

**For Using Data**

Data Policy	JAMSTEC
Principal Investigator	Mikiko Fujita (JAMSTEC)
Use Constraints	It is recommended to contact the above investigator before use for publication.
Data Citation	It is recommended to contact the above investigator by email (fmiki@jamstec.go.jp) before use for publication.

**Quality**

PI-Processed

**Instrument**

GPS water vapor observation system

**Overview**

The data provided here is precipitable water vapor (column water vapor) estimated from GNSS observation on R/V KAIMEI. See "Flow of precipitable water vapor (GNSS water vapor) data processing" for detailed processing methods.

**Measurement System**

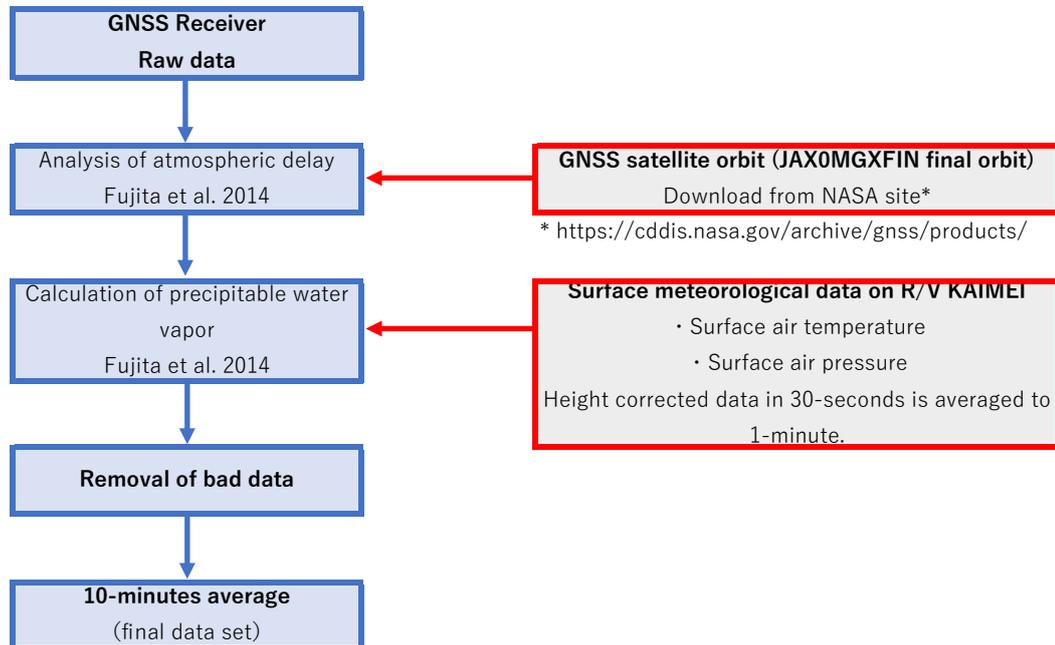
GNSS receiver :	manufacturer :	Trimble
	Type :	NetR9 Ti-1
GNSS antenna :	manufacturer :	Trimble
	Type :	GNSS-Ti Choke Ring Antenna with radome
Antenna location :		compass deck (18 meters high from sea surface)
Received satellite :		GPS, GLONASS, QZSS
Sampling interval :		30 sec
Elevation mask :		5 degrees

**Note**

This precipitable water vapor data was updated to multi-GNSS analysis data in March 2025. Previously processed data analyzed using GPS orbit only is also available. If you would like the previously processed data or raw data set, please contact DMO at "dmo@jamstec.go.jp".

## Flow of precipitable water vapor (GNSS water vapor) data processing

"The R/V KAIMEI precipitable water vapor (GNSS water vapor) data set" is processed with following methods.  
Basically, we obtain precipitable water vapor using the same methods as in Fujita et al., 2014.



### •Removal of bad data

In order to remove bad data, standard deviation filter is used for 1-hour section (30-minutes forward and back-wards). When the value of the target data is more than twice the standard deviation from the average value, the data is removed as bad data.

### •10-minutes average

10-minutes mean value is produced from every 30-seconds data as a simple average of 20 samples. When the number of sample is less than 10 (half number of sample), the average is treated as missing data (999.99).

10-minutes mean value is defined as a average of past 10 minutes from the time (i.e., time stamp at end of average).

### •Removal of the early stage of atmospheric delay analysis

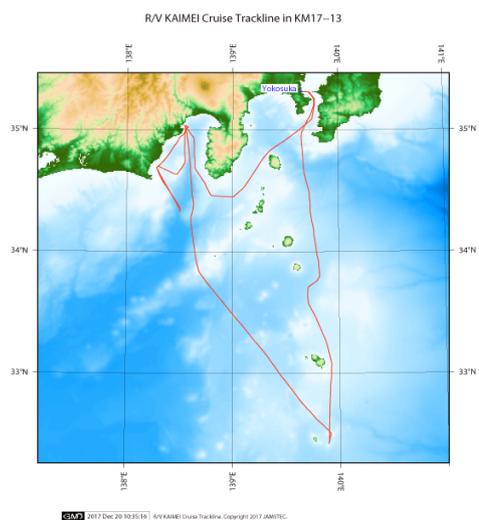
Since the analysis of atmospheric delay is performed using the kalman filter, the estimation accuracy in the early stage of analysis is poor. For that reason, the first three hours is removed from the data provided here.

### •References

Fujita, M., Wada, A., Iwabuchi, T., and Rocken, C.,  
Tropospheric monitoring over the ocean using a shipborne GNSS receiver.  
Proceedings of the 27th International Technical Meeting of The Satellite Division of the Institute of Navigation (ION GNSS+ 2014), 2014.

## Related Information

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### KM17-13

Ship Name: KAIMEI  
Period: 2017/12/03 - 2017/12/10  
Chief Scientist: Fujio Yamamoto (JAMSTEC)  
Proposal:

## Format Description for Precipitable water vapor (GNSS water vapor)

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Single space separated.

No.	Column	Content	Format (nodata or baddata)	Unit	Remarks
1	1-8	Date [YYYYMMDD]	i4,i2,i2		Every 10 minutes*
2	10-13	Time [hhmm]	i4		Every 10 minutes*
3	15-24	Longitude [-180 to 180]	f10.5 (999.99999)	degree	Location at time stamp + : East longitude - : West longitude
4	26-34	Latitude [-90 to 90]	f9.5 (999.99999)	degree	Location at time stamp + : North latitude - : South latitude
5	36-41	Precipitable water vapor (column water vapor)	f6.2 (999.99)	mm	10-minutes mean*

\* Time stamp is set at the end of average