No.	Questions	Answer
1	Availability of averaging kernels and other internal data	They are included in FTS SWIR L2 products for RA users.
2	How to select the FTS SWIR L2 data	Please see the "Important Notes at Releasing"(FTS SWIR L2 V02.xx)" at "Documents (Product Descriptions) " on "Documents & Information" page. Regarding the screening criteria, please refer to "Data Processing Flow for the FTS SWIR Level 2 CO2 and CH4 Data Products" on the same page.
3	When you have forgotten your username and password,	Your username is your e-mail address and please follow the instruction on Article 8.3; If you forgot your password ; in "GDAS Instruction Manual of the GOSAT Data Archive Service"
4	Tools for reading GOSAT data	Please see "Tools" on the top page of GDAS.
5	How to calculate a reflectance	How to calculate a reflectance is as follows. R = I / (S0 / D^2) * PI / cos(th) R: Reflectance S0: CAI-weighted solar irradiance I: Radiance PI: The ratio of circle's circumference to its diameter. th: Solar zenith angle D: Earth-Sun distance (astronomical unit) We calculate CAI-weighted solar irradiance using Thuillier (2003) solar spectrum and spectral response function of CAI. Band1: 1093.76 Band2: 1497.66 Band3: 952.575 Band4: 252.311 Unit: W/m^2/um um: micrometer Reference: Thuillier, G., M. Hers, P. C. Simon, D. Labs, H. Mandel, D. Gillotay, and T. Foujols, 2003, The solar spectral irradiance from 200 to 2400 nm as measured by the SOLSPEC spectrometer from the ATLAS 1-2-3 and EURECA missions, Solar Physics, 214(1): 1-22 The following URL has Thuillier (2003) solar spectrum. http://oceancolor.gsfc.nasa.gov/DOCS/RSR/Thuillier_F0.dat The follwoing page has sperctal response function of CAI. "Documents & Information" > "Technical Information " > "Spectral response function"
6	What's the difference 'Spectrum/SWIR/band1/lowWavelength' and obsWavelength'?	As rare cases, unexpected lower wavenumber components, which shall theoretically be zero, may appear in the spectral data when the jitter of the FTS field of view or micro-vibration occurred during the scan. "Spectrum data in lower wavenumber (lowWavelength)" is used to check the data quality from the condition of the spectrum data in lower wavenumber region. On the other hand, "obsWavelength" means the spectrum data in observation wavenumber. The valid data as the observation value is "the real part of the spectrum data in observation wavenumber (obsWavelength)". "Spectrum data in lower wavenumber (lowWavelength)" and "the imaginary part of the spectrum data in observation wavenumber (obsWavelength)" should be used as an indicator of the noise. So users are recommended to use the real part of the "obsWavelength" as the observation data. The following datasets includes the wavenumber information. ○The wavenumber of the Spectrum data in " lowWavelength(wavenumber)" SWIR : exposureAttribute/pointAttribute/RadiometricCorrectionInfo/spectrumLowWavelengthRange_SWIR TIR : exposureAttribute/pointAttribute/RadiometricCorrectionInfo/spectrumLowWavelengthRange_TIR ○The wavenumber of the Spectrum data in " obsWavelength(wavenumber)" SWIR : exposureAttribute/pointAttribute/RadiometricCorrectionInfo/spectrumObsWavelengthRange_SWIR TIR : exposureAttribute/pointAttribute/RadiometricCorrectionInfo/spectrumObsWavelengthRange_TIR
7	Column Amount' and 'Column-Averaged Mixing Ratio'	"IBUKI" measures an amount of carbon dioxide (CO2) or methane (CH4) in the form of column amount or as column-averaged mixing ratio. This article explains about the column amount and column-averaged mixing ratio. "IBUKI" measures the light that reaches the satellite from the ground surface as reflection of sunlight. By examining the light as spectra to know how much light was lost in the atmosphere due to the absorption by CO2 or CH4, it is possible to measure the amount of CO2 or CH4. For this reason, "IBUKI"'s measurement of CO2 and CH4 come out as a total amount of CO2 or CH4 from the ground surface to the top of atmosphere. A column amount is a total amount of gas in a column of a unit area with a height from the ground to the top of atmosphere. A column amount varies as the elevation of the ground surface or the air pressure change. In order to know the variations of CO2 or CH4, it is necessary to remove the interference of air pressure by calculating a column average mixing ratio. A column average mixing ratio is the ratio of a column amount of CO2 or CH4 to a column amount of dry air. The dry air is the air minus vapor that makes up about 0.5% of air at average, and consists of 78.1% nitrogen, 20.9% oxygen, 0.9% argon, and 0.04% carbon dioxide, and 0.003% others. The column amount of dry air can be calculated on the ground by measuring the air pressure, but it cannot be measured directly from space. Instead, the column amount of dry air is calculated by measuring a column amount of oxygen using its characteristic that its ratio to the dry air is almost always consistent. "IBUKI" calculates the column amount of oxygen by measuring the attenuation of light due to the absorption by oxygen.
8	TANSO-FTS instrument line shape (ILS)	The infromation about the ILS for the FTS is at "Technical Information " on "Documents & Information" page. https://data2.gosat.nies.go.jp/GosatDataArchiveService/usr/doc/PRJ/DocTechPRJPage/view When users use ILSF, please download the models at certain wavenumbers and interpolate them. We have not apodized the interferogram. For further information such as MOPD, please read the following articles carefully: A. Kuze, H. Suto, M. Nakajima, and T. Hamazaki, "Thermal and near infrared sensor for carbon observation Fourier-transform spectrometer on the Greenhouse Gases Observing Satellite for greenhouse gases monitoring", Appl. Opt., 48, 6716-6733, 2009. Akihiko KUZE, Hiroshi SUTO, Kei SHIOMI, Masakatsu NAKAJIMA, and Takashi HAMAZAKI , On-orbit performance and level 1 data processing of TANSO-FTS and CAI on GOSAT, SPIE7474, Proc. of SPIE Vol. 7474 74740I-1, 2009.
9	Where are the wavenumbers for the SWIR radiance data of the observation point defined? Although the radiometric conversion coefficient (CNV) of FTS Band1 has 2601 wavenumber data, FTS Band1 spectra has 6565 wavenumber data. How to use CNV ?	The Radiometric Correction Information for each wavenumber of the SWIR are defined in the exposureAttribute/pointAttribute/RadiometricCorrectionInfo/spectrumObsWavelengthRange_SWIR. On the other hand, the coefficients of the linear equation ; "a" and "b" are provided to calculate the wavenumber from the radiance spectra array number. Since the array number of the data and the number provided in the CNV data are not the same, calculate CNV values by interpolating the wavenumber.

10	Regarding the three angles (solar zenith, observation zenith & relative azimuth) in L1B data	Let us explain solar zenith angle, solar azimuth angle, satellite zenith angle and satellite azimuth angle. In the following section of the GOSAT User Handbook, it is shown where the above angles are stored in the product: 6.4.2 Format Examples (p. 6-20) (2) An example of CAI Level 1B product a. Geometric information of the observation point "Geometric information of the observation point" is configured as described below to indicate observation locations and conditions. ☐ Solar zenith angle of observation point : / Data/ geolocation/ solarZenth ☐ Solar azimuth of observation point : / Data/ geolocation/ solarAzimuth ☐ Satellite zenith angle of observation point : / Data/ geolocation/ satelliteZenith ☐ Satellite azimuth of observation point : / Data/ geolocation/ satelliteAzimuth A brief graphic explanation of zenith and azimuth angles is available at "FTS Level 1 product (MAS-100067C_GOSAT_Leval_1_Product_Format_en.pdf)" in the "Product Format Descriptions"if you login to the GOSAT User Interface Gateway (GUIG). Please see "p.2-19, Figure 2-10 Angles for sunglint judgment (Projection to X-Y plane) " An introductory explanation is also available at http://sacs.aeronomie.be/info/sza.php. The satellite zenith angle is defined as the angle between zenith direction and a vector from the observation point to the satellite(In the figure, it is referred to as "Viewing Zenith Angle"
11	Regarding converting "V/cm-1" (raw spectrum) to "W/m2/micron/str" (radiometric spectrum)	Please see the following information on GDAS. GOSAT Ddata Archive Service -> Documents & Information -> Technical Information -> Radiometric Conversion factor https://data2.gosat.nies.go.jp/GosatDataArchiveService/usr/doc/PRJ/DocTechPRJPage/view You can get the table (excel) to convert L1B spectrum to Spectral radiance (Band 1-3).
12	The wavenumber range of TIR band is 700~1800cm-1,and the resolution is 0.2cm-1, so wavenumber should be 5500. But its wavenumber is 7575 in LIB file. Could you tell me the real wavenumber range ?	Effective wavenumber of TIR wavenumber range is 700-1800 cm-1, while actual data covers 500 - 2000 cm-1. And the wavenumber resolution is not completely equal to 0.2 cm-1. Following information in the products may help: TIR: exposureAttribute/pointAttribute/RadiometricCorrectionInfo/spectrumObsWavelengthRange_TIR (" WavelengthrRange " means in fact "WavenumberRange". We are sorry for this misleading information.)
13	How to calculate the satellite zenith angle at the observation point P	Please refer to this PDF.