# Physical Oceanography Distributed Active Archive Center (PO.DAAC)

## QuikSCAT Level 2B Version 3

## Guide Document

7 March 2013

Version 1.0

Document Clearance Number: 13-1408

Jet Propulsion Laboratory
Pasadena, California

# Table of Contents:

# 1. Abstract:

This ocean surface wind vector dataset is provided as a service to the oceanographic and meteorological research communities on behalf of the NASA/JPL QuikSCAT Project in collaboration with the NASA International Ocean Vector Winds Science Team (IOVWST). This document details the QuikSCAT Level 2B (L2B) Version 3 dataset which provides nominal 12.5 km (pixel spacing) swath bins of ocean surface wind vector retrievals with approximately 90% daily coverage over the global ice-free oceans. This 3rd version of L2B reprocessing represents the latest improvements to the geophysical model function (GMF) for wind retrieval, wind retrieval noise and gap reduction, estimation and removal of cross-track dependent wind speed biases, and a neural network approach to correct rain contaminated wind speeds. The Version 3 algorithm updates, product development, and calibration/validation information is described in further detail by Fore et al. (2013). Development and distribution of this dataset is made possible through funding provided by NASA.

# 2. Acknowledgements:

---

**NOTE:** Please refer all questions concerning this dataset to PO.DAAC User Services: podaac@podaac.jpl.nasa.gov.

---

The following people have contributed to the procurement of this dataset and user guide documentation:

Principal Investigator:
Dr. Ernesto Rodriguez[1]

Co-Investigators:
Bryan Stiles[1], Frank Wentz[2], Thomas Werne[1], Alexander Fore[1], Philip Callahan[1], Scott Dunbar[1], Brent Williams[1], Alexandra Chau[1], Sermsak Jaruwatanadilok[1], and David Moroni[1]

User Guide Authors:
David Moroni[1]
Bryan Stiles[1]
Alex Fore[1]

User Guide Reviewers:
Tony Lee[1]

[1]Jet Propulsion Laboratory
[2]Remote Sensing Systems

# 3. Mission Description:

The SeaWinds on QuikSCAT mission is a "quick recovery" mission to fill the gap created by the loss of data from the NASA Scatterometer (NSCAT), when the ADEOS-1 satellite lost power in June 1997. QuikSCAT was launched from California's Vandenberg Air Force Base aboard a Titan II vehicle on 19 June 1999. QuikSCAT completed more than 10 years of nominal operation when the SeaWinds antenna ceased rotation on 23 November 2009. A similar version of the SeaWinds instrument flew on the Japanese ADEOS-II spacecraft, launched in December 2002. The ADEOS-II mission ended prematurely due to a spacecraft power subsystem failure on 24 October 2003. The QuikSCAT mission has continued to provide data of high quality over more than seven years since launch. The mission will be continued through the Senior Review process until it is deemed no longer able to provide scientifically useful data.

The SeaWinds instrument on the QuikSCAT satellite is a specialized microwave radar that measures near-surface wind speed and direction under all weather and cloud conditions over Earth's oceans. Scatterometer wind data, combined with measurements from various scientific disciplines, will help to understand mechanisms of global climatic change and weather. These measurements will help to determine atmospheric forcing, ocean response and air-sea interaction mechanisms on various spatial and temporal scales. Wind stress is the single largest source of momentum to the upper ocean, driving oceanic motions on scales ranging from surface waves to basin-wide current systems. Winds over the ocean modulate air-sea fluxes of heat, moisture, gases and particulates, regulating the crucial coupling between atmosphere and ocean that establishes and maintains global and regional climate. Measurements of surface wind velocity can be assimilated into regional and global numerical weather and wave prediction models, improving our ability to predict future weather.

As the only remote sensing system able to provide accurate, frequent, high-resolution measurements of ocean surface wind speed and direction under both clear sky and cloudy conditions, scatterometers have played an increasingly important role in oceanographic, meteorological and climatic studies over the past several decades. Scatterometers use an indirect technique to measure wind velocity over the ocean, since the atmospheric motions themselves do not substantially affect the radiation emitted and received by the radar. These instruments transmit microwave pulses and receive backscattered power from the ocean surface. Changes in wind velocity cause changes in ocean surface roughness, modifying the radar cross-section of the ocean and the magnitude of the backscattered power. Scatterometers measure this backscattered power, allowing estimation of the normalized radar cross section ($\sigma_o$) of the sea surface. Backscatter cross section varies with both wind speed and direction when measured at moderate incidence angles. Multiple, collocated, nearly simultaneous $\sigma_o$ measurements acquired from several directions can thus be used to solve simultaneously for wind speed and direction.

The first spaceborne scatterometer flew as part of the Skylab missions in 1973 and 1974, demonstrating that spaceborne scatterometers were indeed feasible. The Seasat-A Satellite Scatterometer (SASS) operated from June to October 1978 and proved that accurate wind velocity measurements could be made from space. The SASS cross section measurements have been used to significantly refine the empirical model relating backscatter to wind velocity, and the SASS data have been applied to a variety of oceanographic and meteorological studies. As a much improved extension of the European Space Agency's Earth Remote Sensing (ERS) scatterometer data record (ERS-

1/2), the Advanced Scatterometer (ASCAT) provided by the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) flown on MetOp-A/B has extended the previous single-swath scatterometer into a dual-swath instrument operating at C-band and providing an extended global time series of ocean surface wind vectors from March 2007 through present. NSCAT was launched on ADEOS-1 (Midori) in August 1996 and returned nearly 10 months of dual-swath, 25-km resolution Ku-band backscatter and wind data until the demise of the spacecraft in June 1997.

### 3.1 Mission Requirements

The temporal scales of important motions in the atmosphere and the ocean range from seconds to decades, and spatial scales range from meters to tens of thousands of kilometers. Given the wide range of geophysical studies requiring surface wind velocity data, construction of a unified, consistent, achievable set of requirements for a satellite instrument is difficult. Following the successful flight of the Seasat scatterometer (SASS) in 1978, NASA established the interdisciplinary Satellite Surface Stress Working Group to define the scientific requirements for the next spaceborne NASA scatterometer system. As understanding of both science issues and scatterometer capabilities grew during the 1980's, the Working Group report evolved into specific mission requirements. In short, the system must measure winds between 3 and 30 m/s with an accuracy better than (the greater of) 2 m/s or 10% in speed and 20° in direction with a spatial resolution of 50 km; virtually the entire ocean surface must be covered at least once every two days; geophysically useful products must be produced within days after data are acquired; and the instrument must be designed to acquire data for at least three years in order to allow investigation of annual and interannual variability.  A summary of the original QuikSCAT requirements is given in Table 1.

| **Quantity** | **Requirement** | **Applicable Range** |
|---|---|---|
| Wind speed | 2 m/s (rms) | 3-20 m/s |
| | 10% | 20-30 m/s |
| Wind direction | $20^o$ (rms) selected ambiguity | 3-30 m/s |
| Spatial resolution | 25 km | $\sigma_o$ cells |
| | 25 km | Wind vector cells |
| Location accuracy | 25 km (rms) | Absolute |
| | 10 km (rms) | Relative |
| Coverage | 90% of ice-free ocean daily | Global |
| Mission duration | 36 months | 24-36 Months |

Table 1: **QuikSCAT Technical Mission Requirements**

### 3.2 Satellite Description

The NASA Quick Scatterometer (QuikSCAT) mission employs a variation of the Ball Commercial Platform 2000 (BCP 2000 "QuikBird") bus. QuikSCAT was selected through the NASA Rapid Spacecraft Acquisition program, which required a stable and highly accurate Earth remote-sensing platform. Ball Aerospace and Technologies Corp. (hereafter, Ball) provided the integration and test of the total space segment consisting of the BCP 2000 spacecraft bus and the JPL-supplied scatterometer payload. Ball was responsible for integration of the spacecraft to the launch vehicle and launch support. Ball also provides mission control and operations following launch.

Modifications to the basic BCP 2000 design for this mission were minimal and included a larger propellant tank (76 kg), CCSDS compatible uplink and science data downlink, S-band telemetry downlink, reduced capacity solid-state recorder (8 Gbit), and minor configuration modifications to support payload boxes and the Titan II launch vehicle. Table 2 outlines the nominal orbit parameters for QuikSCAT.

| | |
|---|---|
| Recurrent period | 4 days (57 orbits) |
| Orbital Period | 101 minutes (14.25 orbits/day) |
| Local Sun time at Ascending node | 6:00 A.M. ± 30 minutes |
| Altitude above Equator | 803 km |
| Inclination | $98.616^o$ |

**Table 2:** Nominal Orbit Parameters

# 4. Sensor Overview:

The SeaWinds instrument on QuikSCAT is an active microwave radar designed to measure electromagnetic backscatter from wind roughened ocean surface. The SeaWinds instrument uses a rotating dish antenna with two spot beams that conically sweep producing a circular pattern on the surface. The antenna radiates microwave pulses at a frequency of 13.4 GHz (Ku-band) across broad regions on Earth's surface. The instrument collects data over ocean, land, and ice in a continuous, 1800-kilometer-wide swath centered on the nadir subtrack, making approximately 1.1 million ocean surface wind measurements and covering 90% of Earth's ice-free ocean surface each day. A pencil-beam scatterometer has several key advantages over a fan-beam scatterometer: it has a higher signal-to-noise ratio, is smaller in size, and provides superior coverage.

### 4.1 Principles of Operation

Spaceborne scatterometers transmit microwave pulses to the ocean surface and measure the backscattered power received at the instrument. Since atmospheric motions themselves do not substantially affect the radiation emitted and received by the radar, scatterometers use an indirect technique to measure wind velocity over the ocean. Wind stress over the ocean generates ripples and small waves, which roughen the sea surface.

These waves modify the normalized radar cross section ($\sigma_o$) of the ocean surface and hence the magnitude of backscattered power. In order to extract wind velocity from these measurements, one must understand the relationship between $\sigma_o$ and near-surface winds (i.e., the GMF).

The SeaWinds scatterometer design used for QuikSCAT is a significant departure from the fan-beam scatterometers flown on previous missions (Seasat SASS and NSCAT) and the current ASCAT. QuikSCAT employs a single 1-meter parabolic antenna dish with twin offset feeds for vertical and horizontal polarization. The antenna spins at a rate of 18 rpm, scanning two pencil-beam footprint paths at incidence angles of $46^o$ (H-pol, inner beam) and $54^o$ (V-pol, outer beam). The transmitted radar pulse is modulated, or "chirped", and the received pulse (after Doppler compensation) is passed through an FFT stage to provide sub-footprint range resolution. The range resolution is commandable between 2 km and 10 km, with the nominal value set at about 6 km. The nominal pulse repetition frequency is 187.5 Hz (also commandable). Each telemetry frame contains data for 100 pulses. Signal and noise measurements are returned in the telemetry for each of the 12 sub-footprint "slices." Ground processing locates the pulse "egg" and "slice" centroids on the Earth's surface. The $\sigma_o$ value is then computed for both the "egg" and the best 8 of the 12 "slices" (based on location within the antenna gain pattern).

QuikSCAT generates an internal calibration pulse and associated load pulse every half-scan of the antenna. In ground processing, the load pulses are averaged over a 20-minute window, and the calibration pulses over a 10-pulse (approximately 18-second) window, to provide current instrument gain calibration needed to convert telemetry data numbers into power measurements for the $\sigma_o$ calculation.

# 5. Processing Methodology:

Instrument power measurements are calibrated and converted to normalized radar cross section ($\sigma_o$) to produce the time-ordered Level 1B (L1B) product. The $\sigma_o$ measurements are grouped into an along-track, cross-track grid of "wind vector cells" (wvc) for wind retrieval. A wvc typically contains several measurements looking both forward and backward from both the inner and outer beams. Slice measurements are grouped into both 25 km and 12.5 km wvc. The tradeoff is between resolution and noise. Data products indicate the resolution. Version 3 data are done at 12.5 km. The grouped $\sigma_o$ measurements are the Level 2A (L2A) product. The Version 3 data described here are 12.5 km wind (L2B) netcdf data files. No new versions have been made for L1B and L2A products which remain in the HDF (Version 2) format.

Wind retrieval processing is performed in three steps. First, a point-wise maximum likelihood estimate of wind speed and wind direction is computed resulting in multiple ambiguous solutions (typically two to four). Next, a median filter is used to select the best ambiguity. Finally, Directional Interval Retrieval (DIR) (Stiles et al. 2002) processing is performed, which uses the directional spread of the objective function and allows the retrieved wind direction to vary within a region of high likelihood about the selected ambiguity.

Version 3 products have several improvements over the previous JPL processing of the QuikSCAT L2B winds. Version 3 processing begins with the same L1B (time-ordered backscatter) data as used in the previous processing. The first set of changes was with respect to measurement binning, which was done in order to decrease noise and reduce gaps in the 12.5 km L2B wind retrievals. The next step was an improved geophysical model function (GMF) to model the effect of wind on backscatter. An important effect in Ku-band derived winds is rain, so a neural network approach was implemented to correct rain contaminated winds speeds. Finally, cross-track dependent wind speed biases were estimated and removed from the wind retrievals.

More details of the Version 3 processing methodology are found in Fore et al. (2013): ftp://podaac.jpl.nasa.gov/allData/quikscat/L2B12/docs/fore_et_al_ieee_2013.pdf. The details regarding the processing lifecycle from telemetry to L2B may be found in the "QuikSCAT Science Data Product User's Manual" (Version 3.0, 2006): ftp://podaac.jpl.nasa.gov/allData/quikscat/L2B/v2/docs/QSUG_v3.pdf

## 6. Calibration and Validation:

The Version 3 L2B winds have been compared to ECMWF and buoy winds in order to assess accuracy. Version 3 was found to be more accurate than Version 2 when compared with both ground truth and ECMWF wind data sets. In rain-free conditions, RMS speed error with respect to ECMWF was reduced from 1.6 m/s for Version 2 to 1.5 m/s for Version 3; RMS direction error was reduced from 20 degrees to 18 degrees. In rainy conditions, the improvement was much larger, with reductions in error by as much as a factor of 2. Although much improved, rainy areas continue to have more difference from ECMWF than clear areas. When compared with buoys, significant improvements in RMS error were also observed. A rain-rate dependent speed bias with was observed in triple colocations of SSM/I, QuikSCAT Version 2, and buoy winds. This rain-dependent speed bias is no longer observed in the Version 3 data set. For a detailed description of the validation of the L2B Version 3, please refer to Fore et al. (2013).

## 7. Dataset Description:

This data set is being distributed in netCDF version 4 classic (i.e., compatible with netCDF Version 3) format, adhering to CF v1.5 conventions. Each file is unique to a particular calendar day of a year and consists of one complete orbital revolution (assuming no data gaps).

The file naming convention is qs_l2b_RRRRR_v3_YYYYMMDDhhmm.nc, where:

qs = QuikSCAT, which is the instrument/platform source of the dataset
l2b = the processing level of the dataset

RRRRR = the 5-digit starting orbital revolution number
v3 = Version 3, the dataset version identifier of the data file
YYYY = the 4-digit calendar year of the file start time
MM = the 2-digit calendar month of year (e.g., 09 = September)
DD = the 2-digit calendar day of month
hh = the 2-digit hour of the start time of the 1st measurement within the file
mm = the 2-digit minute of the start time of the 1st measurement within the file
.nc = the file extension indicating the usage of netCDF data formatting

The date and time represented by the file name is with respect to GMT (UTC). Greater precision of the start and stop times, including equatorial crossing times, is available in the netCDF global attributes.

### 7.2 Variable Types

**Table 2.** Dataset Variable Description

| **Name** | **Along Track Cells** | **Cross Track Cells** | **Data Type** | **Missing Value** | **Description** |
|---|---|---|---|---|---|
| time | 3248 | N/A | double | N/A | Defines the mean reference time of all WVC measurements along a given WVC row referenced by the number of seconds since 00Z on 1 January 1999. |
| lat | 3248 | 152 | float | N/A | The latitude value at WVC. |
| lon | 3248 | 152 | float | N/A | The longitude value at WVC. |
| retrieved_wind_speed | 3248 | 152 | float | -9999.f | Equivalent neutral wind speed at reference height of 10 m. |
| retrieved_wind_direction | 3248 | 152 | float | -9999.f | Equivalent neutral wind direction at reference height of 10 m. |
| rain_impact | 3248 | 152 | float | -9999.f | Impact of rain upon wind vector retrieval. |
| flags | 3248 | 152 | short | 32767s | WVC bit-wise quality flags. |

| | | | | | |
|---|---|---|---|---|---|
| eflags | 3248 | 152 | short | 32767s | Extended WVC bit-wise quality flags |
| nudge_wind_speed | 3248 | 152 | float | -9999.f | NCEP Model wind speed. |
| nudge_wind_direction | 3248 | 152 | float | -9999.f | NCEP Model wind direction. |
| retrieved_wind_speed_uncorrected | 3248 | 152 | float | -9999.f | Wind speed without rain correction. |
| cross_track_wind_speed_bias | 3248 | 152 | float | -9999.f | Relative wind speed bias with respect to the "sweet spot". |
| atmospheric_speed_bias | 3248 | 152 | float | -9999.f | Atmospheric wind speed bias. Speed bias removed by rain correction algorithm. |
| num_ambiguities | 3248 | 152 | byte | 0b | Number of ambiguous wind directions found in point-wise wind retrieval prior to spatial filtering. |

### 7.3 Grid Description

The L2B data are grouped by rows of wind vector cells (WVC). L2B wind vector cells are square pixels of dimension 12.5 km. Each wind vector cell row corresponds to a single cross-track cut of the QuikSCAT measurement swath. Full coverage of the earth's circumference requires 3248 rows at 12.5 km pixel resolution (i.e., a single data file with no measurement gaps).

QuikSCAT's swath extends 900 km on either side of the satellite nadir track, providing a full swath width of 1800 km. Thus, each WVC row nominally contains 148 WVCs. To accommodate occasional measurements that lie outside of the 900 km swath, the L2B data design includes additional WVC values at each end of each row. Each Level 2B WVC row therefore contains a total of 152 WVCs in the 12.5 km product. As an artifact of the orbital inclination and instrument swath width, consecutive orbits will usually start to overlap poleward of ~47° latitude.

### 7.4 Related Products

All related data products are referenced here:

a) QuikSCAT:
http://podaac.jpl.nasa.gov/datasetlist?ids=Platform&values=QUIKSCAT

b) SeaWinds on ADEOS-II:
http://podaac.jpl.nasa.gov/datasetlist?ids=Platform&values=ADEOS-II
c) Oceansat-2:
http://podaac.jpl.nasa.gov/datasetlist?ids=Platform&values=Oceansat-2

### 7.3 Grid Description

The data is binned in a swath grid pattern at 12.5 km pixel resolution. There are 152 WVCs in the across-track direction and 3248 WVC rows in the along-track direction. The very first WVC row is defined by the beginning of the ascending node near the South Pole with respect to the nadir position of the spacecraft. All 3248 WVC rows represent an entire orbit revolution.

# 8. Known Issues and Source of Error:

The high wind speed (> 20 m/s) calibration of the data is substantially different from previous versions due to the use of the new GMF that was optimized for consistency with passive microwave wind speed measurements. Due to the lack of ground truth at high winds, it is an open question whether the high wind performance is improved or degraded by the change in GMF.

Performance in high winds and rain is poor because the rain contamination removal method was only optimized for winds from 0 to 20 m/s. For winds above 20 m/s the rain correction method often degrades the accuracy of the winds when rain is present. Although the location of the grid cells are much more regular than previous 12.5 km products, there can still be irregularities in the grid near the edges of the swath due to poor measurement sampling. As was done for previous QuikSCAT products, a grid cell location is defined to be the average centroid of the measurements used to retrieve wind in that cell. Unlike previous versions, latitude and longitude locations are now computed for grid cells in which winds are not retrieved (i.e., null WVCs over land). Locations of WVCs without winds are determined independently of the measurement locations. For this reason, there is commonly a noticeable discontinuity in grid locations near land. A further issue to point out is in reference to the start of the dataset, which is on 27 October 1999. This starting point occurs 100 days after the start of the previous L2B versions, which is done to maintain optimal and consistent quality of the dataset time series.

# 9. Data Access:

### Obtaining Data, Documentation and Read Software:

The data, read software, and documentation are freely available for public download via anonymous FTP and OPeNDAP. For immediate access, please visit:

a) FTP: ftp://podaac.jpl.nasa.gov/allData/quikscat/L2B12/v3
b) OPeNDAP: http://opendap.jpl.nasa.gov/opendap/allData/quikscat/L2B12/v3

Note: the documentation (/doc) and read software (/sw) are located one directory level above the /v3 data directory.

All data granules are compressed using the industry standard GNU Zip compression utility. To learn more about the GNU compression utility, please visit the GZIP home page: http://www.gzip.org/.

MD5 checksum files are also available in the data directories to assist you in verifying the integrity of each data file/granule. To learn more about MD5 checksums, please visit: http://en.wikipedia.org/wiki/MD5

For information on how to cite this data in presentations or publications, please read: http://podaac.jpl.nasa.gov/CitingPODAAC

For general news, announcements, and information on this and all other ocean and sea ice data sets available at PO.DAAC, please visit the PO.DAAC web portal: http://podaac.jpl.nasa.gov/

**Contact Information:**

Questions and comments concerning QuikSCAT Version 3 L2B should be directed to the Physical Oceanography Distributed Active Archive Center (PO.DAAC) at the NASA Jet Propulsion Laboratory (JPL). Please note that email is always the preferred method of communication.

E-Mail: podaac@podaac.jpl.nasa.gov

WWW: http://podaac.jpl.nasa.gov/DATA_CATALOG/ccmpinfo.html

Mail: PO.DAAC User Services Office
Jet Propulsion Laboratory
M/S T1721-202
4800 Oak Grove Drive
Pasadena, CA 91109

# 10. Read Software:

Sample software readers are currently available in IDL, MATLAB, R and Python at: ftp://podaac.jpl.nasa.gov/allData/quikscat/L2B12/sw/netcdf

# 11. References:

[1] Fore, A.G., B. W. Stiles, A.H. Chau, A.H., B.A. Williams, R.S. Dunbar, E. Rodríguez, “Point-wise Wind Retrieval and Ambiguity Removal Improvements for the QuikSCAT Climatological Data Set,” Accepted for publication in IEEE Trans. Geoscience and Remote Sensing. doi:10.1109/TGRS.2012.2235843, 2013.

[2] Stiles, B.W., B. Pollard, and R.S. Dunbar, “Direction interval retrieval with thresholded nudging: a method for improving the accuracy of quikscat winds,” Geoscience and Remote Sensing, IEEE Transactions on, vol. 40, no. 1, pp. 79–89, doi:10.1109/36.981351, 2002.

# 12. Acronyms:

**ADEOS:** Advanced Earth Observing Satellite
**ASCAT:** Advanced Scatterometer (METOP)
**CCSDS:** Consultative Committee for Space Data Systems
**CF:** NetCDF Climate and Forecast (CF) Metadata Convention
**DIR:** Directional Interval Retrieval
**ECMWF:** European Centre for Medium-Range Weather Forecasts

**ERS:** Earth Remote Sensing
**EUMETSAT:** European Organization for the Exploitation of Meteorological Satellites
**FTP:** File Transfer Protocol
**GMF:** Geophysical Model Function
**GMT**: Greenwich Mean Time (also known as Zulu or UTC time)
**H-Pol**: Horizontally (HH) Polarized
**IDL:** Interactive Data Language
**JPL:** Jet Propulsion Laboratory
**L2B:** Level 2B
**MD5:** Message-Digest Algorithm
**MetOp-A/B:** Meteorological Operational Satellite series A and B (also METOP)
**NASA:** National Aeronautics and Space Administration
**NetCDF:** Network Common Data Form
**OPeNDAP:** Open-source Project for a Network Data Access Protocol
**PO.DAAC:** Physical Oceanography Distributed Active Archive Center
**QuikSCAT**: NASA Quick-recovery Scatterometer
**RMS:** Root-Mean-Square
**SASS:** Seasat-A Satellite Scatterometer
**SSM/I:** Special Sensor Microwave Imager
**V-Pol**: Vertically (VV) Polarized
**WVC:** Wind Vector Cell

# 13. Document History

**Document Draft Date:**

7 March 2013

**Document Review Date:**

22 March 2013

**Document Revision Date:**

25 March 2013

## Citation:

A majority of the document material was provided by Bryan Stiles and Alex Fore, much of which was derived from material derived from Fore et al. (2013) and the previous QuikSCAT user guide.

Citation of this dataset should reference Persistent ID PODAAC-QSX12-L2B01 and follow PO.DAAC general dataset citation guidelines as mentioned here: http://podaac.jpl.nasa.gov/CitingPODAAC

## Document Location:

ftp:// podaac.jpl.nasa.gov/allData/quikscat/L2B12/docs/