This document explains the CLARS data structure and quick look figures (last modified on May 23, 2016). Please read this file carefully before using the CLARS data. If you have any questions, please contact Clare Wong (clare.wong@jpl.nasa.gov), Stanley Sander (stanley.p.sander@jpl.nasa.gov) or Thomas Pongetti (thomas.j.pongetti@jpl.nasa.gov).

1.1 TEXT FILES

The text files are generated daily. The format of the file name is CLARS_sample_data_YYYYMMDD.txt. Data are available from 2015/06/01 to 2016/03/27. Each file contains 9 columns of information. Figure 1 shows an example of the data structure of each text file.

CLARS_sample_data_20160224.txt

target	time (utc)	mc (#)	lat (deg)	lon (deg)	R (ppb/ppm)	err (%)	flag_highcloud	flag_lowcloud
Fontana	2016-02-24_15:28	1	34.069	-117.390	9.435	12.192	0.99	0.69
RanchoCucamunga	2016-02-24_15:31	1	34.081	-117.589	8.914	9.157	0.99	0.82
Riverside	2016-02-24_15:34	1	33.951	-117.392	10.480	15.451	0.99	0.61
LakeMatt	2016-02-24_15:37	1	33.877	-117.416	9.560	13.296	0.99	0.65
Norco	2016-02-24_15:40	1	33.962	-117.573	9.754	12.310	0.99	0.72
Pomona	2016-02-24_15:43	1	34.043	-117.725	9.611	9.590	0.99	0.86
210Bend	2016-02-24_15:46	1	34.120	-117.868	10.477	8.716	0.99	1.00
Corona	2016-02-24_15:52	1	33.868	-117.601	11.005	15.152	0.99	0.67
NorthOC	2016-02-24_15:55	1	33.863	-117.776	7.728	4.679	0.99	0.71
60Industry	2016-02-24_15:58	1	34.000	-117.883	8.705	4.856	0.99	0.92
SantaFeDam	2016-02-24_16:01	1	34.110	-117.969	7.490	3.680	0.99	1.12
OCairPort	2016-02-24_16:04	1	33.678	-117.864	7.056	5.934	0.99	0.68
AngelsStadium	2016-02-24_16:07	1	33.800	-117.883	7.406	5.377	0.99	0.76
HuntinghtonBeach	2016-02-24_16:13	1	33.722	-117.975	7.238	5.908	0.99	0.74
LaMirada	2016-02-24_16:16	1	33.910	-118.006	9.468	5.843	0.99	0.95
605and60	2016-02-24_16:19	1	34.030	-118.025	8.970	5.118	0.99	1.06
SantaAnitaRace	2016-02-24_16:22	1	34.141	-118.042	8.533	4.024	0.99	1.14
LongBeach405	2016-02-24_16:33	1	33.821	-118.195	8.162	5.453	0.99	0.95
Downey	2016-02-24_16:36	1	33.930	-118.158	8.627	5.287	0.99	1.06
ELAwater	2016-02-24_16:39	1	34.048	-118.116	8.532	4.395	0.99	1.31
PalosVerdes	2016-02-24_16:47	1	33.810	-118.368	6.350	5.540	0.99	0.77
MarinaDelRey	2016-02-24_16:50	1	33.990	-118.400	6.752	4.015	0.99	0.98
DownTownFar	2016-02-24_16:53	1	34.054	-118.305	6.216	3.335	0.99	1.15
DownTownNear	2016-02-24_16:56	1	34.102	-118.234	6.671	3.293	0.99	1.31
WestPasadena	2016-02-24_16:59	1	34.170	-118.165	9.072	3.952	0.99	1.18
SantaMonicaMountains	2016-02-24_17:02	1	34.093	-118.470	7.665	3.854	0.99	1.00
Glendale	2016-02-24_17:08	1	34.154	-118.273	7.124	3.444	0.99	1.20
UniversalCityNew	2016-02-24_17:11	1	34.143	-118.357	7.044	3.382	0.99	1.13
ShermanOaks	2016-02-24_17:14	1	34.163	-118.411	7.880	3.727	0.99	1.13
WoodlandHills	2016-02-24_17:17	1	34.178	-118.601	7.694	4.307	0.99	1.08
VanNuysAirPort	2016-02-24_17:20	1	34.201	-118.496	8.524	4.441	0.99	1.11
CanogaPark	2016-02-24_17:23	1	34.207	-118.595	7.520	4.240	0.99	1.06
Northridge	2016-02-24_17:26	1	34.223	-118.546	2.950	10.098	0.99	0.94
Fontana	2016-02-24_17:33	2	34.069	-117.390	9.760	11.192	0.98	0.71
RanchoCucamunga	2016-02-24_17:36	2	34.081	-117.589	7.383	4.603	0.98	0.84

Figure 1. Example of the text files.

Column 1: *target names*; basin target reflection point. Figure 2 and Table 1 show a map and a list of the CLARS-FTS basin reflection points. The CLARS FTS had 28 basin reflection points from 2015/06/01 to 2015/12/14 (#1 - #28 in Figure 2 and Table 1). We have expanded our field of view to include an additional five reflection points (#29 - #33) in the San Fernando Valley since 2015/12/15.

Column 2: *time*; date and time in UTC (YYYY-MM-01_HH:MM).

Column 3: *mc*; measurement cycle numbers (#). Our standard measurement cycle typically starts from the eastern side of the Los Angeles basin and ends at the western side of the basin.

Column 4: *lat*; latitudes of reflection points (deg.).

Column 5: *lon*; longitudes of reflection points (deg.).

Column 6: *R*; CLARS XCH4/XCO2 excess ratios (ppb/ppm). The ratios are derived using the Spectralon observations at the CLARS facility on Mount Wilson as the background reference as shown in Equation 1. In Equation 1, $XCH4_{LABS}$ and $XCO2_{LABS}$ are the basin path-averaged dry air mixing ratios, and $XCH4_{SVO}$ and $XCO2_{SVO}$ are the average spectralon path-averaged dry air mixing ratios for the measurement cycle. The path-averaged dry air mixing ratios ($Xgas$) are computed by dividing the slant column density of the trace gas ($gas\ SCD$) by that of oxygen ($gas\ SCD$) using Equation 2. 0.2095 is the dry air mole fraction of oxygen in the atmosphere. Details on CLARS-FTS instrument setup, data retrieval and processing algorithms can be found in Fu et al. (2014).

$$R = \frac{XCH4_{LABS} - XCH4_{SVO}}{XCO2_{LABS} - XCO2_{SVO}}, \text{ where} \quad (1)$$

$$Xgas = \frac{gas\ SCD}{O2\ SCD} \times 0.2095 \quad (2)$$

Column 7: *err*; Uncertainty of R or CLARS XCH4/XCO2 excess ratio (%).

Column 8: *flag_highcloud*. This is a flag indicating high cloud conditions. Flag ≈1 when there is no high cloud. Flag > 1.01 when high cloud exists.

Column 9: *flag_lowcloud*. This is a flag indicating potential low cloud conditions. Flag <=1 when there is potential for low cloud condition. Flag > 1 indicates that there is no low cloud.

Figure 2. Location of the CLARS-FTS basin reflection points. The names of the reflection points are shown in Table 1. The Spectralon target located at the CLARS facility on Mount Wilson is not shown on this map.

1. Santa Anita Race Track	12. Downey	23. Huntington Beach
2. West Pasadena	13. La Mirada	24. Palos Verdes
3. Santa Fe Dam	14. Pomona	25. Fontana
4. East Los Angeles	15. Santa Monica Mountains	26. Orange County Airport
5. 210 Freeway	16. Marina Del Rey	27. Riverside
6. Glendale	17. Rancho Cucamonga	28. Lake Mathews
7. 60 and 605 Intersection	18. North OC	29. Northridge
8. Downtown (near)	19. Long Beach	30. Woodland Hills
9. Universal City	20. Angeles Stadium	31. Canoga Park
10. 60 Freeway, City of Industry	21. Norco	32. Sherman Oaks
11. Downtown (far)	22. Corona	33. Van Nuys Airport

Table 1. List of the CLARS-FTS basin reflection points. The locations of the reflection points are shown in Figure 2.

1.2 QUICK LOOK MAPS

The CLARS quick look maps were generated for each measurement cycle per day. The format of the file name is CLARS_sample_data_YYYYMMDD_MC#.jpg. Data are available from 2015/06/01 to 2016/03/27. The quick look maps are generated by interpolating the CLARS CH_4:CO_2 excess ratios (ppb/ppm) using natural neighbor interpolation. If there is more than one observation for a specific target in one measurement cycle, we use the average of the observations for that target in the quick look map. Data plotted on these quick look maps are mostly raw data with uncertainties of less than 100%. Please note that we do not apply any addition filters to take out data contaminated by cloud conditions. The purpose of these maps is to give the users a quick look on the raw data. It is up to the users to apply filters to the dataset based on the flags for cloud conditions and uncertainties. Please refer to Section 1.1 in this document for the CLARS cloud flags and

uncertainties. A two-year average CH_4:CO_2 excess ratio map in the Los Angeles basin from 2011 to 2013 can be found in Wong et al. (2015).

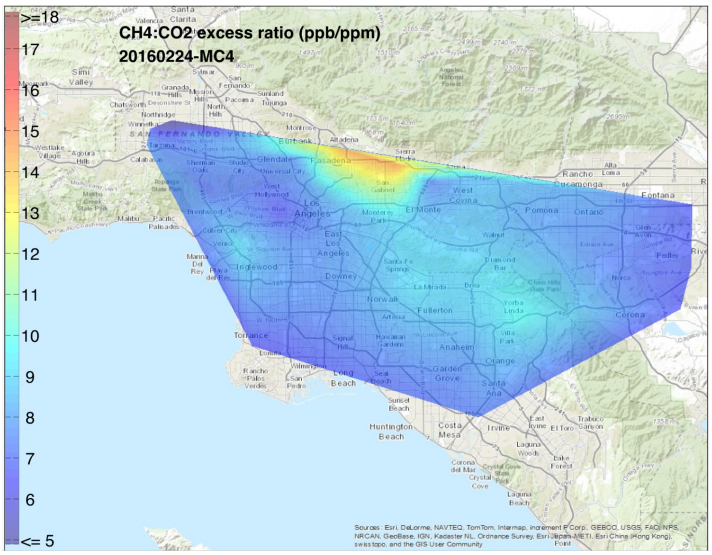

Figure 3. An example of the CLARS CH_4:CO_2 excess ratio quick look map for measurement cycle #4 on 2016/02/24.

References

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