

\* **NIES Monitoring of  
Atmospheric  
Halocarbons**

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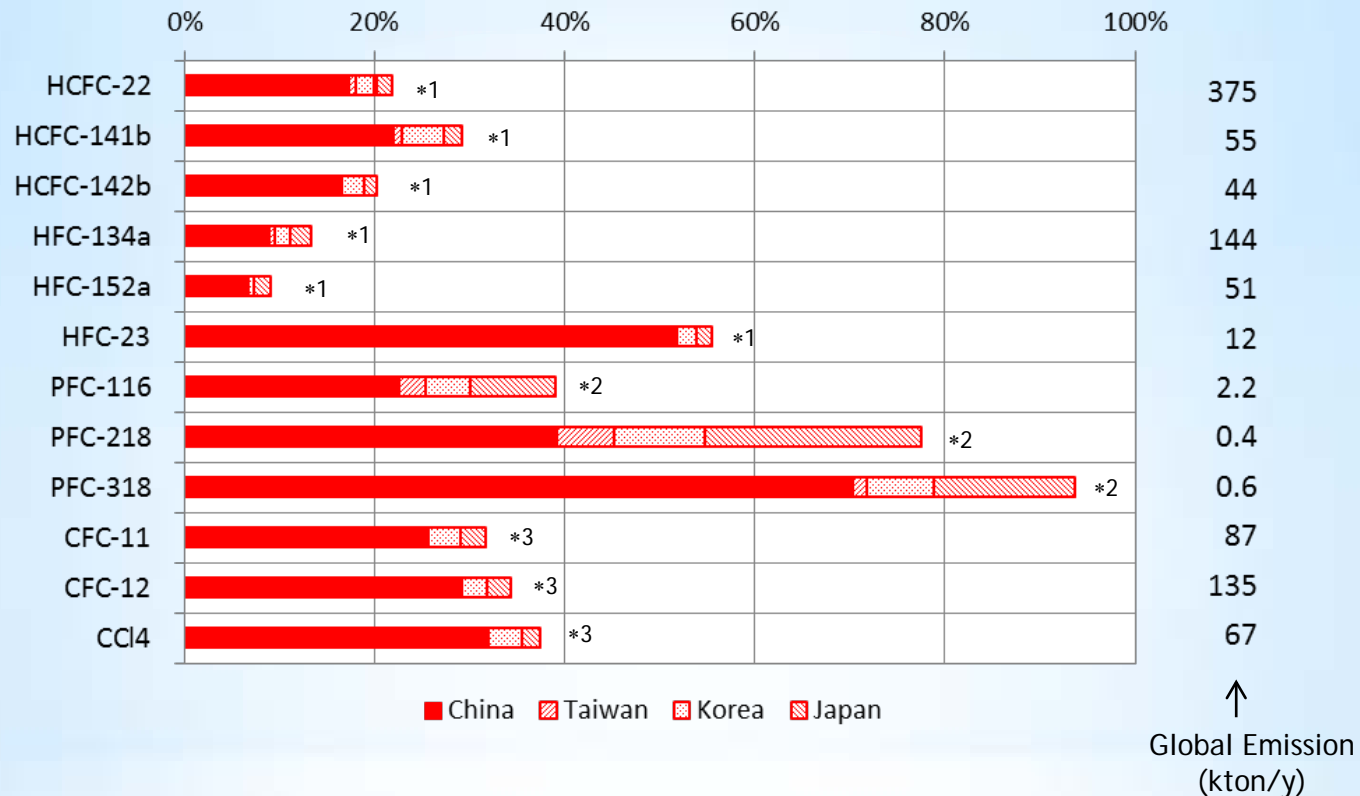
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# High Contribution of East Asia to the Global Halocarbons Emissions



\*1: Stohl et al. (2010), \*2: Saito et al. (2010), \*3: Palmer et al. (2003)

# Topics

1. Outline of NIES halocarbon monitoring study
2. *In situ* monitoring at Hateruma Island and Cape Ochiishi
3. Shipboard observation over western Pacific Ocean and East-Asian Sea

# Target Compounds and Methods

- \* Naturally derived Halocarbons

$\text{CH}_3\text{Cl}$ ,  $\text{CH}_3\text{Br}$ ,  $\text{CH}_3\text{I}$ ,  $\text{CHBr}_3$ ,  $\text{CH}_2\text{Br}_2$ , ....

- \* Anthropogenic Halocarbons

HCFCs, HFCs, CFCs,  $\text{SF}_6$ , PFCs, ....

- \* Flask sampling

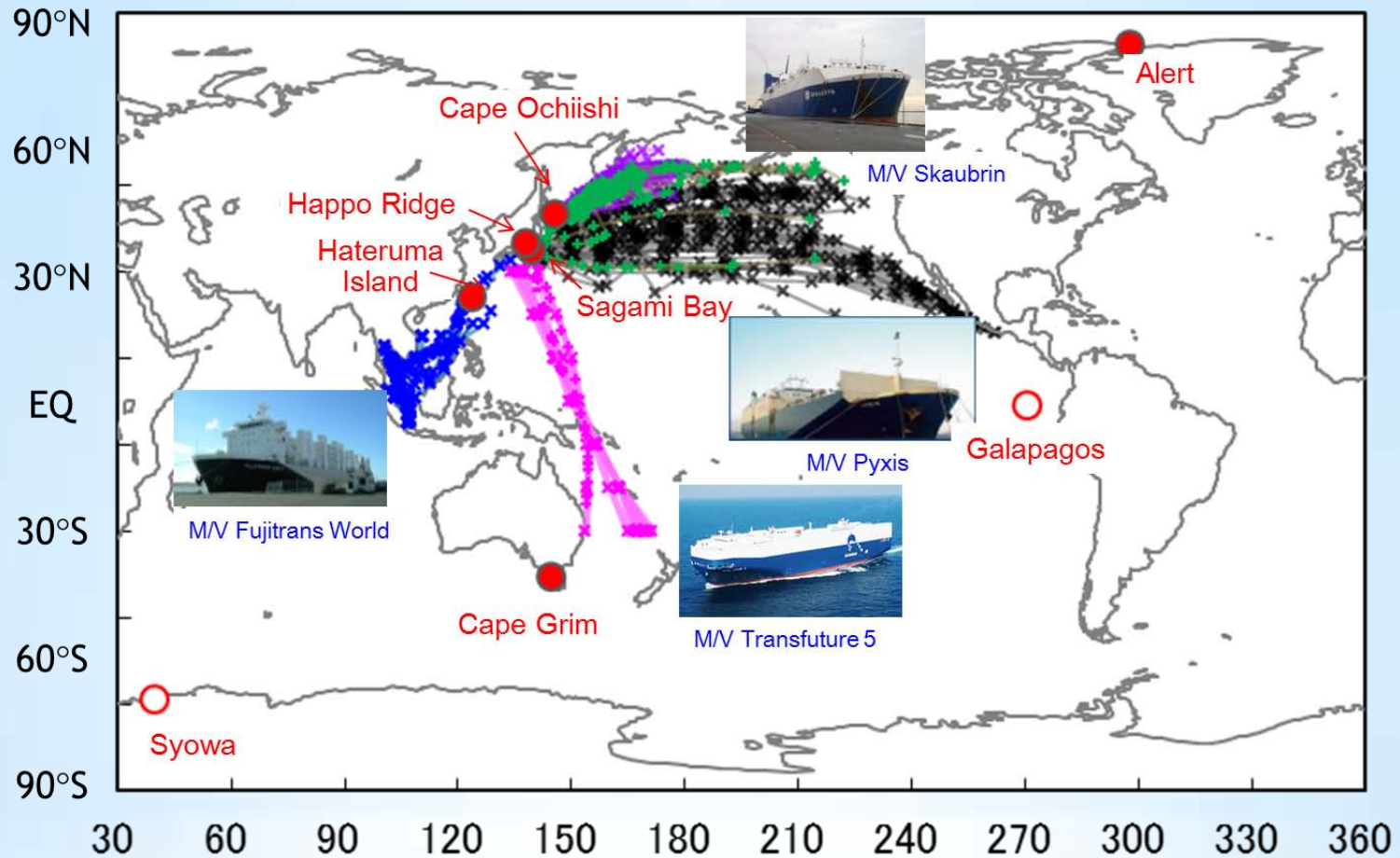
Monthly~weekly air sampling at ground stations

Aircraft sampling

Ship-based sampling

- \* *In situ* high-frequency measurements at remote sites

# Monitoring Sites



**Alert** : collaboration with MSC (*Canada*), 1996~ semi-monthly, **Cape Grim** : collaboration with CSIRO (Australia), 2000~ semi-monthly, **Happo Ridge** : collaboration with NECRI , 1998~ semi-monthly, **Syowa** : collaboration with NIPR and Nagoya Univ. 2000 & 2004 weekly, **Galapagos** : collaboration with INAMHI & Hokkaido Univ. 2004, **Sagami Bay** (500m~7000m asl) : collaboration with JAXA, 1999~ monthly, **Hateruma Island** : 1996~ semi-monthly, 2004~ hourly, **Cape Ochiishi** : 2002~ semi-monthly, 2006~ hourly

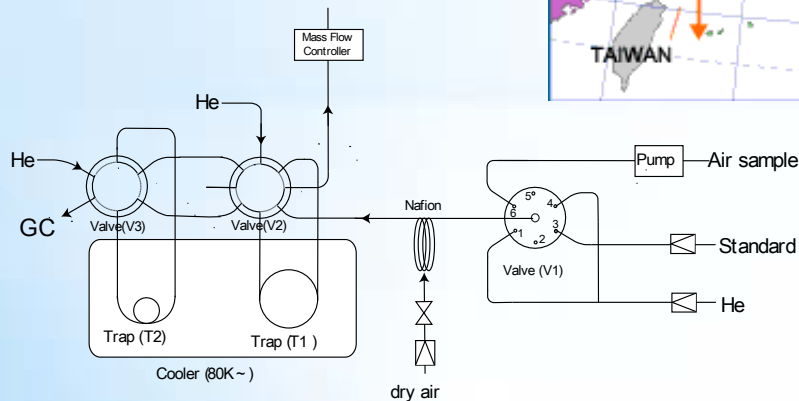
# \* In-situ measurements of halocarbons at Hateruma Island and Cape Ochiishi



2004~



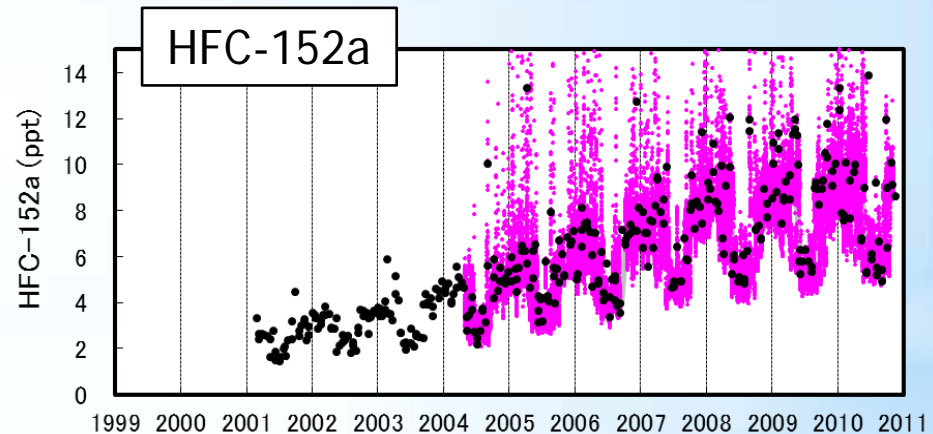
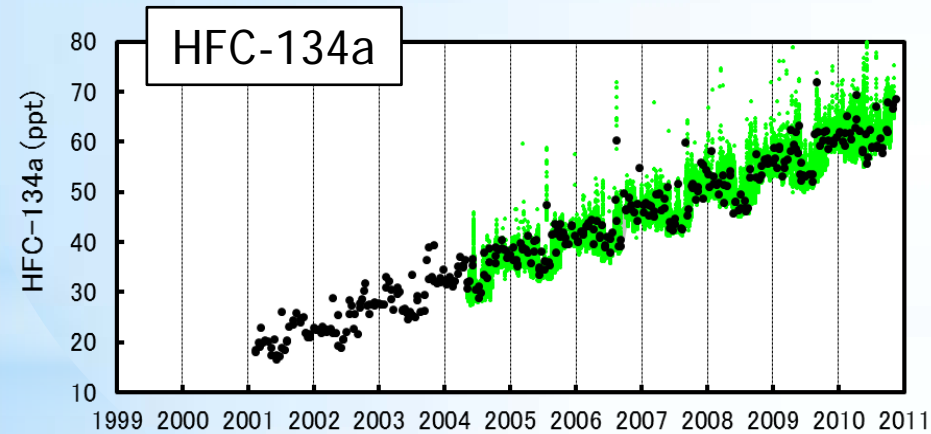
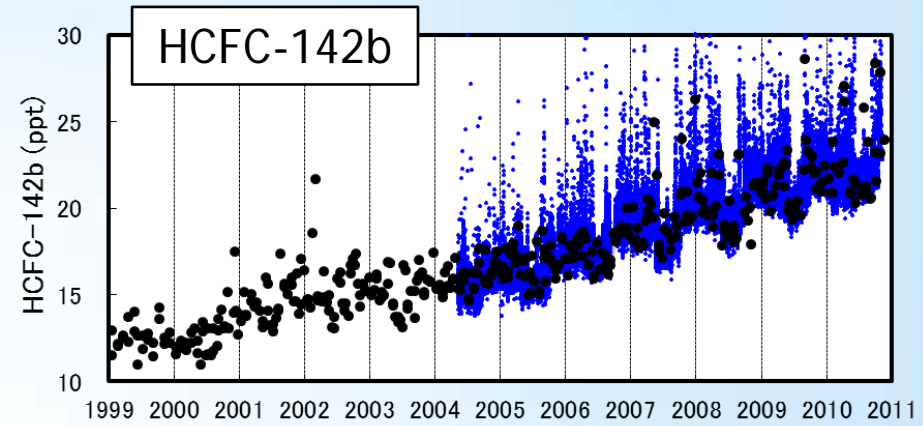
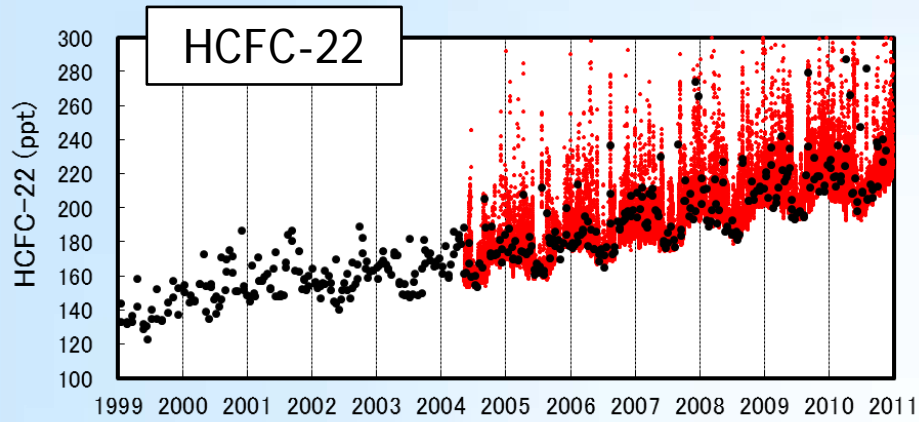
2006~



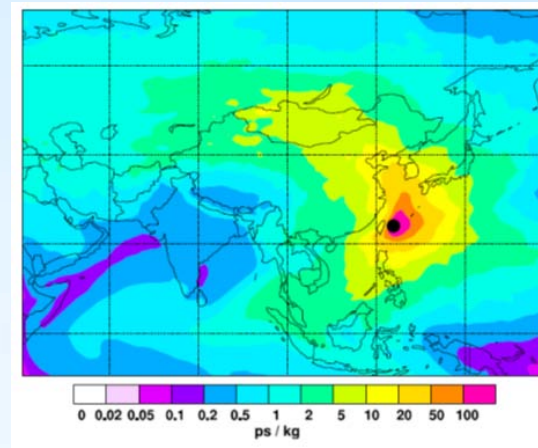
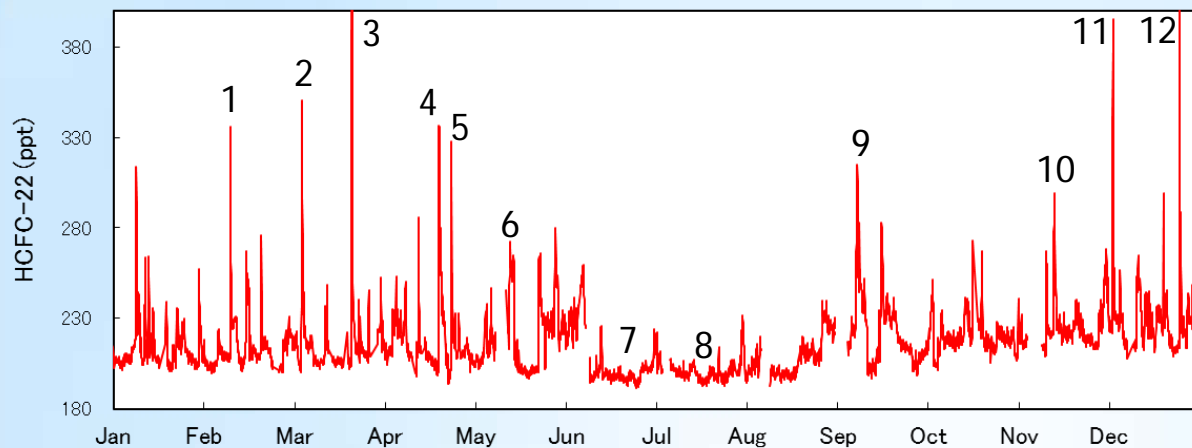
Collaboration with AGAGE

- data exchange
- inter-laboratory calibration

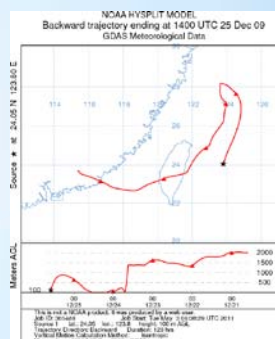
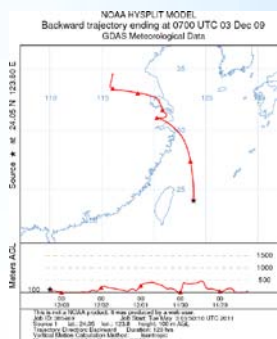
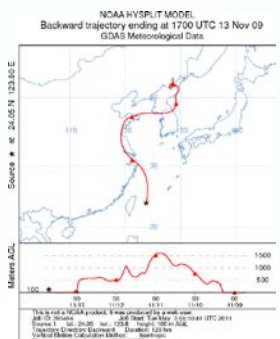
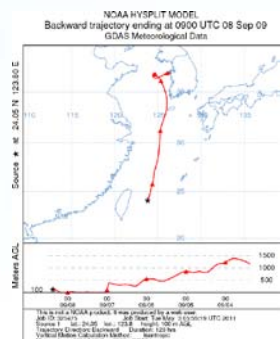
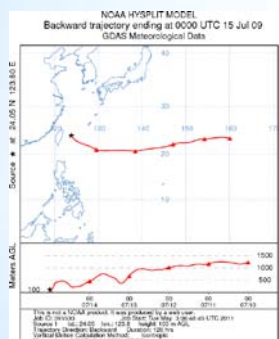
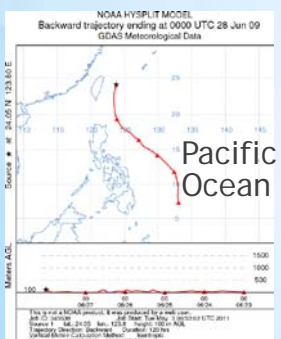
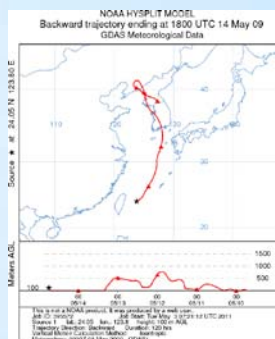
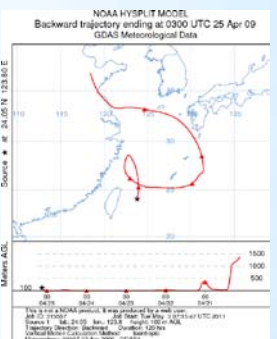
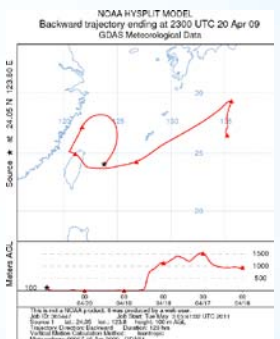
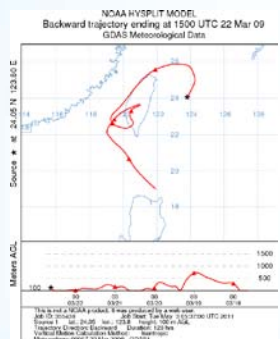
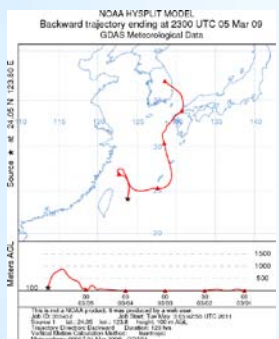
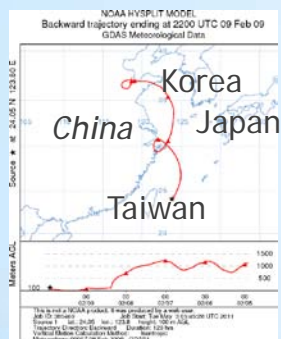
# Long-term trends of selected halocarbons observed at Hateruma Island



# Pollution events at Hateruma Island and their sources

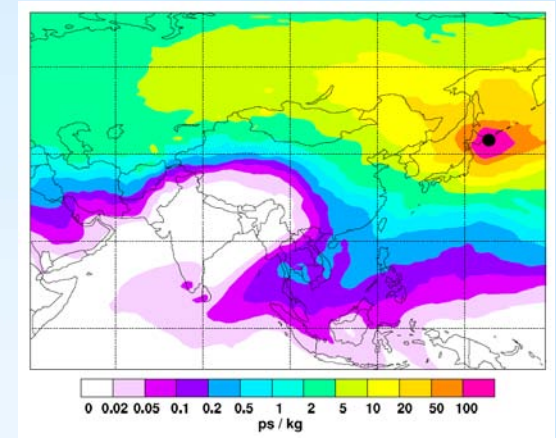
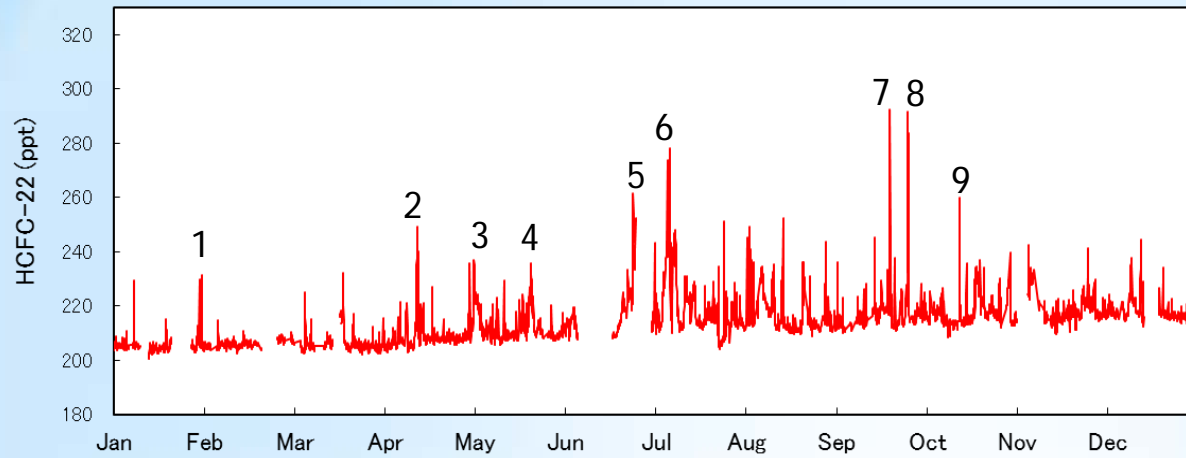


Courtesy Dr. Andreas Stohl

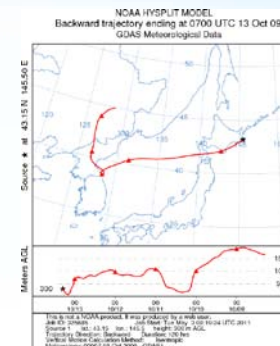
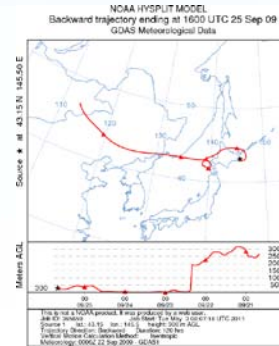
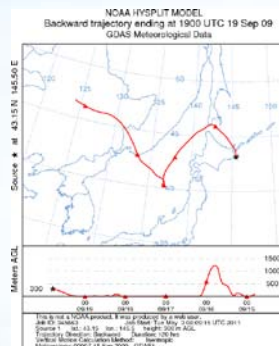
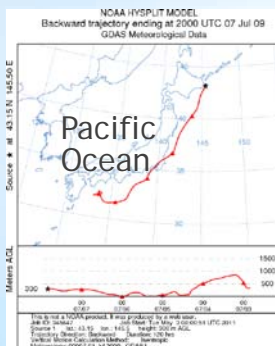
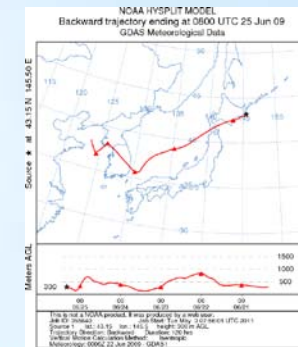
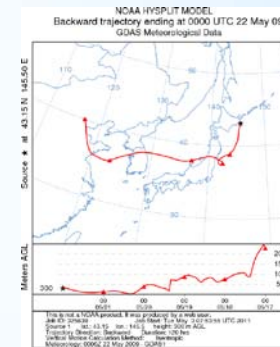
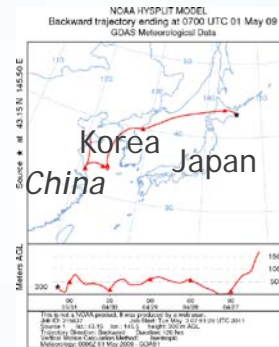
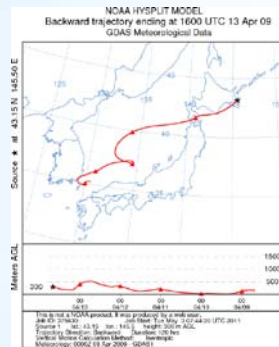
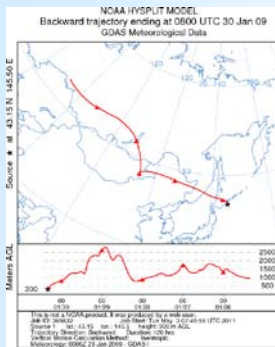




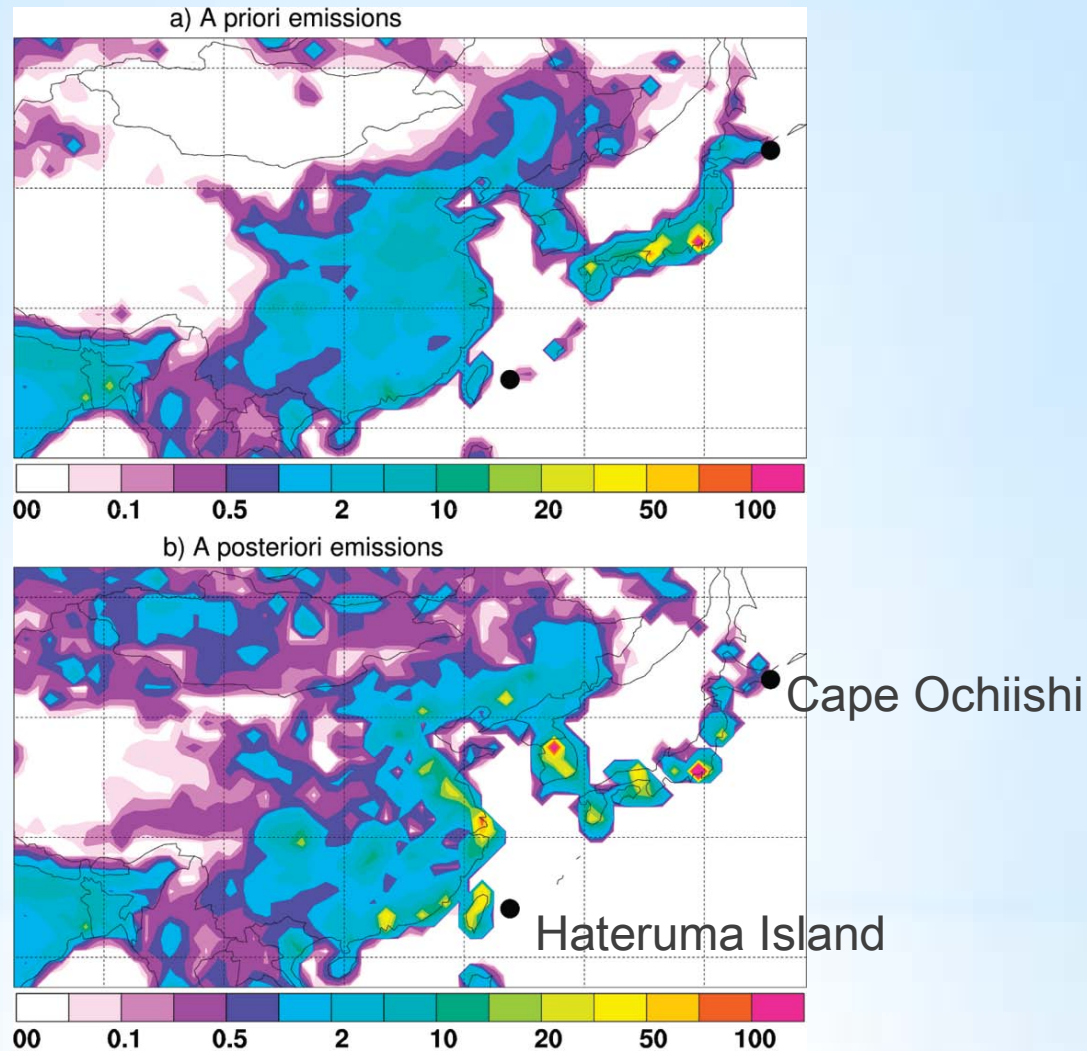
# Pollution events at Cape Ochiishi and their sources



Courtesy Dr. Andreas Stohl



# Map of estimated emissions of PFC-116



The data from Hateruma and Ochiishi were used to estimate regional emissions. Calculation was done using the Lagrangian particle dispersion model FLEXPART and an inversion technique.

# Air sampling at M/V Transfuture 5



Air intake for long-lived species



Air intake for reactive species

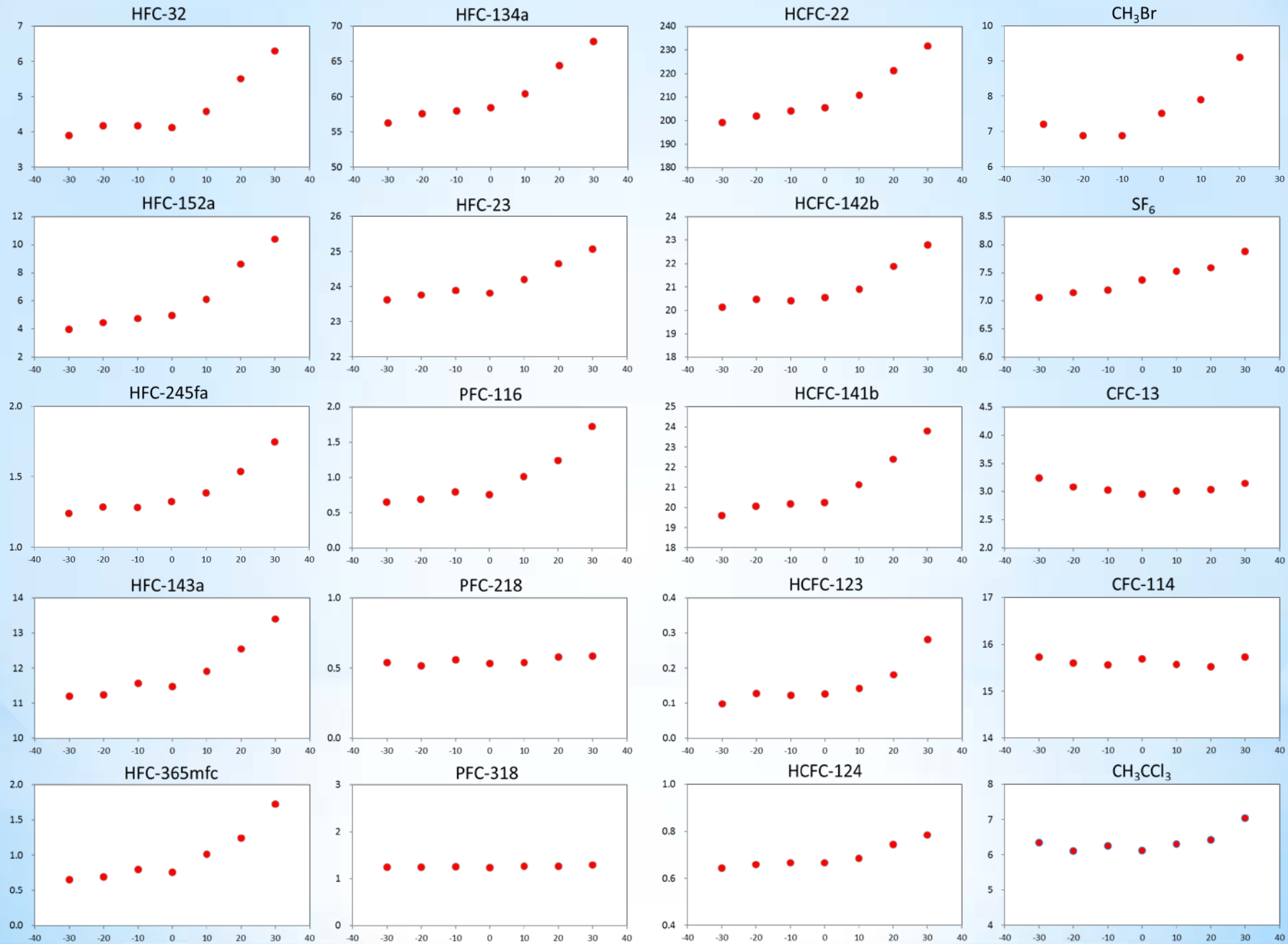


Observation room

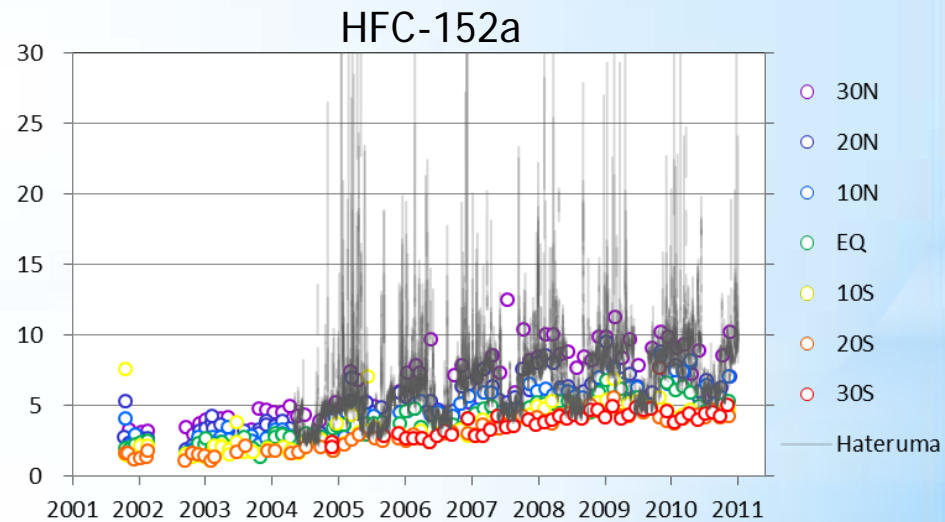
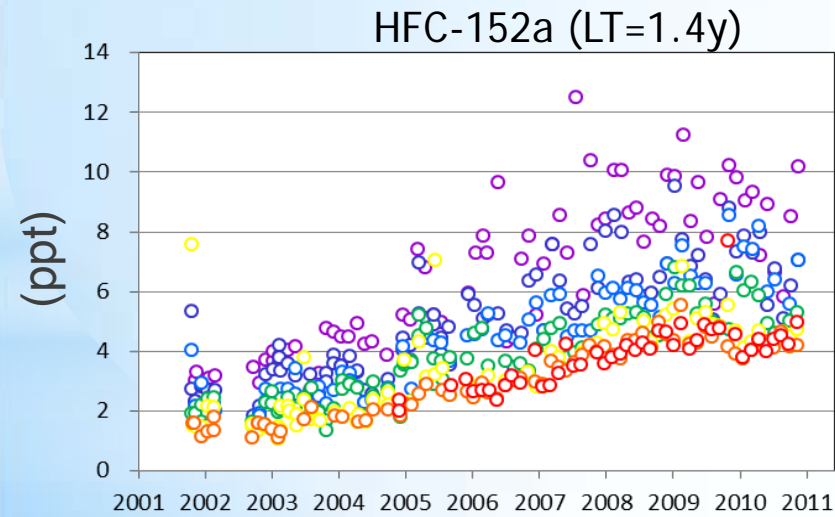
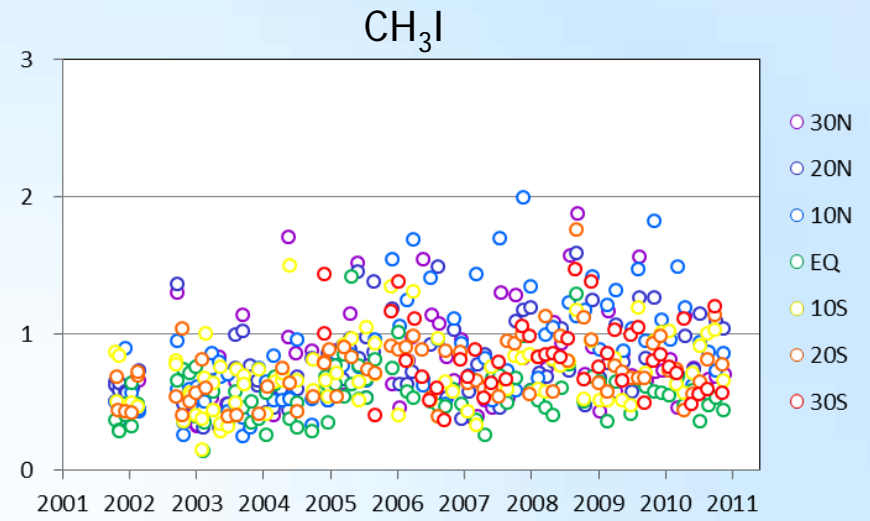
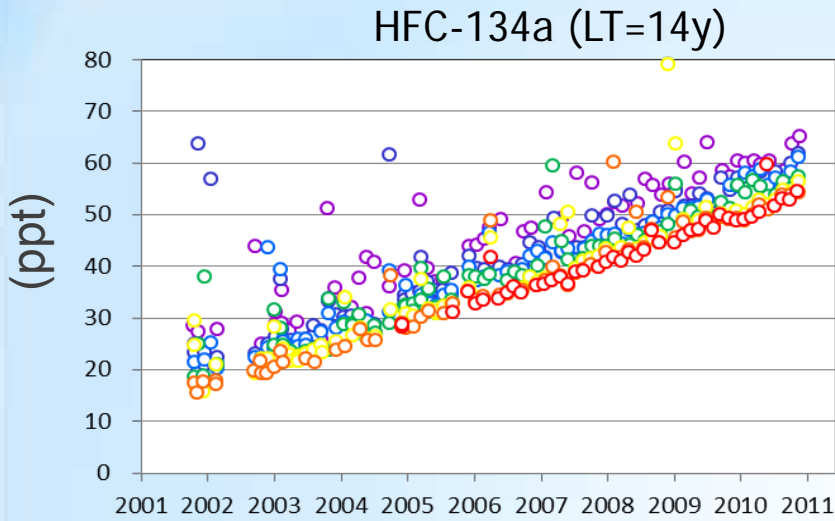


# Latitudinal variation of selected halocarbons over western Pacific (16-25 Mar, 2011)

Mixing ratio (ppt)



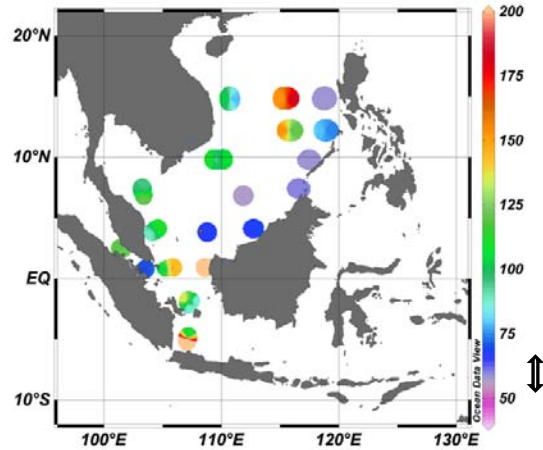
# Long-term change of halocarbon concentrations over W. Pacific



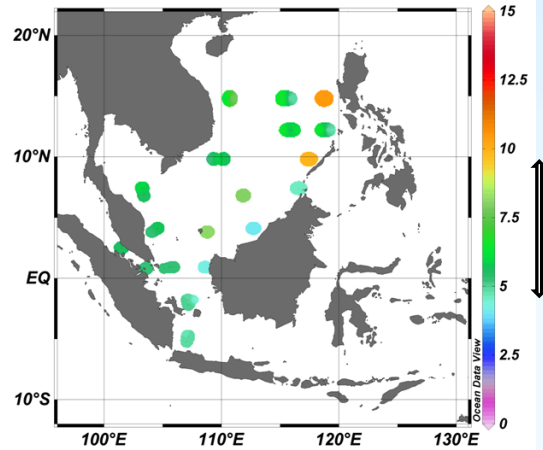
Lowest concentrations observed at Hateruma during summer are similar to the concentrations in southern hemisphere.

# Distribution of selected halocarbons over south-east Asian Sea

HFC-134a



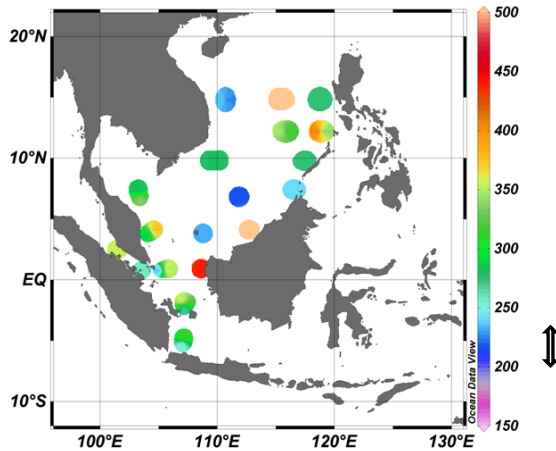
HFC-152a



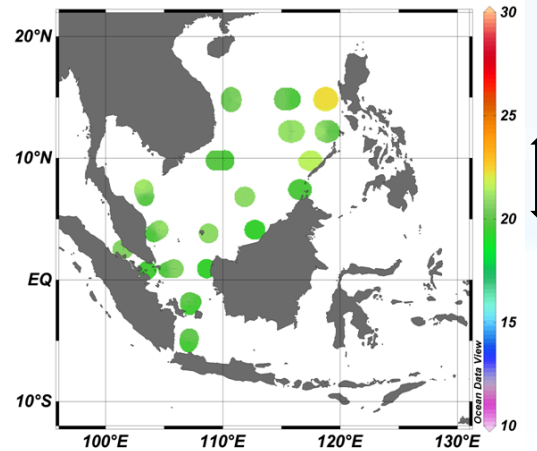
M/V Fuji Transworld  
2009~2010

Baseline  
concentration at  
Hateruma

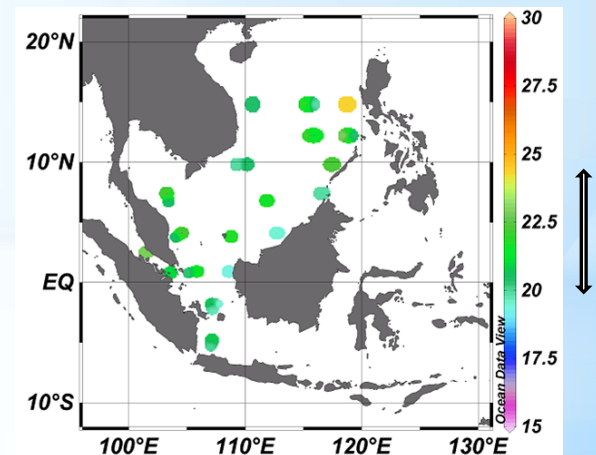
HCFC-22



HCFC-142b



HCFC-141b



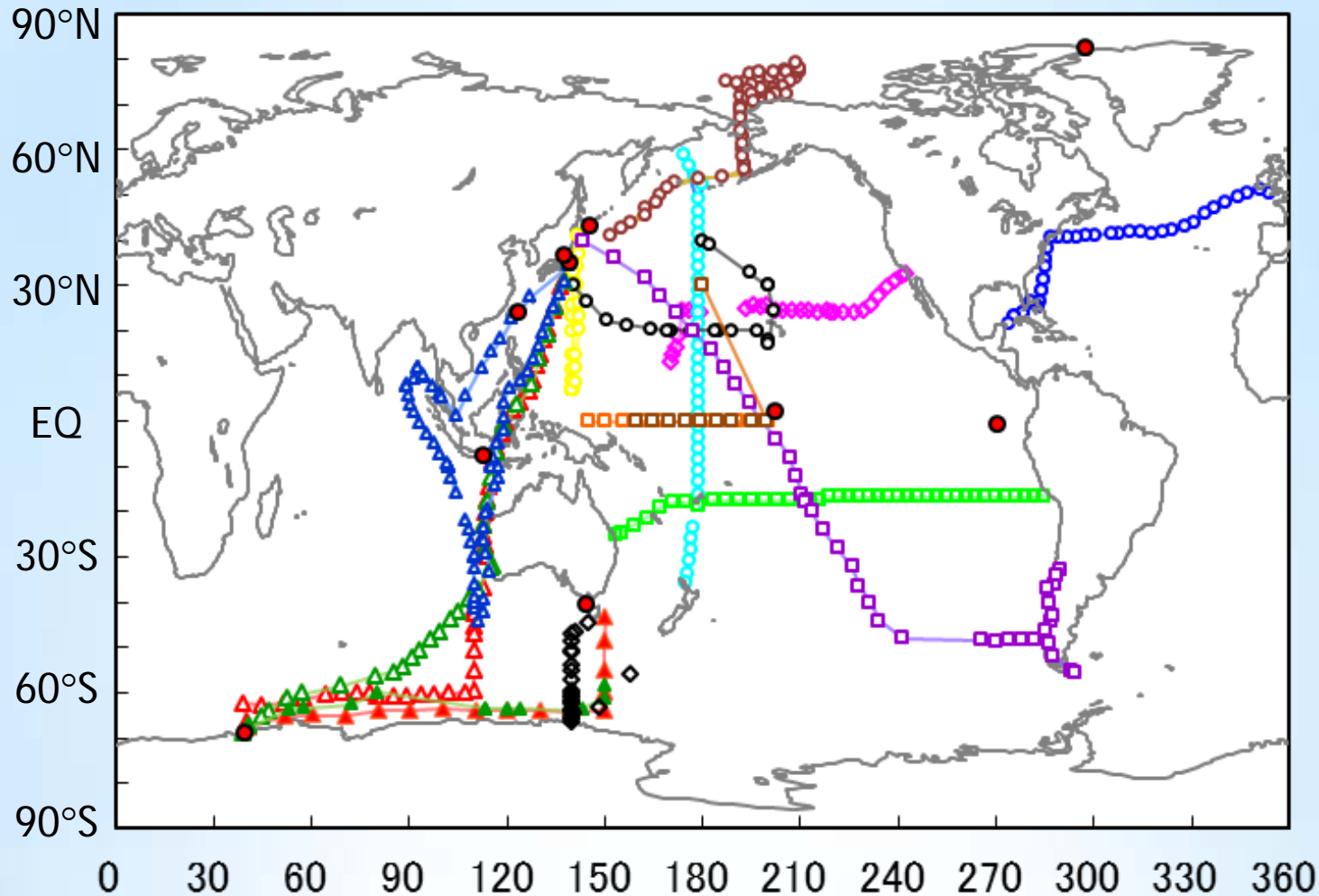
# \* Acknowledgements

Toyofuji Shipping Co.

S. Kariya, T. Yamada, N. Oda, H. Shimano  
(Global Environmental Forum)

Y. Inuzuka

# Research Cruise Sampling Locations



▲	Hakuho	Dec 1996- Feb 1997	▲	Shirase	Nov- Dec 1997	▲	Shirase	Feb- Mar 1998
▲	Shirase	Nov- Dec 1999	▲	Shirase	Feb- Mar 2000	○	Mirai	Jun- Jul 2000
○	Hakuho	Jun- Jul 2000	□	Mirai	Jan- Feb 2002	◇	Tangaroa	Jan- Feb 2002
□	Mirai	Jan 2003	◇	Mirai	Nov- Dec 2005	○	Mirai	Oct- Dec 2007
○	Asuka	May- Jun 2007	□	Mirai	Jan- Mar 2008	□	Mirai	May- Jun 2009
○	Mirai	Sept- Oct 2009						



# Latitudinal and seasonal variation of methyl iodide

