Strategic R&D Area Project of the Environmental Research and Technology Development Fund

SII-8 [2021–2023]

Toward multi-scale greenhouse gas monitoring system for supporting global stock take

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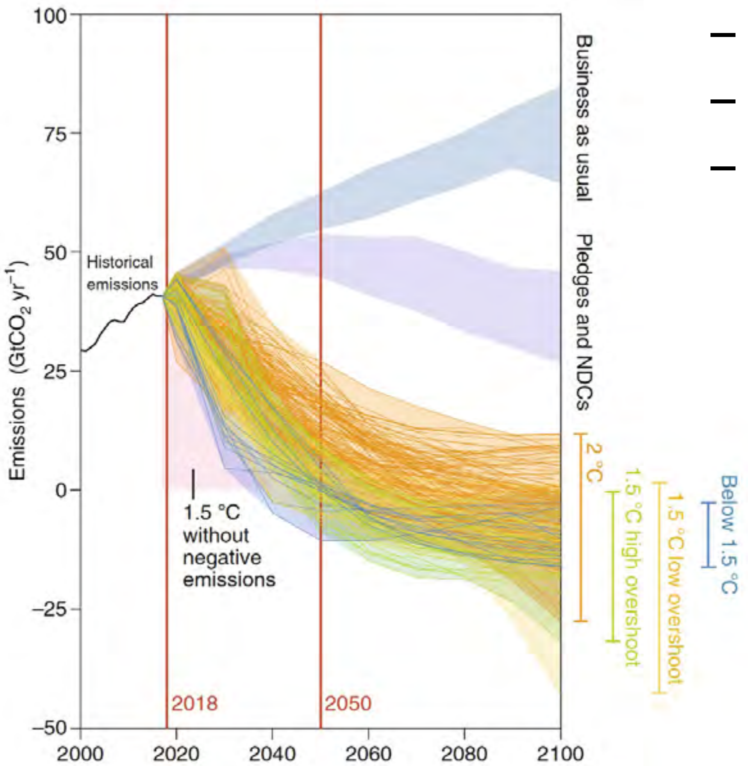
and many collaborators

Background: Global Stock Take

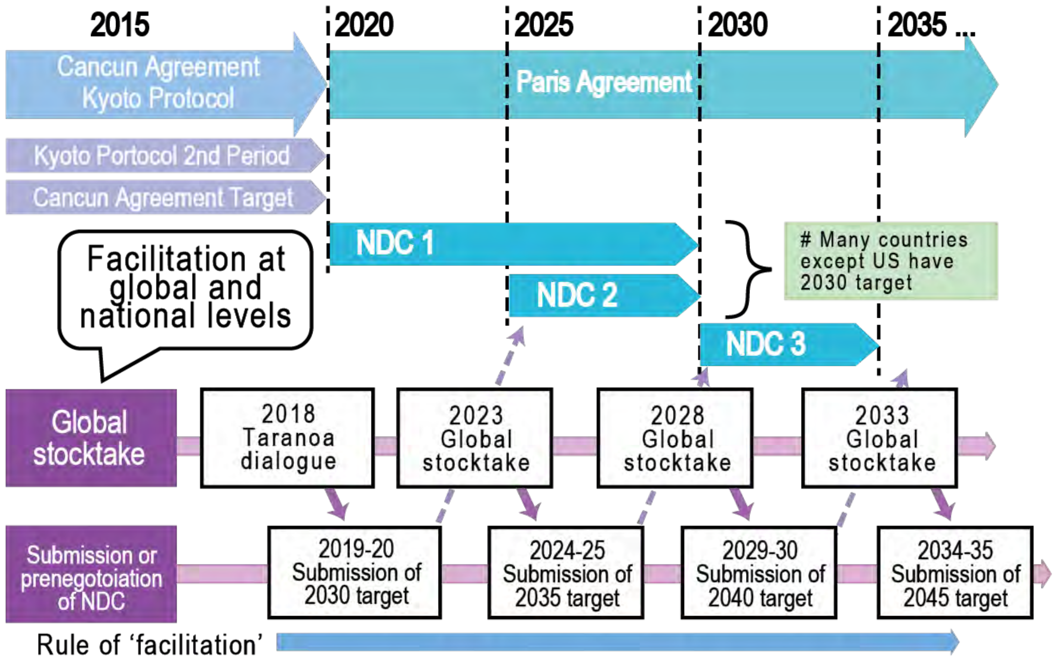


(Roe et al. 2019, NCC)

Paris Agreement: 1.5/2.0 ℃ target
=> Need for GHGs emission reduction
=> Nationally determined contributions (NDCs)

Japan: Zero emission by 2050

Global stock take
=> Check progress and re-targeting
- Comprehensive and facilitative manners
- Mitigation, adaptation, implementation and support
- Equity and the best available science



(from WWF Japan Material)

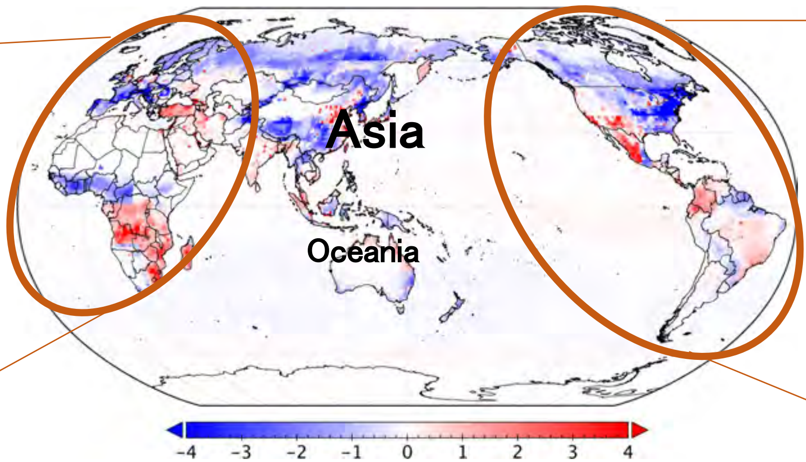
Current status of GHG monitoring

<u>Necessity and issues in GHG monitoring</u>

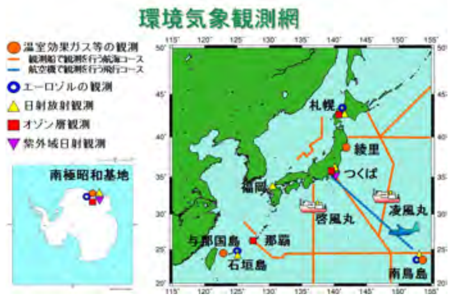
- GHG monitoring by 'beat available science' (for policy)
- Critical examination of climate policies (〃)
- Understanding and prediction of GHG budget (for science)

Lack of regional framework, in contrast to Europe and US

Bottle-neck of speedy reporting: lack of operational monitoring system



But, we have resources making it possible.



Objectives

The SII-8 project aims at speedy and high-precision evaluation of GHG budget through observational and modeling researches, for making contributions to political needs in terms of the Global Stocktake of the Paris Agreement.

Specifically, we make attempts by the best available science for:

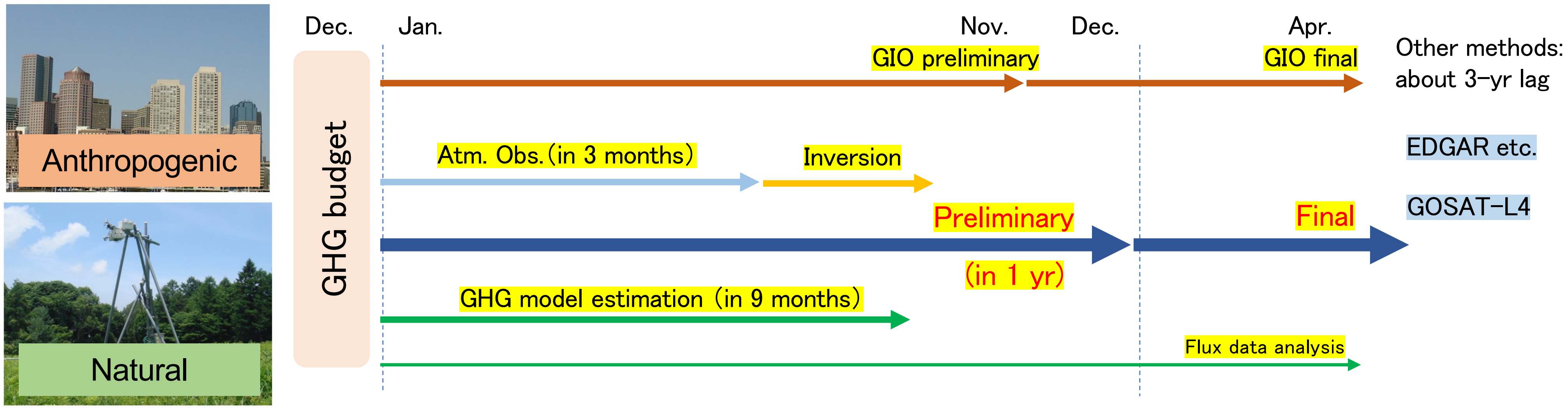
- 1: GHG evaluation at multi spatial scales from mega-city to country and global scales
- 2: establishment of speedy reporting system from observations of accounting
- 3: refinement of global warming projection by improving global GHGs cycles

Novelties and advantages

Establishing a top-level GHG evaluation system from scratch in 3 years => difficult
=> buildup on the existing resources (e.g., 2-1701 & 2-1710 projects)

What is the <u>novelty</u> and <u>advantage</u> of the SII-8 ? (why big budget is needed?)
- Multi-scale: seamless coverage from mega-city, country / region, to global scales
- Comprehensiveness: natural and anthropogenic major GHGs and tracers (e.g., CO)
- High scientific quality: rich achievements, understanding, prediction
  - => scientific topics: urban, fire, permafrost, climate-GHG feedback, CH_4 dynamics
- Speedy: not only for GST but also for emergent events (e.g., fires, COVID-19)

Image of speedy reporting



Structure

Theme 1: Multi-scale evaluation of GHGs based on atmospheric measurement

(PI: Yosuke NIWA, NIES)

Sub theme 1-1 : Observational strategy and GHG budget estimation with atmospheric model

Sub theme 1-2 : GHG observation by ground observatory and aircraft

Sub theme 1-3: Ocean CO2 flux data improvement by ship observation

Theme 2: ESM validation and GHG budget estimation for mitigation assessment

(PI: Tomohiro HAJIMA, JAMSTEC)

Sub theme 2-1 : Estimation of mitigation effect using Earth system model

Sub theme 2-2 : Global GHG budget assessment by to—down approach

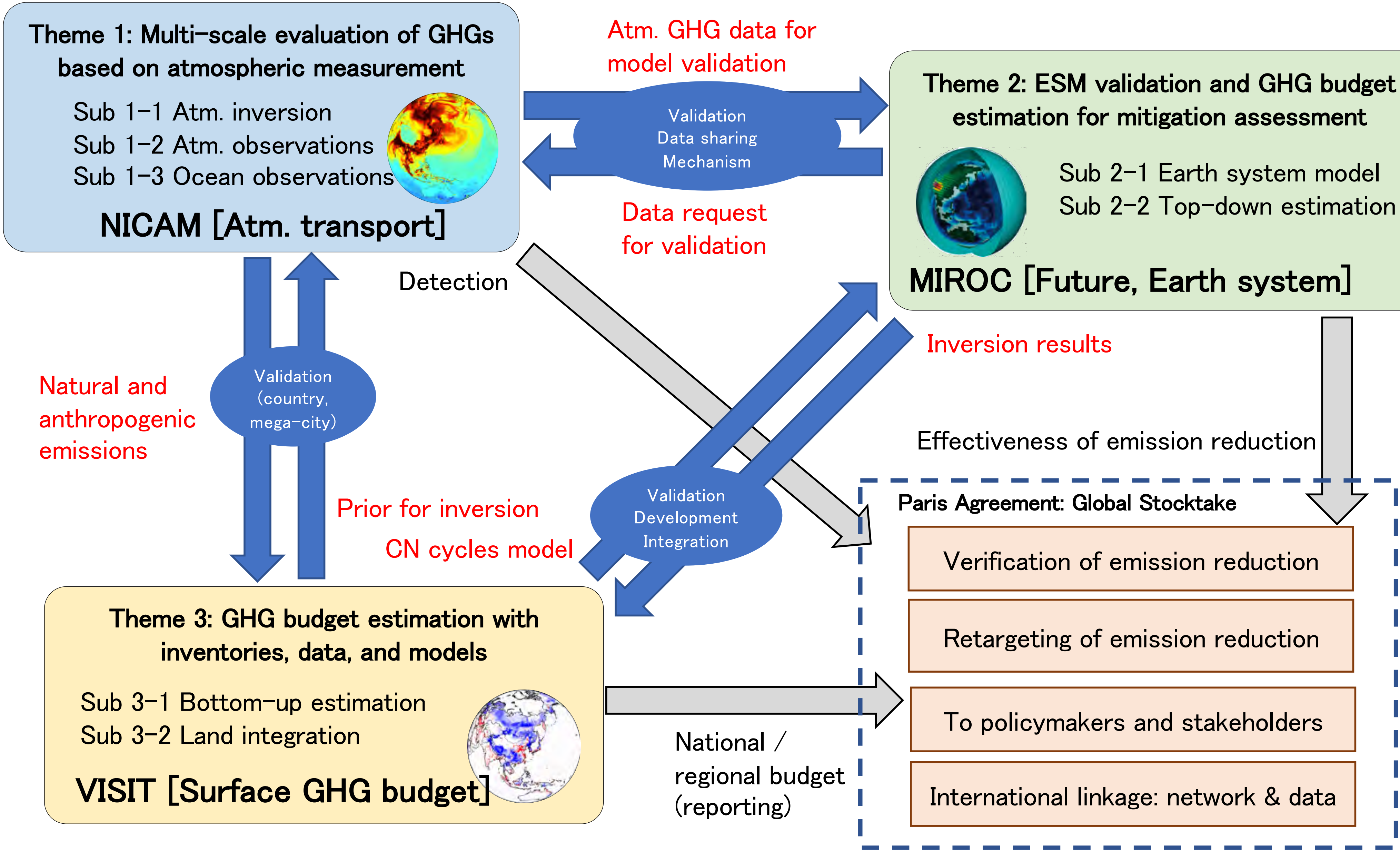
Theme 3: GHG budget estimation with inventories, data, and models

(PI: Akihiko ITO, NIES)

Sub theme 3-1 : Bottom-up evaluation of GHG including anthropogenic emission inventories

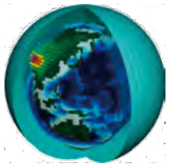
Sub theme 3-2 : Land GHG budget evaluation by integrated analyses of observational data and models

Organization

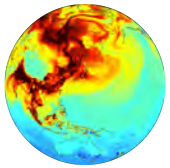


Systematic observational structure

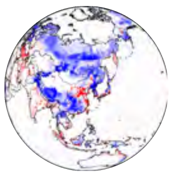
Models



MIROC
(Earth system)



NICAM
(Atm. inversion)



VISIT
(Surface budget)

Global scale

10^4 km^2

Country / regional scale

10^2 km^2

Mega-city scale

10^0 km^2

Main data

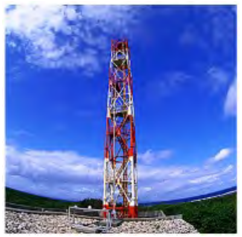
Available within 3 months

GOSAT(2009～)
GOSAT-2(2018～)、GW(2023～ [tbc])
Foreign satellites: e.g., OCO-2

CONTRAIL(2005～)
※ Continue by MOE budget after 2021

JMA Minami Torishima Observatory
(GAW: 1993～ [operationally])

International atm. Obs. networks
NOAA、AGAGE etc.



NIES Hateruma Station
(1993～: by NIES operation)

Measurement at Tokyo Metropolitan Area
(2016～)
※ To be continued by other MOE budget

Asian and global networking

Observational networks of atmosphere, ocean, and land & Model intercomparison

Global

Global Carbon Project (GCP)、WMO-GAW、FLUXNET、GOSAT
Global Earth Observation System of Systems (GEOSS)、SOCAT

NASA-GSFC (ODIAC)
Other regions（NACP、ICOS）

Japan

JapanFlux
Tohoku U.
etc.

Asia – Oceania

GCP-RECCAP
[Atm. Land models]

AOGEOSS
AsiaFlux （Asian countries）

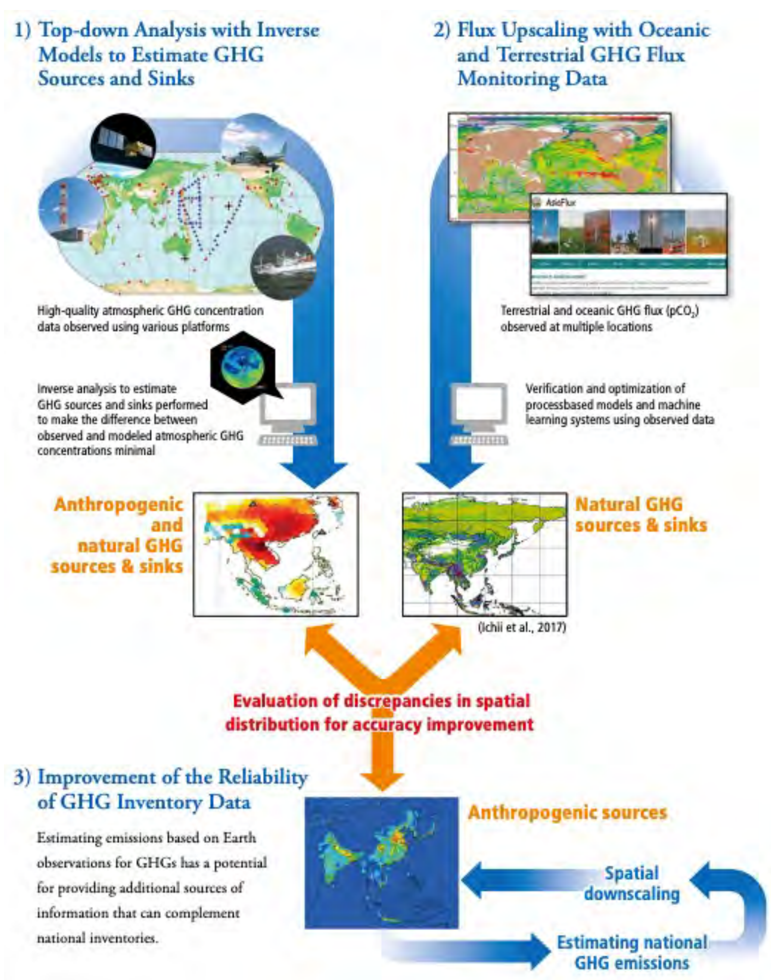
CSIRO（Australia）
OzFlux（ 〃 ）
NIWA（New Zealand）

Contributions to policy and society

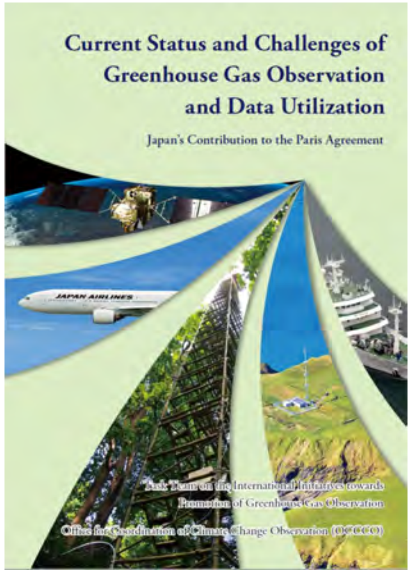
To UNFCCC-COP and IPCC

Dr. Saigusa, CGER Director

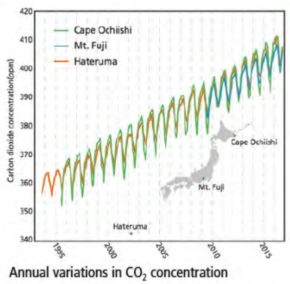
Pr. P.K. Patra, JAMSTEC

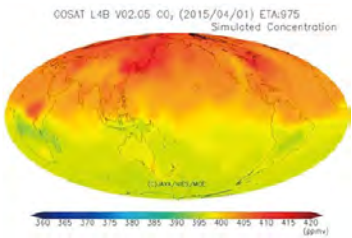


Regional GHG (e.g.,GCP-RECCAP2)



Current Status and Challenges of Greenhouse Gas Observation and Data Utilization: Japan's Contribution to the Paris Agreement





http://occco.nies.go.jp/pdf/inter_initiatives_pamphlet_e2018.pdf