



Committee on Earth Observation Satellites

UNFCCC Global Stocktake #1 Products

David Crisp (NASA/JPL) on behalf of AC-VC and
WGClimate GHG Task Team

2020 CEOS Plenary

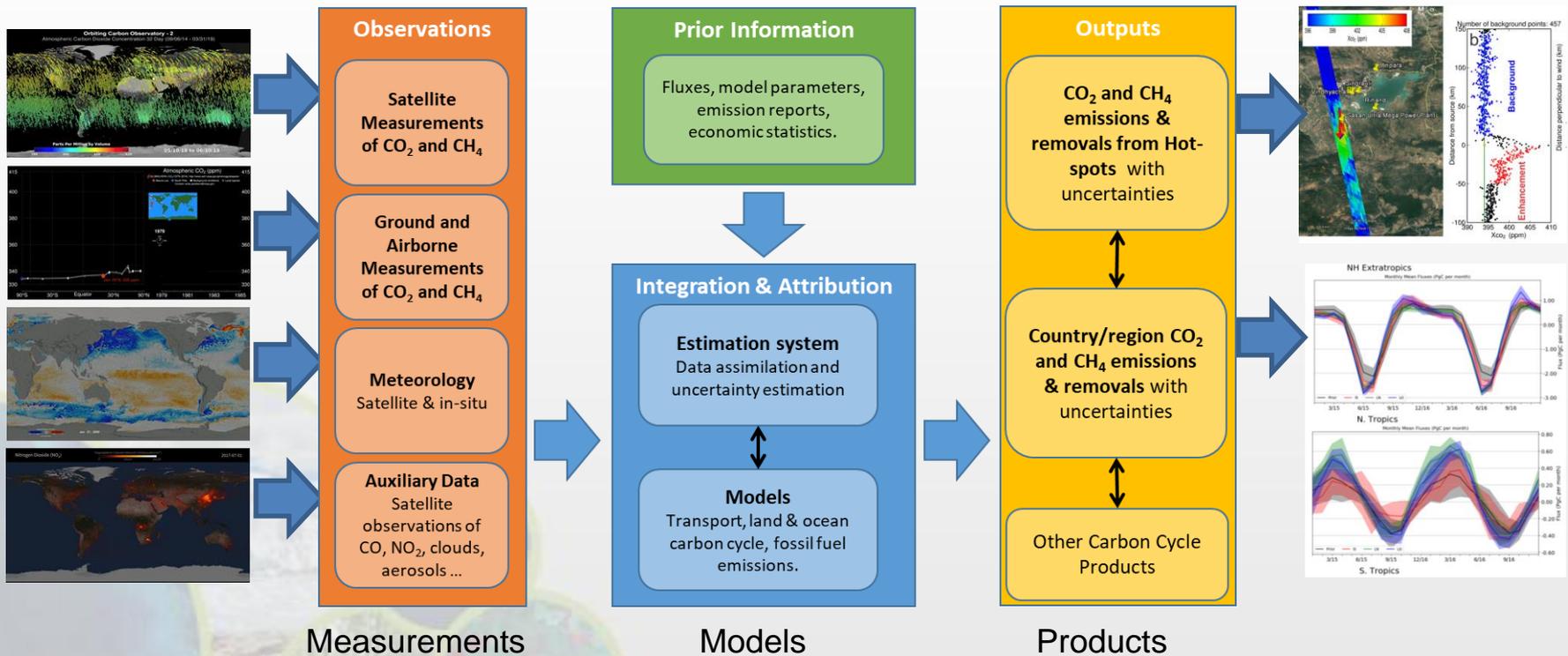
Agenda Item #3.10

20th – 22nd October 2020





Recall that a system approach has been adopted to provide atmospheric CO₂ and CH₄ inventories to support the global stocktakes



Here, we show the types of pilot products under development to support the first Global Stocktake in 2023



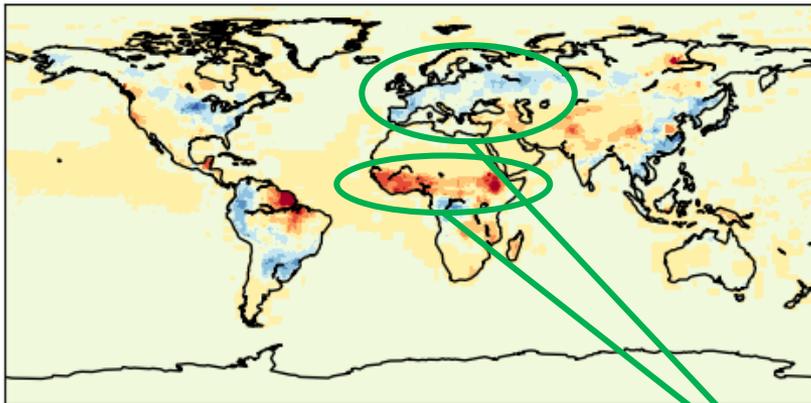
To support the GHG Roadmap (§3.4) and the UNFCCC Global Stocktake (GST)

- An Ensemble of 10 atmospheric inverse models is being used to assimilate NASA OCO-2 and *in situ* CO₂ measurements to produce spatially-resolved maps of CO₂ emissions and uptake
 - Bottom-up inventories for fossil fuel, fires etc. are used to establish the prior flux estimates, illustrating system approach
- Ensemble mean CO₂ flux maps optimized with in situ and space-based CO₂ measurements are adopted here as baseline values
 - Annual mean maps at 2° by 2° spatial resolution shown here
 - Monthly time series can also be extracted for 38 geographic regions (national totals under development)
- Variances across ensemble initially adopted as uncertainty estimates
- Delivery formats and schedules are still under discussion

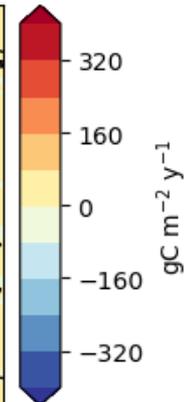
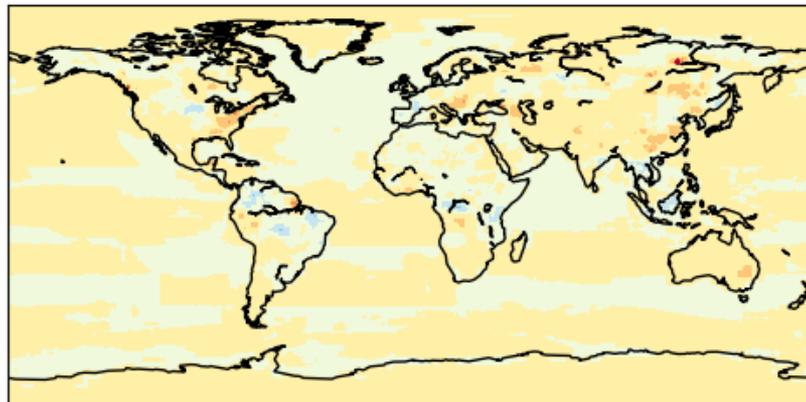
Global Maps of Annual Mean CO₂ Biospheric Emissions and Uptake



EnsMean: LN Land 2018 Annual Flux

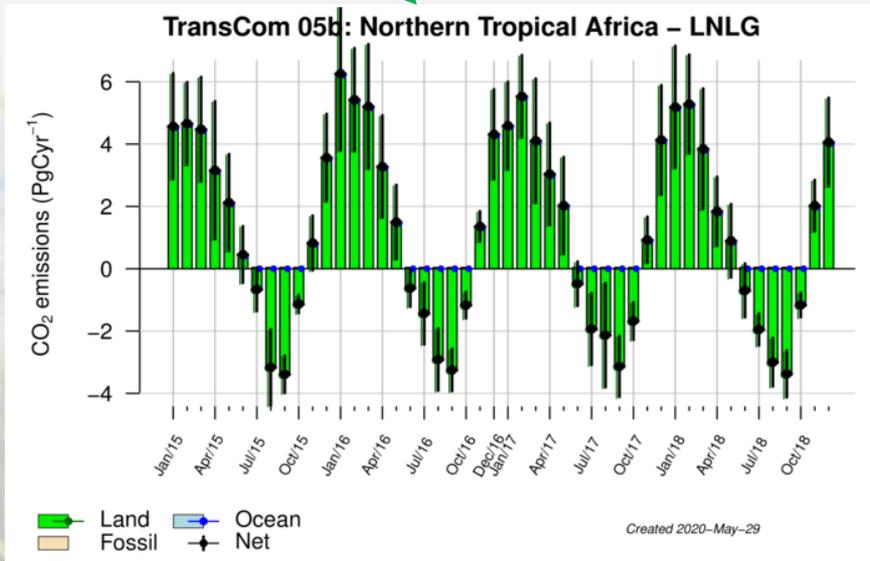


EnsMean: LN Net 2018 Annual Flux Anomaly



Mean CO₂ Fluxes

Flux Uncertainties



Regional Scale
Monthly Time
Series – ~~European~~
Africa

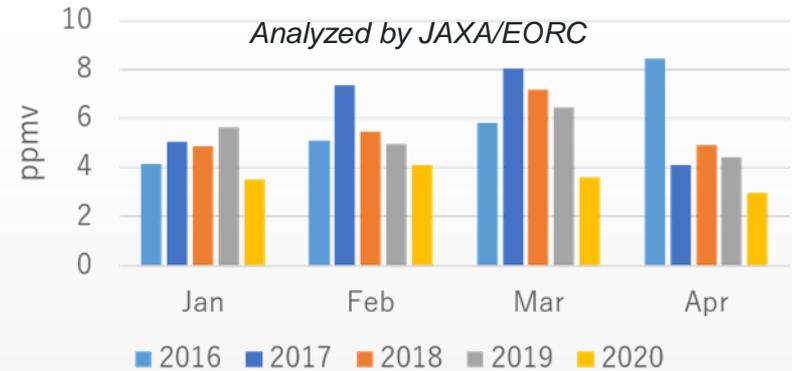


In addition to national-scale global atmospheric inventories, we are developing pilot products for localized sources including large urban areas, power plants and oil fields

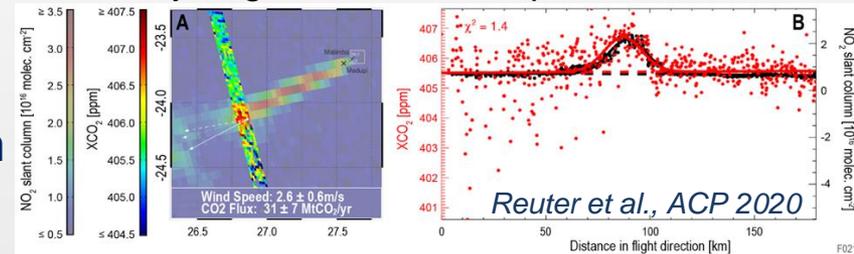
- The GOSAT team accelerated the development of an upper/lower tropospheric product to track effects of COVID-19 lockdowns on emissions from large urban areas
- The OCO-2 team is trending emissions from individual powerplants and large urban areas
- The TROPOMI team is tracking methane emissions from fossil fuel extraction

These products illustrate methods for tracking hot spots for future GST's

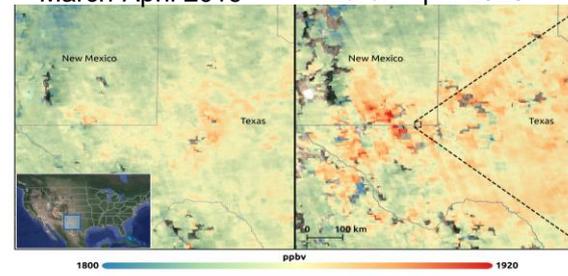
GOSAT observes CO₂ over Tokyo



OCO-2 XCO₂ and TROPOMI NO₂ quantify CO₂ emission by large South African power Plants



March-April 2019 March-April 2020



TROPOMI observes CH₄ emissions changes over Texas oil fields



The objective of this activity is to provide a product that starts a conversation with the relevant players and establishes the role of atmospheric inventories in future Global Stocktakes

- While existing space-based infrastructure and analysis capabilities are still evolving rapidly and are providing key insights into the emissions and uptake of CO₂ and CH₄ by natural processes and human activities, they are not expected to fully address the requirements of the first UNFCCC Global Stocktake in 2023
- However, these tools are adequate for generating products that illustrate the capabilities of future space-based greenhouse gas monitoring and analysis systems
- These pilot products are expected to foster the development of requirements with CEOS stakeholders (UNFCCC, GCOS) and interfaces with users in the national inventory communities who will be using the outputs of the much more capable system that will be coming on line to support the 2028 and future Global Stocktakes at 5-year intervals