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GOSAT CO2 and CH4 calibration and validation activities with portable FTS measurements

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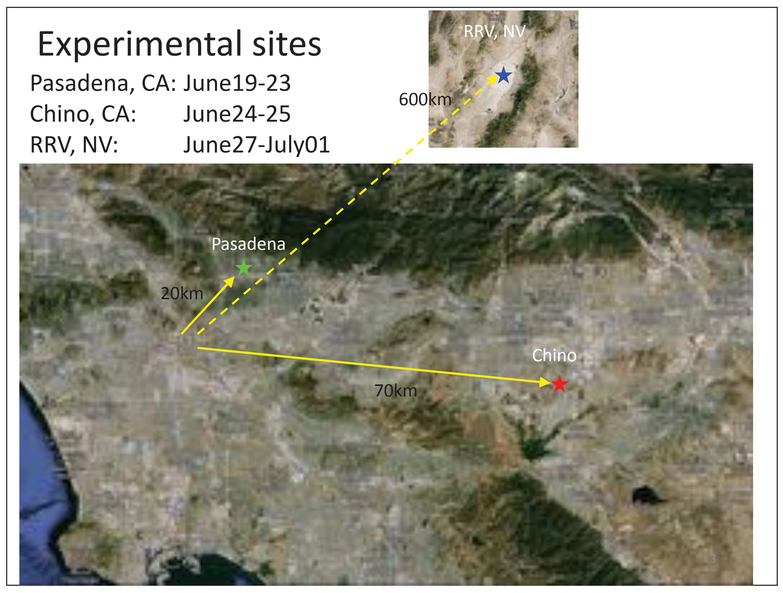
Introduction

- Last year, we introduced EM27/SUN a portable FTS with narrow band for XCO2 and XCH4 measurements at Railroad Valley “GOSAT calibration campaign 2014”.
- This year, we deployed the EM27/SUN at different type sites:
  1) Caltech, in Pasadena, a northern Los Angeles suburb,
  2) Chino, a dairy region east of Los Angeles,
  3) Railroad Valley (RRV), a desert playa in Nevada.
- We also compared with EM27/SUNs of JAXA and Caltech.

Experimental sites

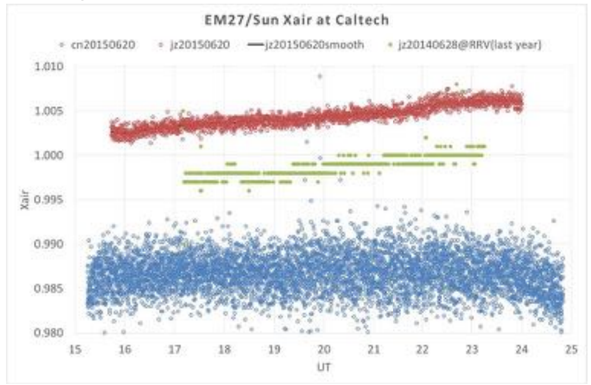
Pasadena, CA: June19-23
Chino, CA: June24-25
RRV, NV: June27-July01



JAXA’s and Caltech’s EM27/SUNs comparison @Caltech, Pasadena

We visited at Caltech before vicarious calibration campaign at Railroad Valley, Nevada in June 19-23.

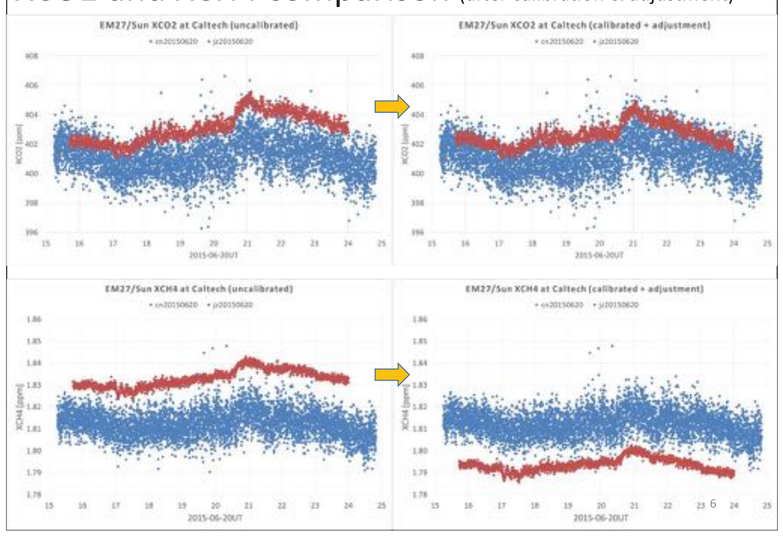
Xair comparison



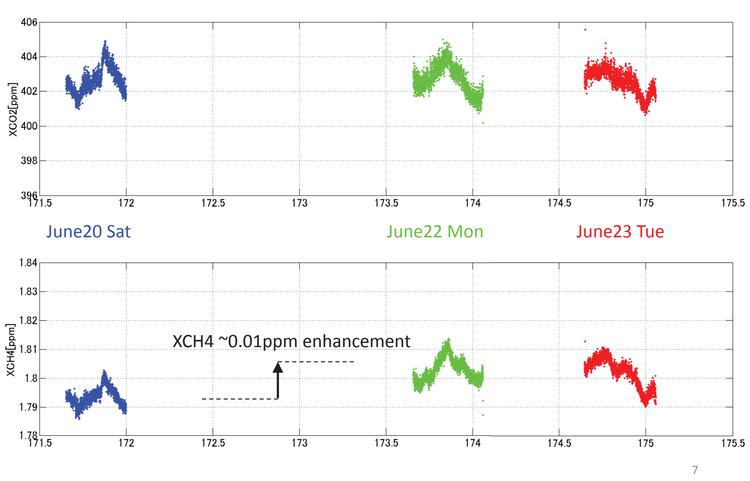
- JAXA’s Xair is not flat and increases gradually rather than Caltech’s Xair.
- Last year’s JAXA’s Xair was the same trend as this year’s.
- JAXA’s EM27/SUN measurement data is applied :

(1) Scale factor : at 21UT around AJAX flight time by RRV2015 calibration.
(2) Xair de-trend factors : Xair_smooth (t) / Xair_smooth (21h) for each time.

XCO2 and XCH4 comparison (after calibration & adjustment)

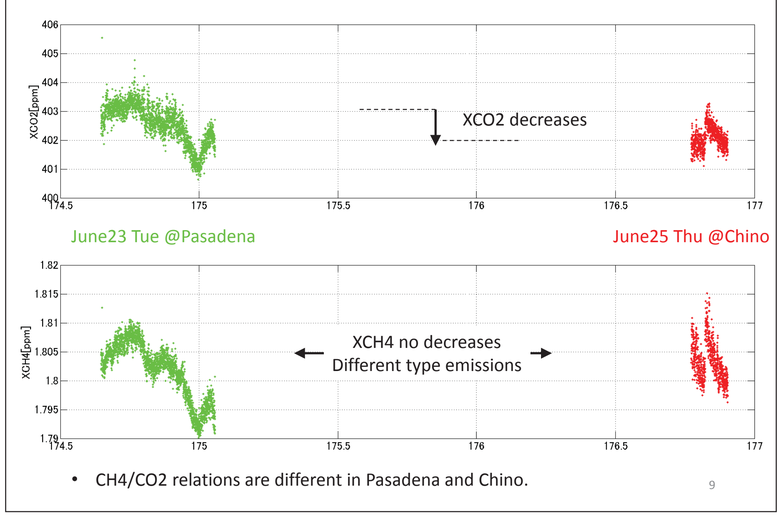


XCO2 and XCH4 at Pasadena (weekends and weekdays)



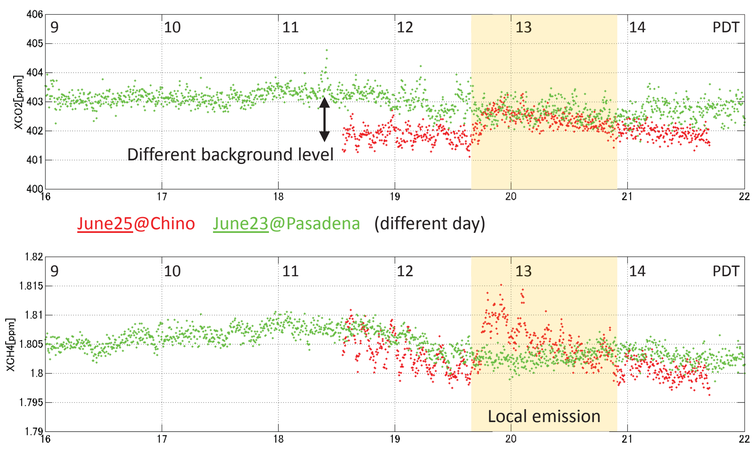
Chino site

XCO2 and XH4 at Chino (compared with Pasadena)



- CH4/CO2 relations are different in Pasadena and Chino.

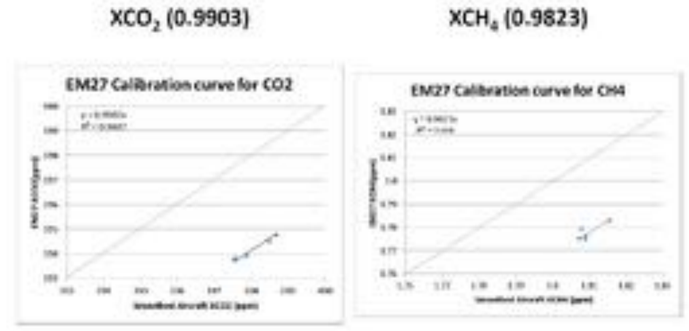
Comparison in local time



- Chino XCH4 is more fluctuated than Pasadena due to effecting next to point emission.
- XCH4 ~0.01 ppm and XCO2 ~ 1ppm increased in 10 min by local large emission.

Measurement at Railroad Valley Playa, Nevada

Last year calibration of JAXA’s EM27/SUN at AFRC and RRV using AJAX flight profiling



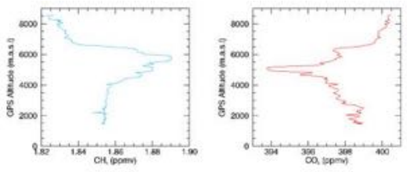
Each calibration curve (or scale factor, SF) for CO_2 and CH_4 is determined using AJAX aircraft profiles on 18, 24, 25, 27, 28 June 2014.

It was calibrated at AJAX flight time around 21UT.

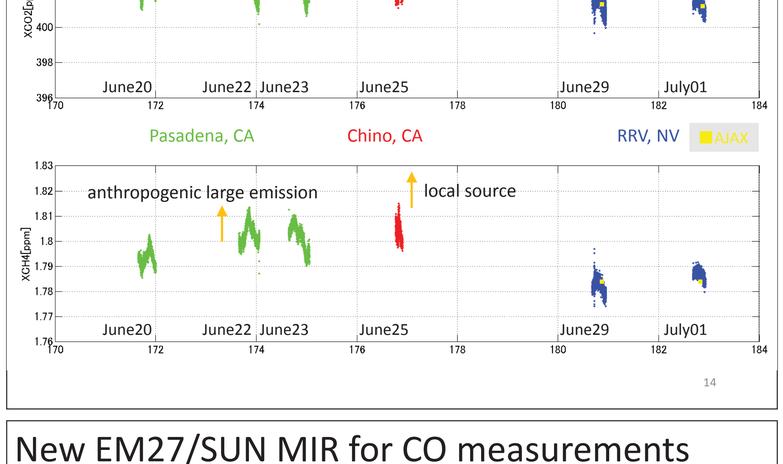
Kawakami et al., AGU Fall Meeting, 2014

JAXA’s EM27/SUN scale factor by AJAX RRV flight at 21UT

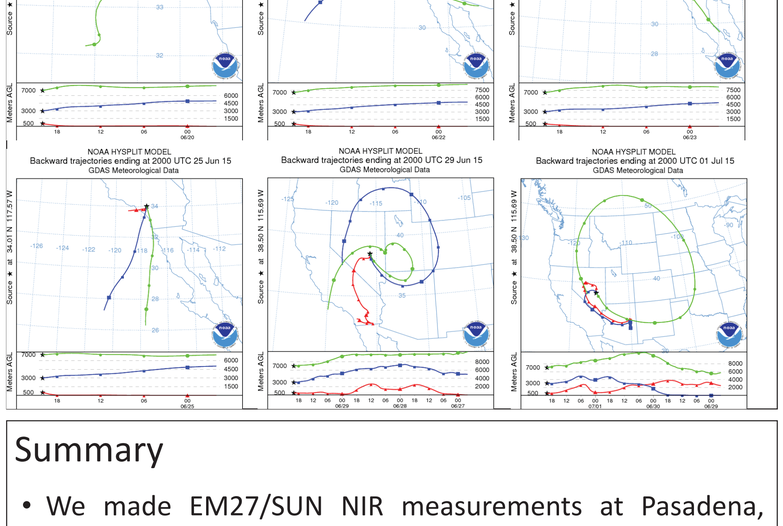
AJAX flight @RRV	EM27/SUN (+/-10min)		AJAX airplane		Scale factor (RRV2015)	
	XCO2	XCH4	XCO2	XCH4	XCO2	XCH4
2015/06/29 21:00	401.92	1.8217	401.3	1.784	1.0016	1.0224
2015/07/01 21:00	401.86	1.8261	401.2	1.784		



EM27/SUN XCO2 and XCH4 at all sites

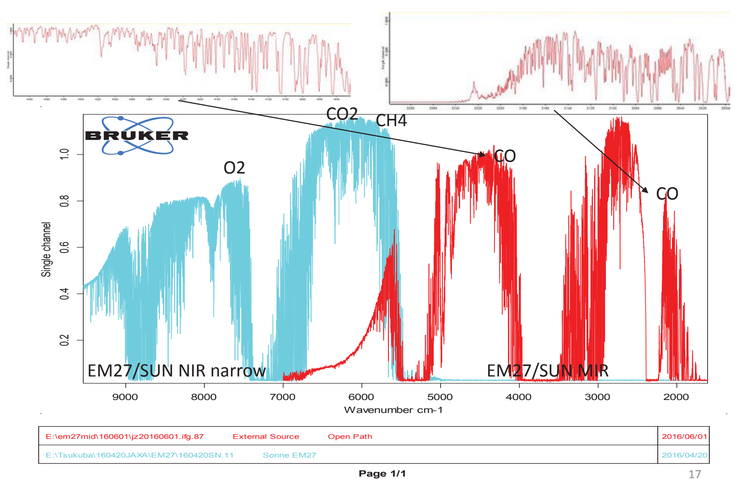


Trajectory analysis（HYSPLIT）



New EM27/SUN MIR with InSb-detector

New EM27/SUN MIR for CO measurements



Summary

- We made EM27/SUN NIR measurements at Pasadena, Chino and Railroad Valley; different type sites.
- CH4 gives a useful information on anthropogenic large emission at Pasadena, local emission at Chino.
- Comparison between JAXA’s and Caltech’s EM27/SUNs was shown the Xair difference.
- JAXA’s EM27/SUN data became better after applying of scale factor by AJAX RRV flight and de-trend Xair.
- Xair difference might come from ILS issue or sampling.

- We have just set up a new EM27/SUN MIR with CO measurements for GOSAT-2 objectives. It will be tried at West US campaign.