National Aeronautics and Space Administration Goddard Earth Science Data Information and Services Center (GES DISC)

README Document for the GPS Radio Occultation Boundary Layer Depth Annual and Seasonal Products (GPSROZPBLA and GPSROZPBLS)

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Revision History

Revision Date	***Changes***	***Author***

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1.0 Introduction

This document provides basic information for using the GPSROZPBLA and GPSROZPBLS products.

The GPSROZPBLA and GPSROZPBLS are annually and seasonally averaged products generated for the global planetary boundary layer (PBL) height climatology derived from the COSMIC/FORMOSAT-3 and TerraSAR-X Global Positioning System (GPS) radio occultation (RO) measurements from June 2006 to December 2015.

1.1 Dataset/Mission Instrument Description

The COSMIC/FORMOSAT-3 mission consists of a six-satellite constellation launched in 2006. Each satellite carries the IGOR GPS receiver and is equipped with fore and aft looking antenna to track both setting and rising occultations. The constellation provides globally distributed measurements across different local times. The TerraSAR-X (TSX) is a X-band SAR imaging satellite with GPS RO being a secondary measurement. It also carries an IGOR receiver and has been collecting GPS RO measurements since 2011. The instrument tracks the L-band microwave signal broadcast by a GPS satellite in a limb-viewing geometry. The IGOR receivers on COSMIC and TSX are capable of tracking the GPS signals in open loop through the middle to lower troposphere, which is essential for obtaining data with high quality for PBL height estimation, especially at low latitudes. COSMIC and TSX data are routinely processed at JPL and publicly distributed (http://genesis.jpl.nasa.gov). The refractivity profiles retrieved form the basis for these PBL height products.

1.2 Algorithm Background

For each occultation, the PBL height is calculated as the height where the vertical gradient of the refractivity (dN/dz) is minimum. This algorithm is designed to locate the height where a large vertical change in refractivity occurs, corresponding to the transition from the free troposphere to the PBL. More details can be found in Ao et al. (2012).

Each PBL height is associated with a time (starting time of the occultation) and location (latitude and longitude of the tangent point at the minimum altitude). The PBL height data are then binned into 2° x 2° latitude/longitude regions and averaged to produce the mean and standard deviation values in the climatology products. The refractivity profile has a vertical resolution of about 200 m and represents an along path horizontal averaging of ~100 km. Thus, occultations with tangent points near the coast may represent averaging over both land and ocean and should be interpreted with care.

The refractivity gradient method used here is not the only method that can be used to estimate the PBL height. Other algorithms have been proposed, including looking at "breakpoint" instead of minimum gradient, wavelet covariance transform, and using variables like bending angles or specific humidity instead of refractivity. However, the basic principle is the same. The difference between the different algorithms is small where the PBL is well-defined, with a strong capping inversion.

1.3 Acknowledgement

The data may be referenced by the following DOIs:

Shortname	DOI
GPSROZPBLA	http://dx.doi.org/10.5067/4XKM9DCKEB5K
GPSROZPBLS	http://dx.doi.org/10.5067/XGL1QBKFBI5B

2.0 Data Organization

The GPSROZPBLA and GPSROZPBLS data products are annual and seasonal climatologies of the boundary layer height.

2.1 File Naming Convention

Each dataset has only 1 file that indicates the year range, the resolution, and temporal frequency.

Shortname	Filename
GPSROZPBLA	pblh_gps_2006-2015_2x2_annual.nc
GPSROZPBLS	pblh_gps_2006-2015_2x2_season.nc

2.2 File Format and Structure

The data files are in netCDF-4 format and follow the CF 1.7 conventions.

2.3 Key Science Data Fields

The key science data fields are "atmosphere_boundary_layer_thickness" and "atmosphere_boundary_layer_thickness_sd" which provide the mean value of the atmospheric boundary layer and the standard deviation respectively.

3.0 Data Contents

3.1 Dimensions

*The annual product (*GPSROZPBLA) provides the mean value of the atmospheric boundary layer thickness for each latitude and longitude. The seasonal product (GPSROZPBLS) has an additional dimension for each of the four seasons (DJF, MAM, JJA, SON).

3.3 Products/Parameters

Data Field Name	Description	Units
lat	latitude of the center of the grid element	degrees_north
lon	longitude of the center of the grid element	degrees_east
atmosphere_boundary_layer_thickness	atmosphere boundary layer thickness mean value	meters
atmosphere_boundary_layer_thickness_sd	atmosphere boundary layer thickness standard deviation	meters
number_of_soundings	Number of soundings	count
season	0=DJF, 1=MAM, 2=JJA, 3=SON	Not Applicable
surface_type	0 (ocean); 1 (land); 2 (coast)	Not Applicable

4.0 Options for Reading the Data

This data may be read many different program languages that are able to read netCDF-4 or HDF-5 files as well as hdfview and panoply.

5.0 Data Services

These data are available for download via https and opendap.

If you need assistance or wish to report a problem:
Email:
Voice: 301-614-5224
Fax: 301-614-5268
Address:
Goddard Earth Sciences Data and Information Services Center NASA Goddard Space Flight Center Code 610.2 Greenbelt, MD 20771 USA

References

Ao, C. O., D. E. Waliser, T. K. Chan, J.-L. Li, B. Tian, and A. J. Mannucci, Planetary boundary layer heights from GPS radio occultation refractivity and humidity profiles, J. Geophys. Res., 117, D16117, doi:10.1029/2012JD017598, 2012.