

Report of Breakout Session:

Greenhouse Gases (CH₄, CO₂, N₂O, etc.)

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Eri Saikawa, Keen Amooney, Aronne Merelli,**

(a) **ID users and applications**

• **List potential users (GFDL, AQ Mgr's and Forecasters, Modeling)**

1. NOAA NCEP for CO2 – daily average (Mark Liu working with Yutai Hou)
Needed for radiation scheme (a radiance closure product)
Matt: this is sort of a different kind of product
2. Same kind of product for desired for CO2 and methane (YunHua Yang and John Derber, JCSDA)
3. NOAA CarbonTracker as a potential user – wants scene specific information

4. Eri Saikawa for N2O and Dylan for CO2

5. Qianlia Zhuang, Purdue University, Assimilation of AIRS/IASI CH4

Assimilation of IASI CO2, CH4 by several groups in Europe; Assimilation of GOSAT TIR and NIR data

NOAA should have appropriate disclaimers on experimental data products so that bloggers and any other unauthorized user would have a warning of use of these products.

Chris the original IASI users (Oct. 2011) were:

	CLASS	DDS	CCR	T	q	O3	CO	CH4	CO2	HNO3	N2O	SURF	CLD	CONV
Gary Jedlovec	SPoRT	.	X	X	XX	.	.	.	.	.	.	.	.	.
Michele Rienecker	GMAO	X	X	X	XX	X	X	.	.	.	X	X	X	.
Ben Rustin	NRL	.	X	.	X	X	.	.	.	.	.	.	.	.
.. Edward Hyer	NRL	.	X	.	.	X	X	.	.	.	.	.	.	.
John LeMarshall	AU/BOM	X	X	X	XX	.	.	X	.	.	.	.	.	.
Sylvain Heilliette	CMC	.	X	X	(and CCR PC's)	.	.	.	.	.	.	.	.	.
Andrew Gettleman	UCAR	X	.	.	XX	.	.	.	.	X	X	.	.	.
Mark DeMaria	STAR	X	X	X	XX	X	.	.	.	X	X	X	.	.
+ John Knaff	CIRA	X	X	X	XX	X	.	.	.	X	X	X	.	.
Steve Wofsy	HARVARD	X	X	.	X	X	X	X	.	X	.	.	.	.
Laura Pan	NCAR	X	X	.	XX	X	.	.	.	.	.	.	.	.
Bill Randel	NCAR	X	X	.	XX	X	X	X	.	.	.	.	.	.
Juying Warner	UMBC	X	.	.	.	X	X	X	.	.	.	.	.	.
Brad Pierce	NOAA	X	.	.	XX	X	X	.	.	.	.	.	.	.
Gail Bingham	SDL	X	X	X	XX	X	.	.	.	X	X	.	.	.
Wallace McMillan	UMBC	X	X	.	XX	X	X	X	X	.	.	.	.	.

Dave Edwards	NCAR	X	.....	X	X	.....	.
Brian Gockel	AWIPS	X	XX	.....	.....	.....	X

- **Different Needs**

- NRT operational
- Long-term trend analysis
- Field campaign support
 - A.K's NRT display of products can be used for flight planning
 - STAR can support providing NRT

(b) Describe status of current CrIS products

- What products exist? CO2, CH4, N2O, O3, H2O
- Are the available in NRT? Yes, by request
- What validation has been done: comparisons to AIRS products and very limited comparisons to ESRL, For CARIBIC CH4, HIPPO (for AIRS)
 - Arlyn: IAGOS will measure CO2 soon. We have time series that can be used for statistical comparisons. Alaska coast guard flights from Fairbanks to Barrow – these are ongoing. NASA CARVE campaign.
 - Colm Sweeney is contact point for more aircraft data

- What are the known biases/issues:

CH4 spectroscopy issues – need validation;
 bigger issue is updating spectroscopy into our forward model
 Jean-Luc at ERT runs OSS-plus

(c) ID validation needs

- What past or already planned field campaigns
 - Long term data sets : TCCON, NDACC for total column; but would love more ESRL aircraft – profile is what is needed
 -
 - Add to VALAR?
 - Need to have in archive so we can re-process and compare new versions of the retrieve in hindsight

Joost's slide on upcoming campaigns:
 ABOVE is upcoming. EV proposal in the pipeline for ADAM which is a follow-on to HIPPO

Arlyn: targeted flights every 2 weeks, at WLEF we go to 4 km but I would argue it represents 50-100 km scales.

Tokyo University, NIES: measures CO2 at 8 levels, more data in Siberia.

Eri: measuring surface CH₄ and CO in Nepal, ~1 month in April 2015

Arlyn: OCO-2 doesn't look for strict co-location. They look for things like potential temperature fields. Might exclude closest for scenes in same meteorology. It also would be good to collect all the good CO₂ and CH₄ for use by CarbonTracker. In 6 months and we will have a product for all aircraft. Jim Butler wants to promote at WMO. QC needs to be done, but this should be a WMO function. GMD will specify file format and contents. Datasets would reside in originating labs.

Good to use NOAA GMD Aircore. Fairly infrequent but goes up to 30 km. Colm Sweeney et al. doing launches in Finland, ARM-SGP, Boulder, Edwards Air Force Base

NASA AGAGE data

- What other field efforts would be needed
 - What airborne and surface instruments would be available
 - Dream big: if you need 5 HIPPO then say so

More collaboration to match the time of flight with CrIS overpass is required

- What comparisons with past sounders are needed to make consistent data records
AIRS, TES, IASI

(d) **ID needed product changes/refinements**

- Focus on users needs, not retrieval requirements
- What data to be delivered (AKs, bias corrections, TES "lite" files
 - Smallest file size with everything they need

Chris: we can provide real time support and provide a tailored "lite" files. Archiving in CLASS is more difficult but could be hosted at STAR. NETCDF-4 is our preference. Put values on state-vector with full (100 level) AK's, QC etc.

Need AK and uncertainties and also *someone to call*

The 100 level product isn't rational – need a reasonable number of vertical layers

Desire for a NUCAPS trace-gas users guide.

- **Are changes in the processing schedule needed for NRT or long-term**

Chris: NASA grant for a climate version of NUCAPS. Weather products and climate/composition products might diverge.

- **Product testbed for trace gases?**
For example: AK's could be explored in a testbed by collaboration and then once a reasonable format was determined could be promoted to operational system

- **What about visualization?**
 - Common/community package of plotting scripts
 - Online maps to explore the data
 - Repository for readers, etc.

(e) Discuss potential new products

- **What additional products are needed for CrIS to continue the records of other sounders**
- **What new unique products could be possible**

N₂O (and HNO₃) is less mature. Current N₂O work by Xiaochen's on AIRS will be moved towards CrIS.

Arlyn: is there a possibility of a hybrid product. One could imagine a retrieval that is a hybrid product of CarbonTracker and all IR and all SWIR. Within NOAA we have the capacity to do it but not the forward modeling aspect. For example, in C. Barnett's talk when he said O-E is better than SVD I am not sure if I agree. A hindsight analysis could use CarbonTracker as a prior. CarbonTracker-NRT is available for OCO-2. There will always be a retrospective product available. CarbonTracker-retrospective also has confidence limits. It is global with higher resolution over CONUS. Laurie has published CarbonTracker-CH₄.

Regional retrievals

Rogue version of "CarbonTracker-lagrange" (supported by OAR)

- **What additional products would you get if NOAA "close the spectral gaps" for J2**
- **How could validation of these new products be performed?**
- **Is infrastructure sufficient to distribute the new products?**
Yes, if STAR can support things like "lite" files and having testbed support and user support.

A portal to all satellite data that could, at a minimum, point a user to the various data archives and provide oversight.