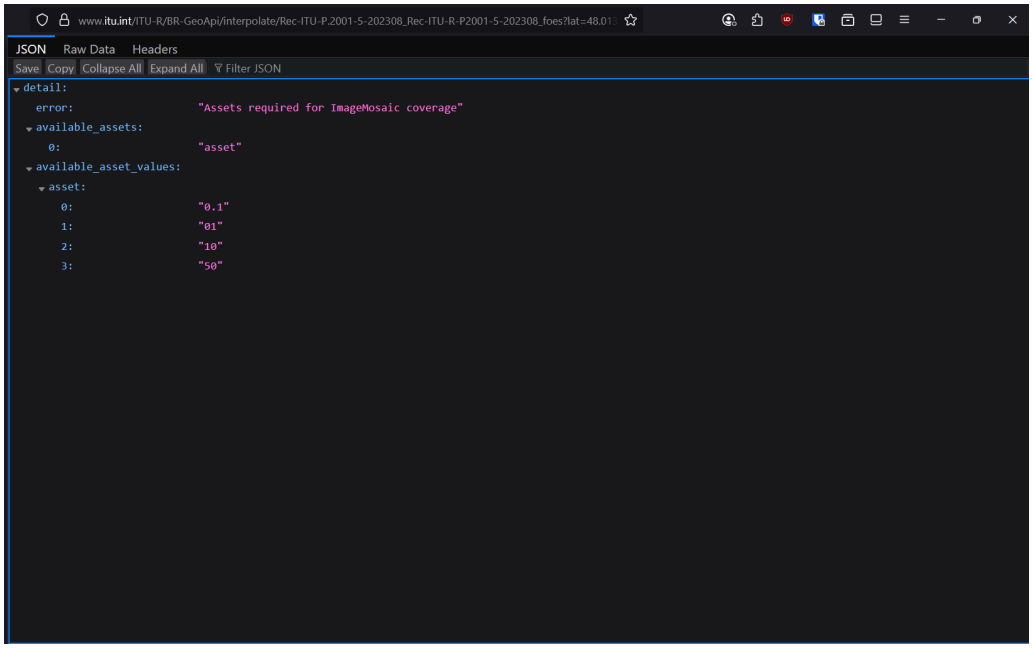
This URL sends a request to an appropriate dataset to get the interpolated value.

If a dataset has assets defined, the request **must** specify one to retrieve an interpolated value.

The available assets can be identified by making a request **without the asset specifier**, as follows:
https://www.itu.int/ITU-R/BR-GeoApi/interpolate/Rec-ITU-P.2001-5-202308_Rec-ITU-R-P2001-5-202308_foes?lat=48.013&lon=8.147

This request will **return an error** indicating that an asset is required, and it will include a list of all **available assets and their valid parameter values**. For example:

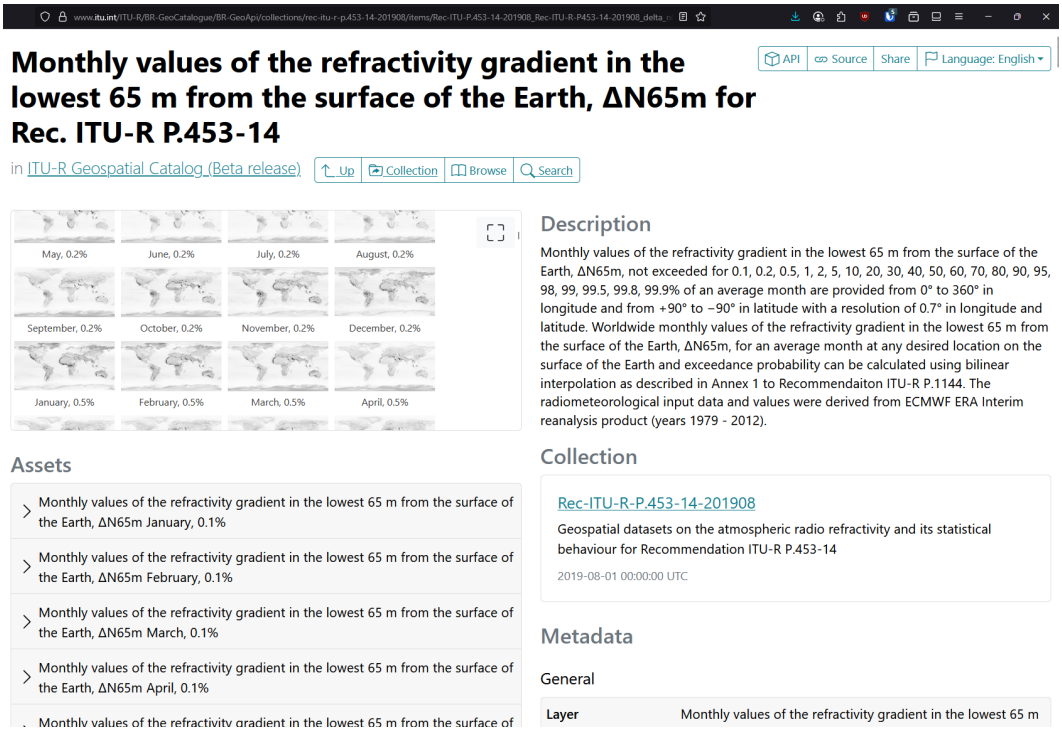
{"detail":{"error":"Assets required for ImageMosaic coverage","available_assets":["asset"],"available_asset_values":{"asset":["0.1","01","10","50"]}}}



For recommendations with datasets that contain different assets which have additionally a series, for example:

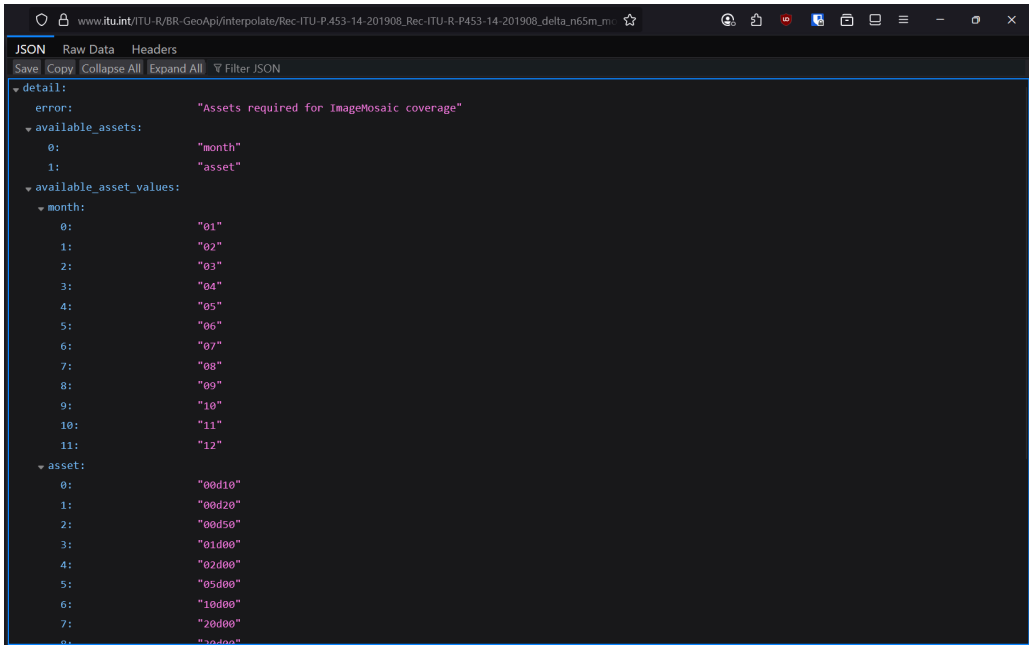
Monthly values of the refractivity gradient in the lowest 65 m from the surface of the Earth, ΔN_{65m} for Rec. ITU-R P.453-14:

https://www.itu.int/ITU-R/BR-GeoCatalogue/BR-GeoApi/collections/rec-itu-r-p.453-14-201908/items/Rec-ITU-P.453-14-201908_Rec-ITU-R-P453-14-201908_delta_n65m_monthly



This dataset requires two assets, percentage and month, of which the order is irrelevant to extract interpolated values from the maps:

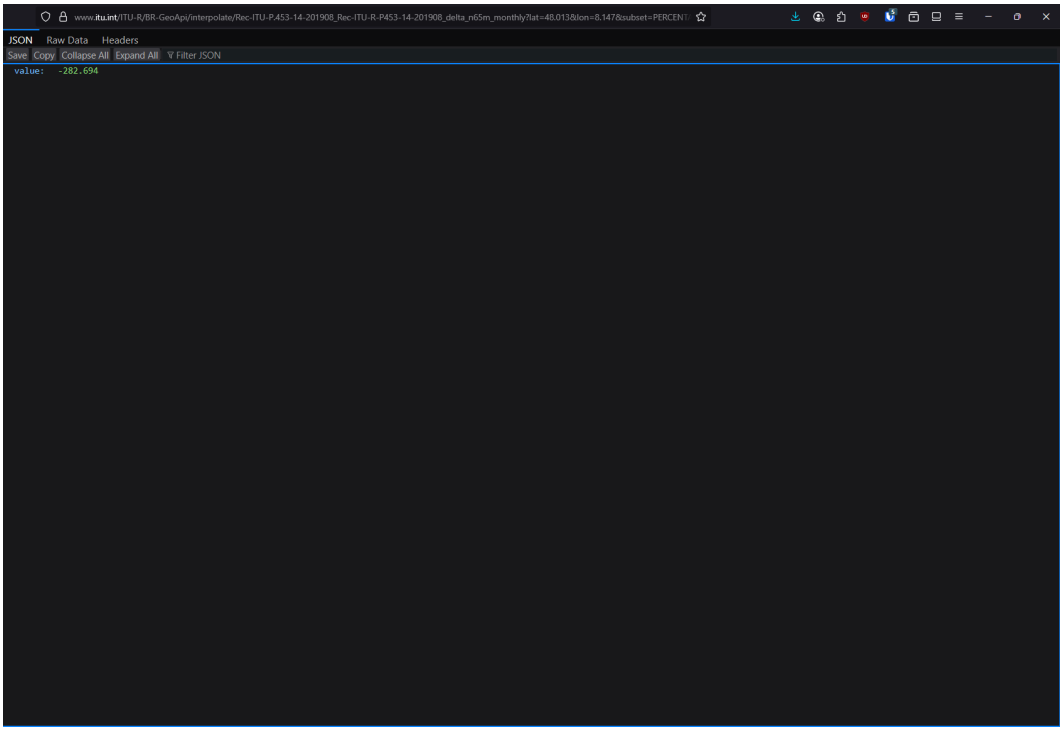
https://www.itu.int/ITU-R/BR-GeoApi/interpolate/Rec-ITU-P.453-14-201908_Rec-ITU-R-P453-14-201908_delta_n65m_monthly?lat=48.013&lon=8.147



Therefore, an example request could be:

https://www.itu.int/ITU-R/BR-GeoApi/interpolate/Rec-ITU-P.453-14-201908_Rec-ITU-R-P453-14-201908_delta_n65m_monthly?lat=48.013&lon=8.147&asset=01d00&month=07

Which provides the value:


www.itu.int/ITU-R/BR-GeoApi/interpolate/Rec-ITU-P.453-14-201908_Rec-ITU-R-P453-14-201908_delta_n65m_monthly?lat=48.013&lon=8.147&subset=PERCENT
JSON
Raw Data
Headers
Save
Copy
Collapse All
Expand All
Filter JSON
value: -282.694

Annex

GIS API variables and Item IDs

Rec. ITU-R	Description	Variable name	Variable in map file	API Item ID
P.452	"Average" annual values of gradient of the radio refractivity, in the lowest 1000 m of the atmosphere	ΔN (N-units/km)	DN50	delta_n
	"Average" sea level value of the surface refractivity	N_0 (N-units),	N050	n_0
P.453	Annual wet term of refractivity	N_{wet}	NWET_Annual	nwet_annual
	Monthly wet term of refractivity	N_{wet}	NWET_Monthly	nwet_monthly
	Annual mean decrease (i.e., lapse) in radio refractivity over a 1 km layer from the surface	ΔN_{1km}	e.g. DN_00d10	delta_n1km_annual
	Monthly mean decrease (i.e., lapse) in radio refractivity over a 1 km layer from the surface	ΔN_{1km}	e.g. DN_NN_00d10	delta_n1km_monthly
	Annual refractivity gradient in the lowest 65 m from the surface of the Earth	ΔN_{65m}	e.g. DN65m_00d10	delta_n65m_anual
	Monthly refractivity gradient in the lowest 65 m from the surface of the Earth	ΔN_{65m}	e.g. DN65m_00d10	delta_n65m_monthly
	Percentage of annual time for which the refractivity gradient over 100 m is lower than −100 N-unit/km	β	Beta	beta_annual
	Percentage of monthly time for which the refractivity gradient over 100 m is lower than −100 N-unit/km	β	Beta	beta_monthly
	Land-sea mask	-	landsea_mask	land_mask
	Average year statistics of elevated ducts in terms of probability of occurrence, mean	E_p (%), E_s (M-units), E_t (m), E_b	E_OCCURENCE, E_STRENGTH,	elevated_duct

Rec. ITU-R	Description	Variable name	Variable in map file	API Item ID
	strength, mean thickness, and mean base height of the duct mean coupling height and maximum height within the duct	(m), E_m (m), E_{max} (m)	E_THICKNESS, E_BASE, E_MEAN, E_MAX	
	Average annual statistics of surface ducts in terms of probability of occurrence, mean strength, and mean thickness	S_p (%), S_s (M-units), S_t (m)	S_OCCURENCE, S_STRENGTH, S_THICKNESS	surface_duct
P.530	Empirical prediction of 0.1% of the average worst month refractivity increase with height over the lowest 75 m of the atmosphere	dN_{75}	dN75	dn75
	Estimate of the logarithm base 10 of the geoclimatic factor for the average worst month	K	LogK	logk
P.534	Sporadic E critical frequency exceeded for average annual percentages of 50%, 10%, 1% and 0.1%	foEs (MHz),	e.g. FoEs10	foes
P.617	“Average” annual values of gradient of the radio refractivity, in the lowest 1000 m of the atmosphere	ΔN (N-units/km)	DN50	delta_n
	“Average” sea level value of the surface refractivity	N_0 (N-units),	N050	n_0
P.678	Climatic ratio	r_c	CLIMATIC_RATIO	climatic_ratio
P.834	Average values, seasonal fluctuation values and day (of the year) of the minimum value of air total pressure at the Earth's surface, water vapour partial pressure at the Earth's surface, mean temperature of the water vapour column above the surface, vapour pressure decrease factor, and the lapse rate of the mean temperature of water vapour from Earth surface	p_s (hPa), e_s (hPa), T_{ms} (K), λ, α_m (K/km)	pres_gd_a1 pres_gd_a2 pres_gd_a3 vapr_gd_a1 vapr_gd_a2 vapr_gd_a3 tmpm_gd_a1 tmpm_gd_a2 tmpm_gd_a3	CoeffsVertExcPathLength

Rec. ITU-R	Description	Variable name	Variable in map file	API Item ID
			lamd_gd_a1 lamd_gd_a2 lamd_gd_a3 alfm_gd_a1 alfm_gd_a2 alfm_gd_a3	
	Coefficients for the calculation of the hydrostatic and wet components $m_h(\theta)$ and $m_w(\theta)$	A_{0h}, A_{1h}, A_{2h}, B_{1h}, B_{2h}, A_{0w}, A_{1w}, A_{2w}, B_{1w} and B_{2w}	A_{0h}, A_{1h}, A_{2h}, B_{1h}, B_{2h}, A_{0w}, A_{1w}, A_{2w}, B_{1w} and B_{2w}	CoeffsMapFunction
	Average height of reference level with respect to the mean sea level	h_{ref} (m)	hreflev	hreflev
P.835-Annex 3	Annual pressure Annual temperature Annual water vapour Annual altitude Monthly pressure Monthly temperature Monthly water vapour Monthly altitude	P T WV Z P T WV Z	P T WV Z P T WV Z	p_annual t_annual wv_annual z_annual p_monthly t_monthly wv_monthly z_monthly
P.836	Annual surface water vapour density Annual total water vapour content Annual total columnar content scale height Monthly surface water vapour density Monthly total water vapour content Monthly total columnar content scale height Topographic altitude	ρ V *vsch* ρ V *vsch* *alt*	RHO V e.g. VSCH_01 RHO V e.g. VSCH_01 TOPO_0DOT5	swvd_annual tcwc_annual_v tcwc_annual_vsch swvd_monthly tcwc_monthly_v tcwc_monthly_vsch topo
P.837	Annual rainfall rate exceeded for 0.01% of an average year	$R_{0.01}$ (mm/hr)	R001	rainfall_annual
	Total monthly mean rainfall	*MT* (mm)	e.g. MT_Month01	rainfall_monthly

Rec. ITU-R	Description	Variable name	Variable in map file	API Item ID
P.839	Mean annual 0° C isotherm height	h_0	h0	rain_height
P.840	Annual integrated cloud liquid water content	L	L	annual
	Monthly integrated cloud liquid water content	L	L	monthly
P.1510	Mean surface temperature	T	T	annual
P.1511	EGM Topographic height	- -	EGM2008 TOPO	egm topo
P.1546	Refractivity gradient, dN, exceeded for time percentage	*dN* (N-units/km)	DNDZ_50 DNDZ_10 DNDZ_01	dn
P.1812	"Average" annual values of gradient of the radio refractivity, in the lowest 1000 m of the atmosphere	Δ*N* (N-units/km)	DN50	delta_n
	"Average" sea level value of the surface refractivity	N_0 (N-units),	N050	n_0
P.1853	Annual mean surface pressure Annual mean surface water vapour	P WV	P_Annual WV_Annual	annual surface temperature annual mean surface water vapour
P.2001	Median value of average refractivity gradient (DN_Median) in the lowest 1 km of the atmosphere. Numerically equal to Δ*N* as defined in Recommendation ITU R P.452 but with opposite sign	N_{d1km50}	DN_Median	dn_median
	Average refractivity gradient in the lowest 1 km of the atmosphere exceeded for $p \geq 50\%$ of an average year	$S_{\Delta Nsub}$	DN_SubSlope	dn_subslope
	Average refractivity gradient in the lowest 1 km of the atmosphere exceeded for $p < 50\%$ of an average year	$S_{\Delta Nsup}$	DN_SupSlope	dn_supslope

Rec. ITU-R	Description	Variable name	Variable in map file	API Item ID
	Refractivity gradient in the lowest 65 m of the atmosphere exceeded for 1% of an average year	N_{d65m}	dndz_01	dndz_01
	Probability of rain in 6-hours slots	P_{r6}	Esarain_Pr6	esarain_pr6
	Annual rainfall accumulation	M_T	Esarain_Mt	esarain_mt
	Ratio between convective and total precipitation	β_{rain}	Esarain_Beta	esarain_beta
	Mean zero-degree isotherm rain height	h_0	h0	h0
	Surface water-vapour density	ρ_{sur}	Surfwv_50_fixed	psur
	Sporadic-E basic transmission loss	f_{oEs1}, f_{oEs2}	e.g. foEs10	foes
	Tropospheric climatic identifiers	-	TropoClim	tropoclim
P.2145	Mean surface pressure Mean surface temperature Mean surface water vapour density Mean integrated water vapour content Height of the surface of the Earth Pressure scale height Temperature scale height Water vapour scale height	$P_s(p)$ $T_s(p)$ $\rho_{w_s}(p)$ $V_s(\rho)$ Z $psch$ $tsch$ $vsch$	P T RHO V Z_ground PSCH TSCH VSCH	p_annual t_annual rho_annual v_annual z_annual p_annual_psch t_annual_tsch v_annual_vsch
	Weibull shape parameter Weibull scale parameter	k_{V_s} λ_{V_s}	kV lambdaV	weibull_k weibull_lambda
P.2148	Wind speed	W	W	W