Towards an International standard for Urban GHG Monitoring and Assessment

22nd – 24th 2020

Meeting Room: https://bluejeans.com/624488263/0047

Monday 22nd June

Date	Session
15:00 - 15:30 CEST 09:00 - 09:30 EDT 21:00 - 21:30 CST	**Expert Group Recommendations**. Welcome Jocelyn Turnbull Overview/Introduction Phil DeCola Introduction to ICOS urban mandate Werner Kutsch Goals of workshop Jocelyn Turnbull
	Inventory or emission flux data products
15:30 - 16:15 CEST 09:30 - 10:15 EDT 21:30 - 22:15 CST Moderator: Jocelyn Turnbull	Fossil fuel emission data products - Kevin Gurney • General principles – "Bottom-up" approaches (these include approaches using remote sensing of non-GHG attributes, estimates of ground-based human activity, direct flux monitoring, fuel statistics, etc) to estimating greenhouse gases play a critical role in planning, tracking, and evaluating emissions mitigation progress. They have been most developed for fossil fuel CO2 emissions, biogenic CO2, and methane emissions. This sub-session focuses on the FFCO2 effort. Bottom-up FFCO2 emissions estimation spans a range of techniques/approaches and has been used as standalone emissions information and in conjunction with atmospheric observation-driven systems. The general principles include a) evaluation against independent estimation techniques such as inverse systems; b) clear definitions of scope or emissions categorization; c) clarity on usable/applicable space/time resolution; d) traceability to input data; e) clarification of uncertainty estimation. • Hierarchy of products – a range of FFCO2 estimation efforts are represented in the research community. This range includes attributes such as domain size, space/time resolution, input data types, and process representation. • Input data required – A large mixture of input data has been used in bottom-up FFCO2 estimation. We will review of these data sources along with strengths, weaknesses, availability, timeliness, etc.

	• Framework for assimilating data into flux model. When used a boundary condition within data assimilation approaches, a number of important processes are worth reviewing such as, gridded regularization, gridding error, general error characterization, scope definition, and grid nesting
16:15 - 16:45CEST 10:15 - 10:45 EDT 22:15 - 22:45 CST Moderator: Jocelyn Turnbull	Methane flux models/products - Felix Vogel
Ancillary Observations	
16:45 - 17:00 CEST 10:45 - 11:00 EDT 22:45 - 23:00 CST Moderator: Jocelyn Turnbull	Meteorological and Boundary layer height observations Sunil Baidar, Alan Brewer
17:00 - 17:15 CEST 11:00 - 11:15 EDT 23:00 - 23:15 CST	Break
Data Analysis Methodologies	
17:15- 19:15 CEST 11:15 - 13:15 EDT 23:15 - 01:15 CST Moderator Phil DeCola	• General principles of method • Input data needed – quality of that data that is required • Model tools and quality required Tower-based data analysis (changes through time, variability in obs values) Jooil Kim Mass balance Joe Pitt Vertical profiles Ken Davis Choice of background Anna Karion Eddy covariance Dario Papale Tracer-tracer methods (including isotopes) Jocelyn Turnbull

WORLD METEOROLOGICAL ORGANIZATION

Integrated Global Greenhouse Gas Information System

Tuesday 23rd June

Date	Session
	DAS or AIM
15:00 - 17:30 CEST 09:00 - 11:30 EDT 21:00 - 23:30 CST Moderator Kevin Gurney	(nominate others for the parts of this section?) • General principles of method • Input data needed and quality • Model tools and quality of these FFDAS Peter Rayner Footprints John Lin Meteorological inputs (reanalysis or modelled) Kim Mueller, Israel Lopez-Coto Forward modelling Thomas Lauvaux Inversion Frederic Chevallier
17:30 – 17:45 CEST 11:30 – 11:45 EDT 23:30 – 23:45 CST	Break
17:45 - 18:45 CEST 11:45 - 12:45 EDT 23:45 - 00:45 CST Moderator Thomas Lauvaux	Mop up session and further discussion on Data Analysis and AIM
	Biogenic CO2 flux models
18:45 – 19:15 CEST 12:45 – 13:15 EDT 00:45 – 01:15 CST Moderator Kevin Gurney	Biogenic CO2 flux models/products - Lucy Hutyra • General principles • Comment on urban scale vs regional/continental/global scale biogenic flux models • Current limitations • Types of input data required. Inventories for vegetation

Wednesday 24th June

Date	Session
	Observations
15:00 - 17:15 CEST 09:00 - 11:15 EDT 21:00 - 23:15 CST Moderator Felix Vogel	• General principles of observational technique [move to end - focus on technical] • Data quality considerations • Sampling location considerations • Choice of background [move to data analysis section] • Trace gasses and isotopes that should be measured – essential – useful – nice to have • Special considerations for individual trace gasses/isotopes • Sampling strategy – frequency, number of sites [move to data analysis section -Low cost sensors - Links to modelling work - Complexity of solutions (obs alone vs those needed for inversions) Tower-based mole fraction observations Michel Ramonet Tower flux observations Dario Papale Aircraft/UAV/Air core based mole fraction observations Huilin Chen Mobile (ground based) surveys Felix Vogel Flask observations (all platforms) Isaac Vimont Tim-integrated samples where possible to reduce difficult-to-interpret short term variability Measure at same location/inlet height as in situ sensors where possible to provide data quality check for in situ sensors, and give context to flask measurements Aircraft and mobile platforms, consideration of locations where flasks are sampled, small numbers of flasks may not be representative of whole city Key species: CO_2, CO, CH_4 Fossil fuel tracer: $^{14}CO_2$ Stable isotopes for source apportionment: CO_2 and CH_4, stable isotopes for other species including CO are less commonly measured but of interest COS to trace photosynthetic uptake (complicated by combustion COS source) Hydrocarbons: source sector apportionment, link to AQ, ethane for CH_4 sector apportionment Halocarbons: source sector apportionment, some are minor GHGs as well Low Cost Sensors Ron Cohen

	Remote sensing – ground/aircraft based Jia Chen Remote sensing – satellite – David Crisp Air quality observations NOx, CO, etc
17:15 – 17:30 CEST 11:15 – 11:30 EDT 23:15 – 23:30 CST	Break
	New and Emerging Techniques
17:30 - 18:15 CEST 11:30 - 12:15 EDT 23:30 - 00:15 CST Moderator Jocelyn Turnbull	Other techniques that aren't covered elsewhere
	Recommendations for Data Management, Archiving and Distribution
18:15 - 19:15 CEST 12:15 - 13:15 EDT 00:15 - 01:15 CST Moderator Felix Vogel	Logan Mitchell, Alex Vermeulen Data management Data archiving Cooperative data products Data distribution
19:15 - 20:00 CEST 13:15 - 14:00 EDT 01:15 - 02:00 CST Moderator Jocelyn Turnbull	Remarks from WMO-Global Atmosphere Watch (GAW) Oksana Tarasova Recommendations for the collaboration and cooperation amongst cities Recommendations for meetings/conferences/working groups Phil DeCola **Closing remarks**