

気象研究所と気象庁の標準ガス相互比較実験について

Intercomparison of standard gases between MRI and JMA

気象研究所
Meteorological Research Institute (MRI)

松枝秀和
Hidekazu MATSUEDA

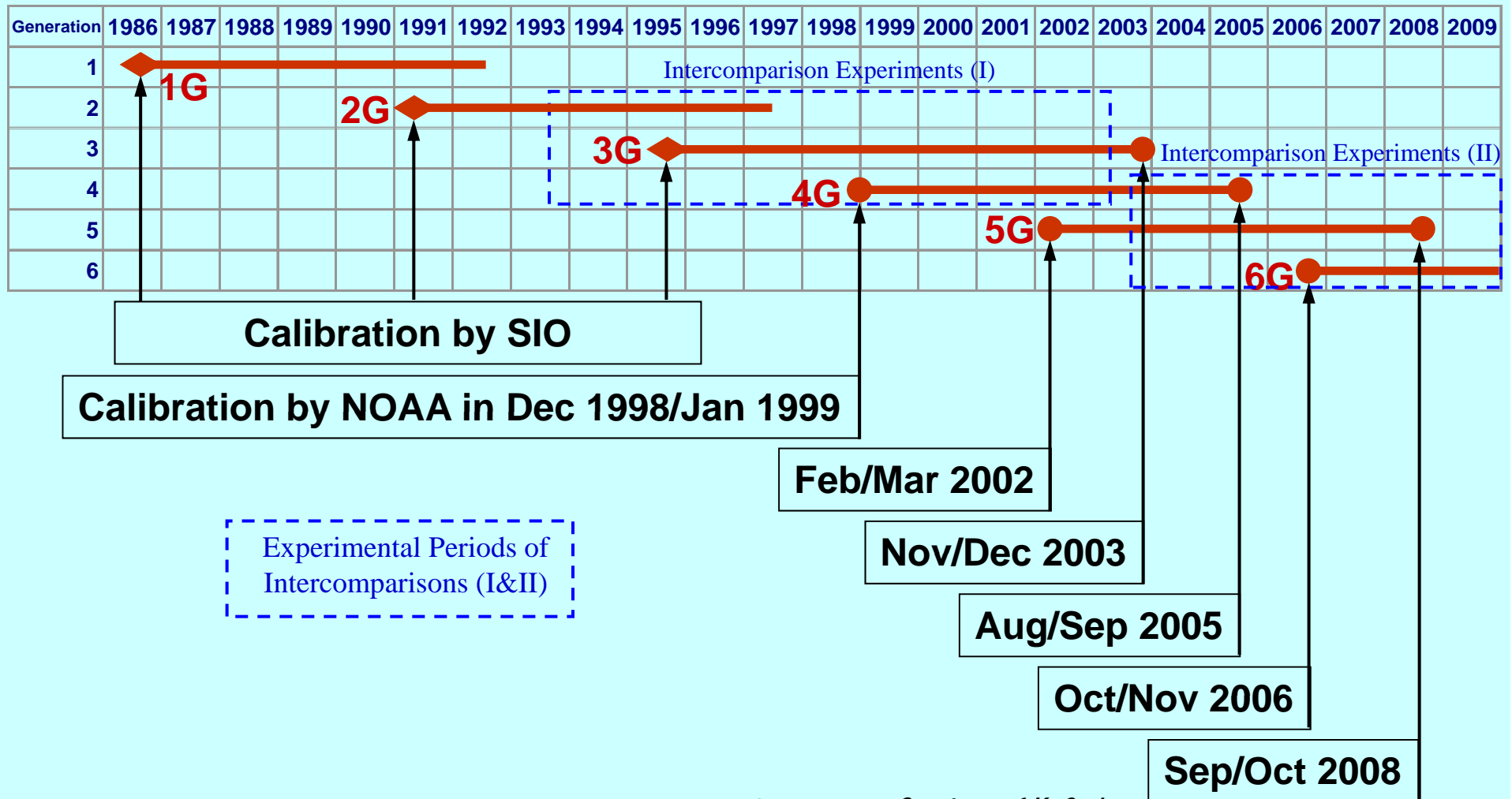
「温室効果ガスの標準ガス体系に関する専門家会合」
Expert meeting of standard scale for greenhouse gas measurement
February 23, 2010

Background of this study

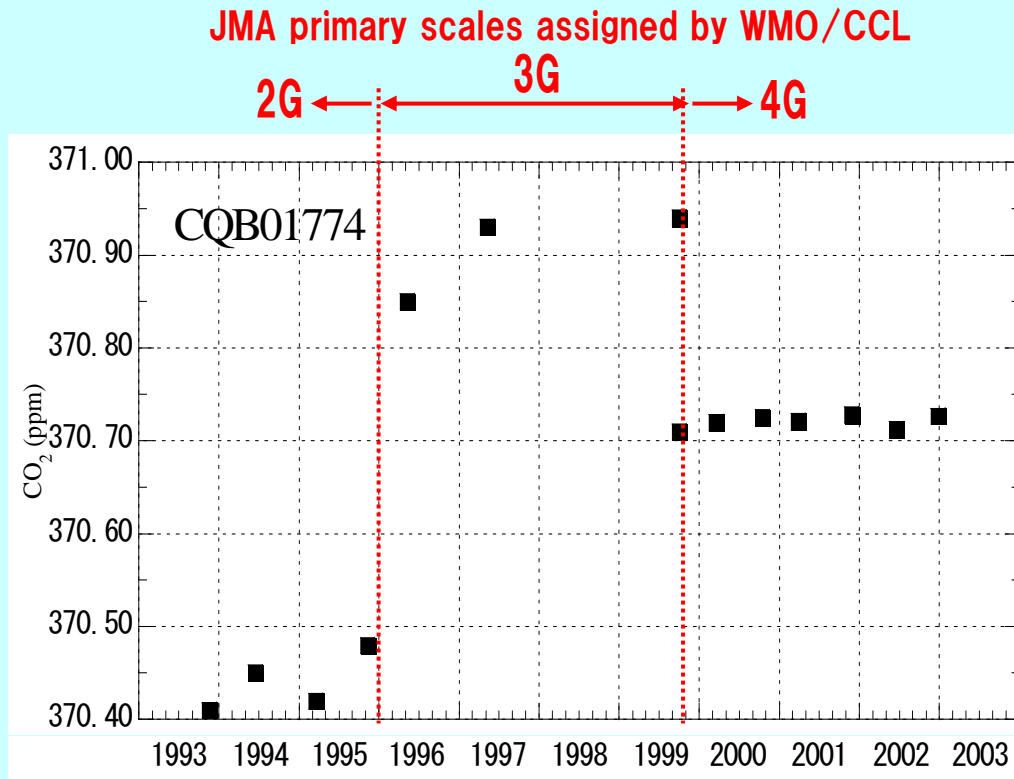
- For atmospheric observations of greenhouse gases, standard gases are essential to collect high-precision measurements as well as to make their consistent data set.
- However, it is not easy to maintain the own standard scale for a long period of time within only one laboratory.
- Intercomparison of standard gases with different laboratories is one of the useful methods to evaluate the concentration drift and propagation of standard scale.
- Intercomparison experiments between MRI and JMA started since 1993 for CO₂ and 2000 for CH₄.

Calibration History of CO₂ Primary Standards in JMA

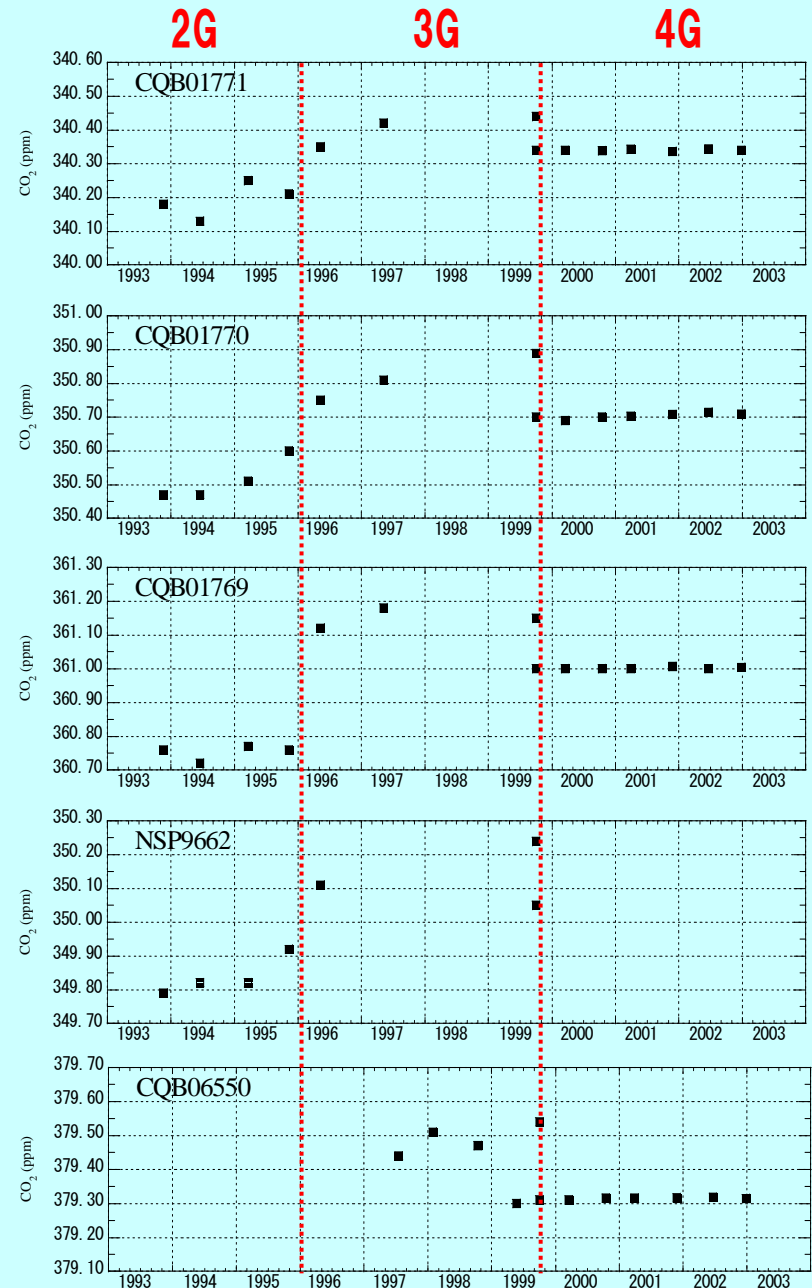
6 sets (1G~6G) of CO₂ primary standard gases in JMA calibrated by the WMO/CCL at the beginning and end of use.



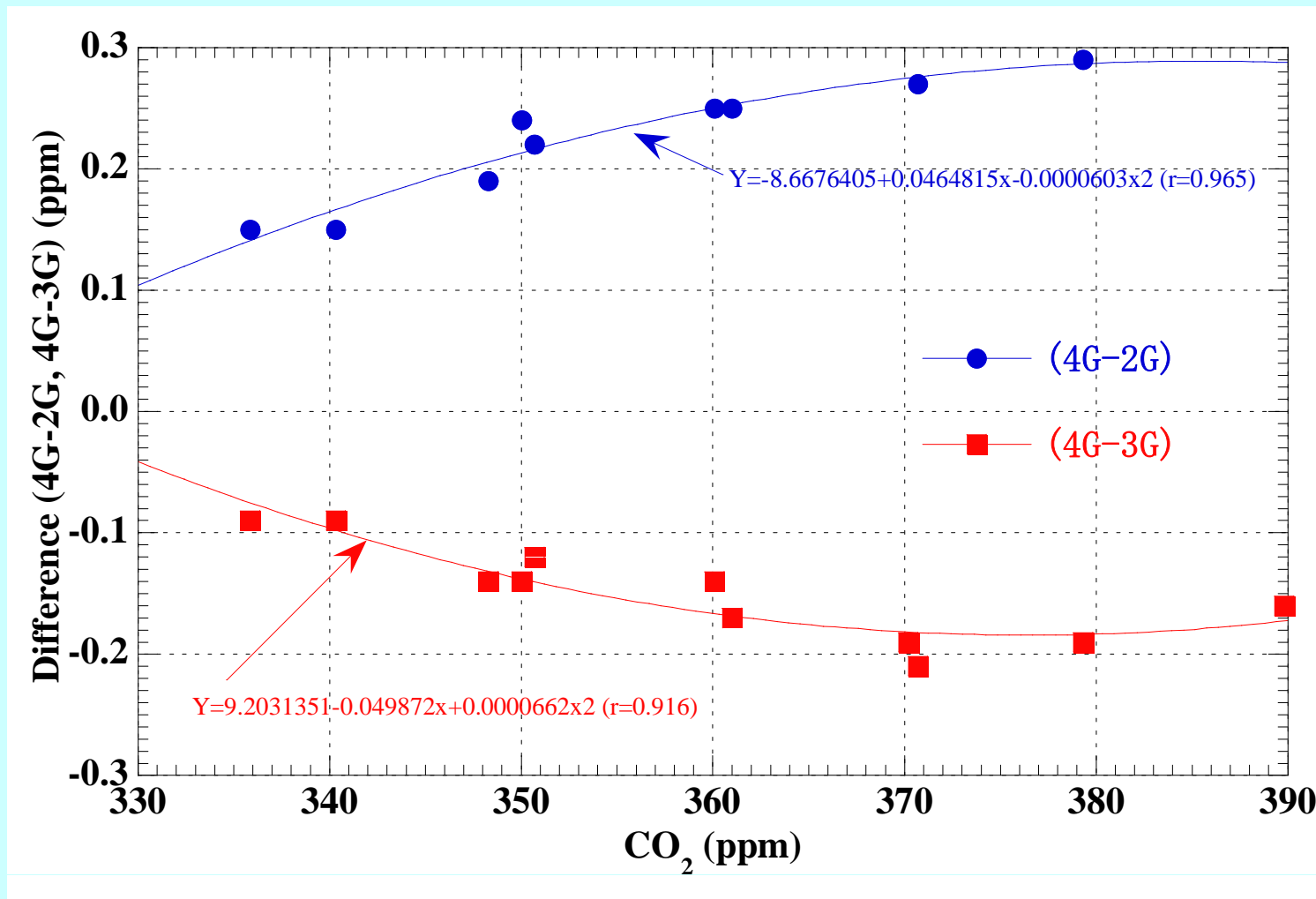
Intercomparison results of CO₂ standard gases during 1993 – 2003



Matsueda et al. (2004)
 Technical Reports of the Meteorological Research Institute,
 No45, pp1-64 (in Japanese).



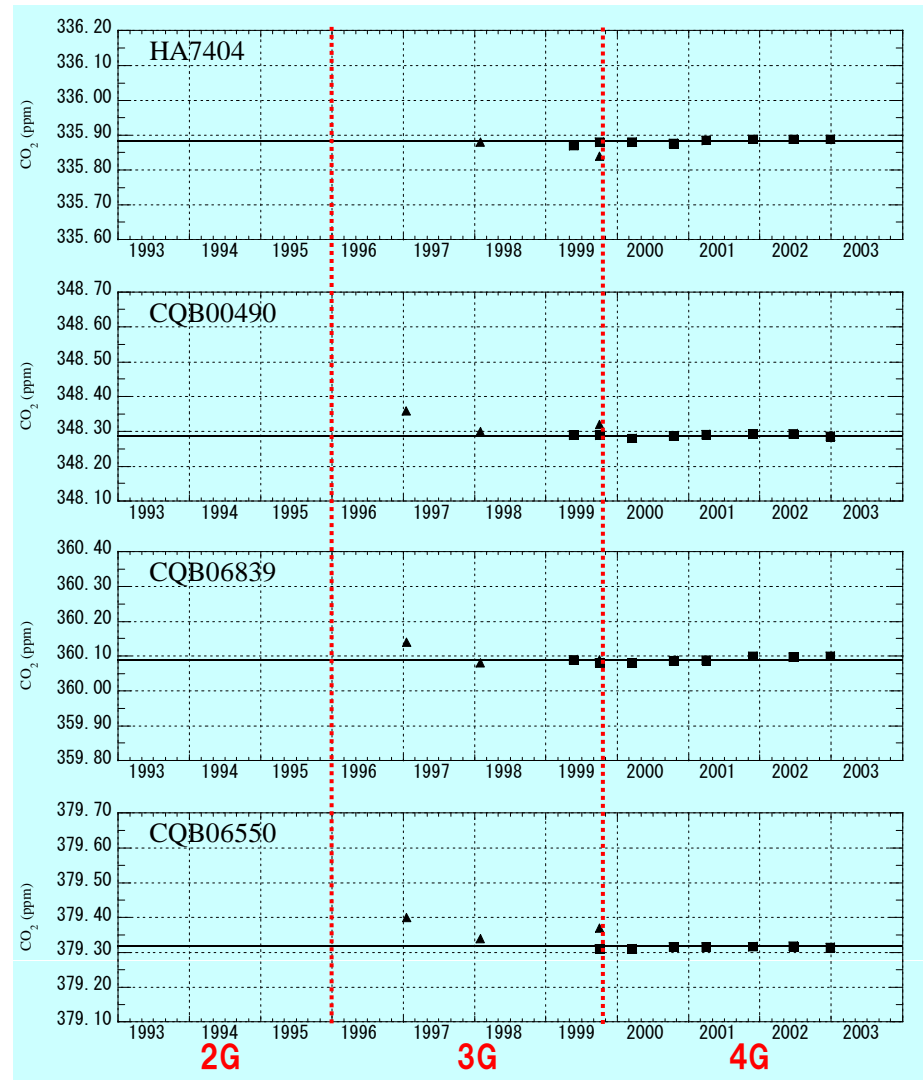
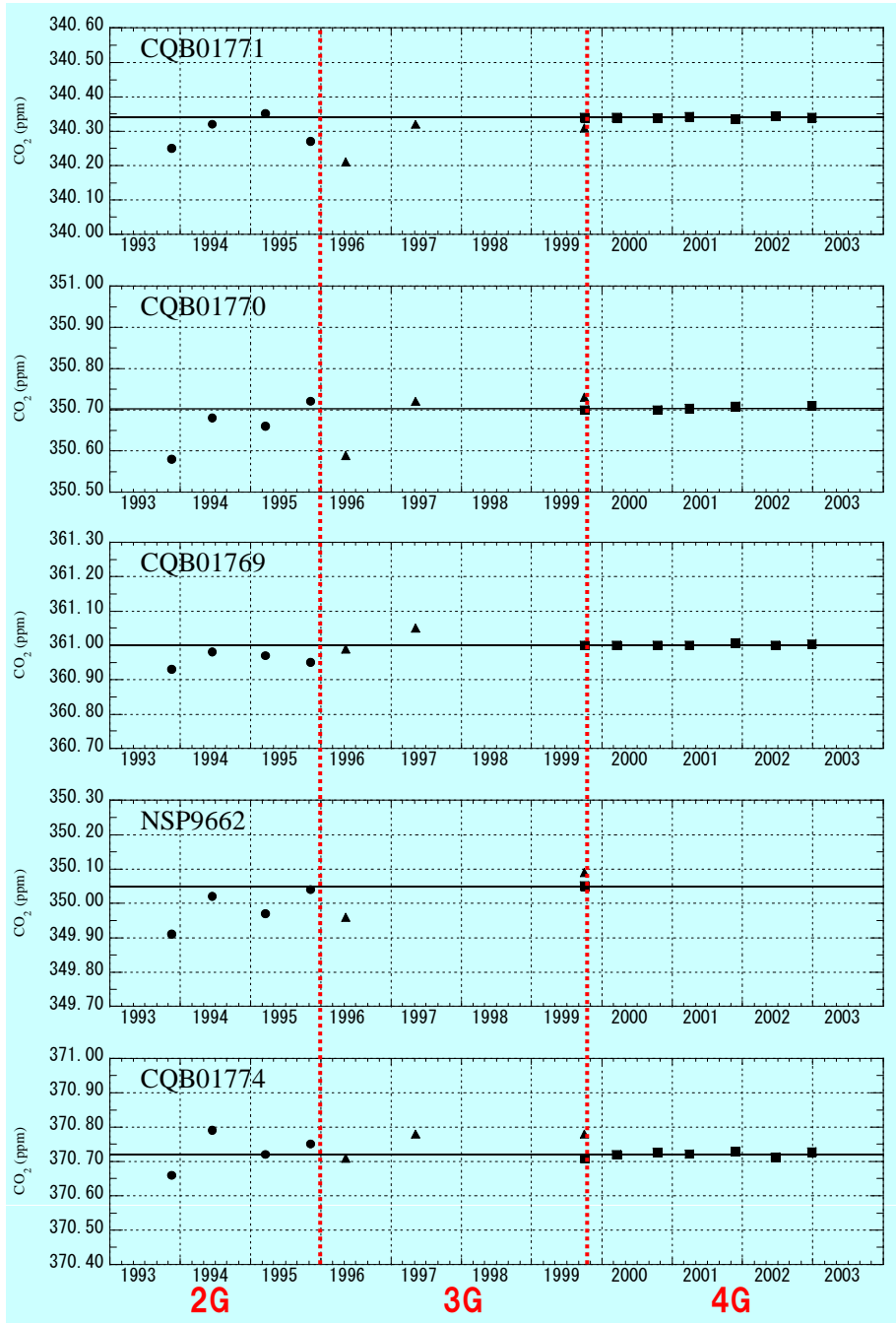
Scale Differences between 2G, 3G and 4G determined by their intercomparisons



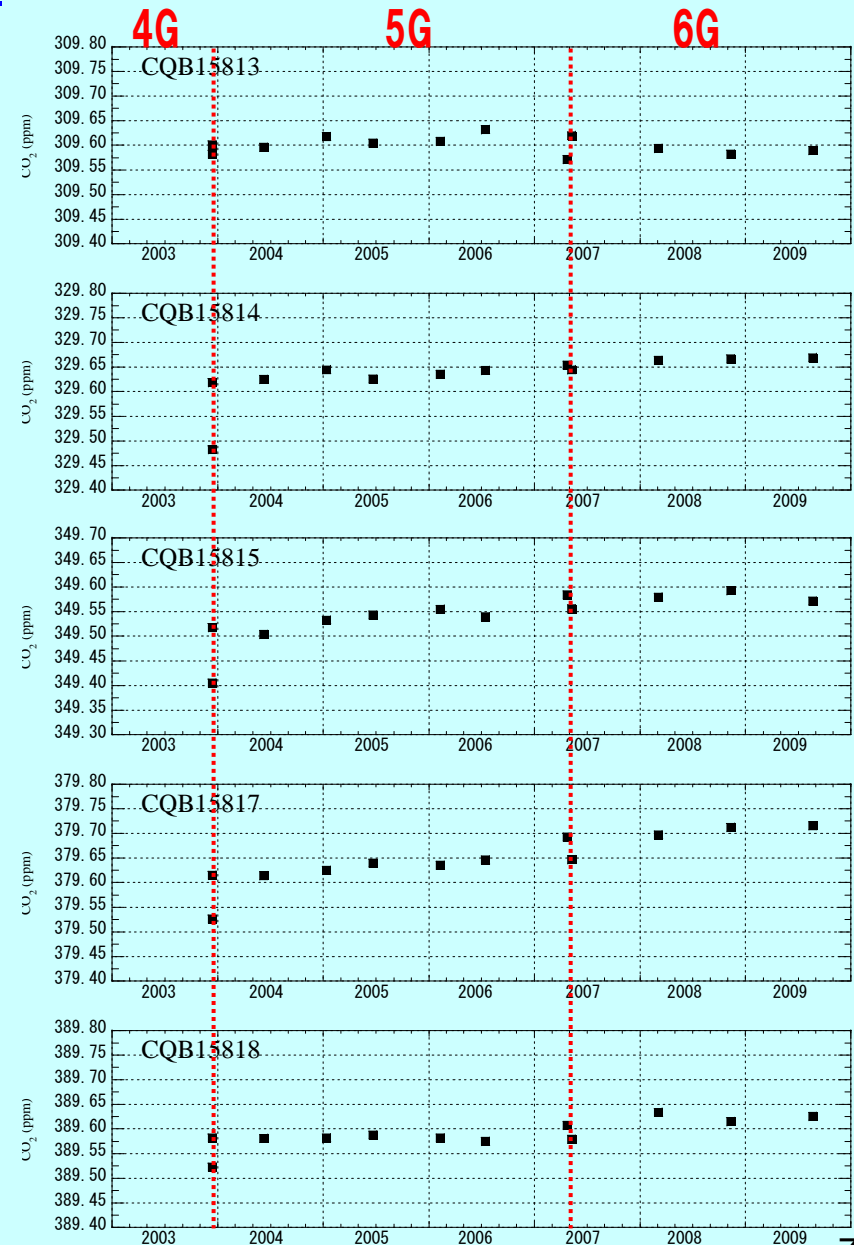
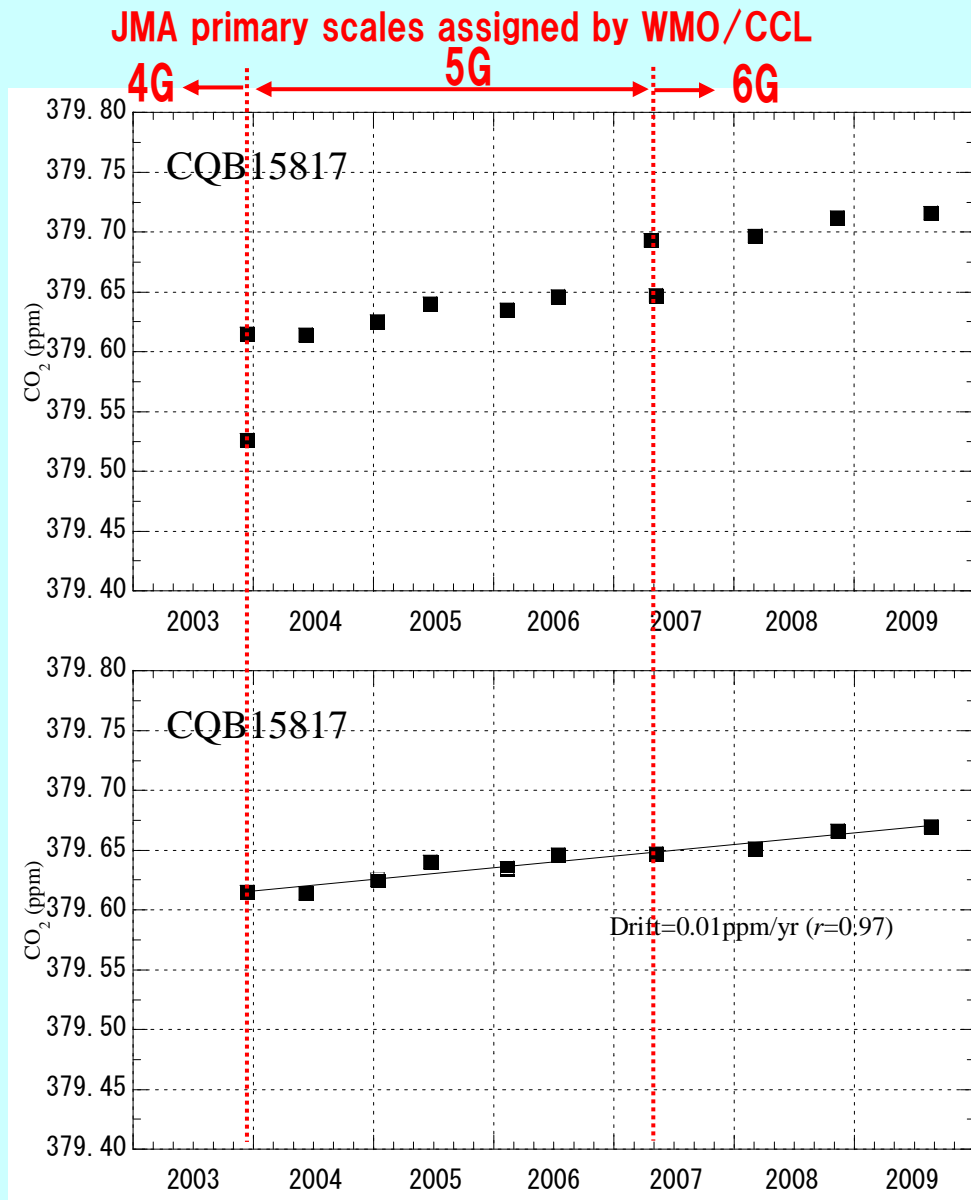
Matsueda et al. (2004): Technical Reports of the Meteorological Research Institute, No45, pp1-64 (in Japanese).

Consistency of CO₂ Standard Scale by Corrections of WMO/CCL Assigned Values

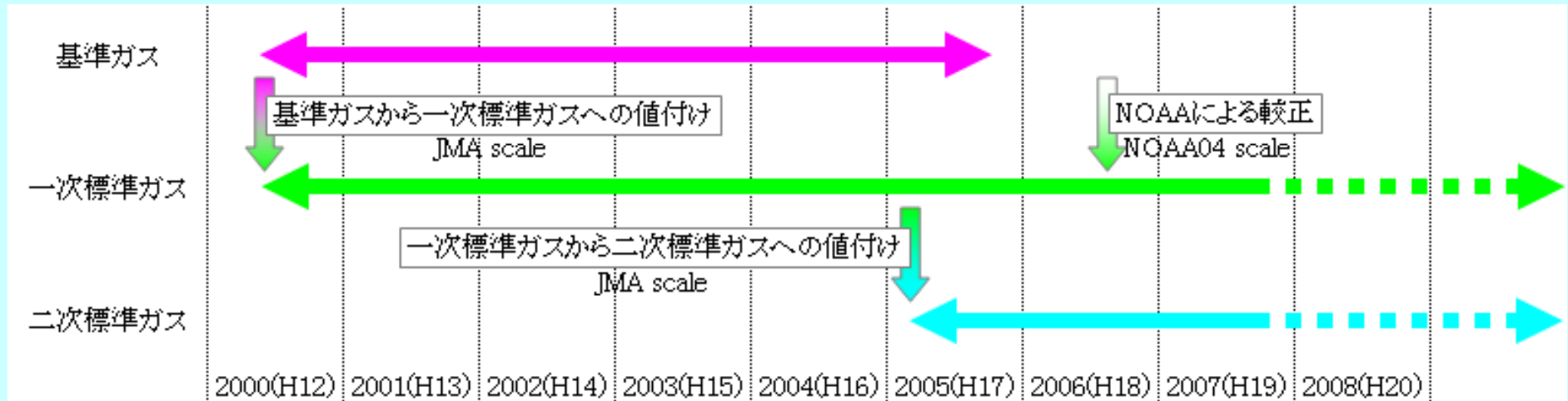
Revised based on the Scale Gaps



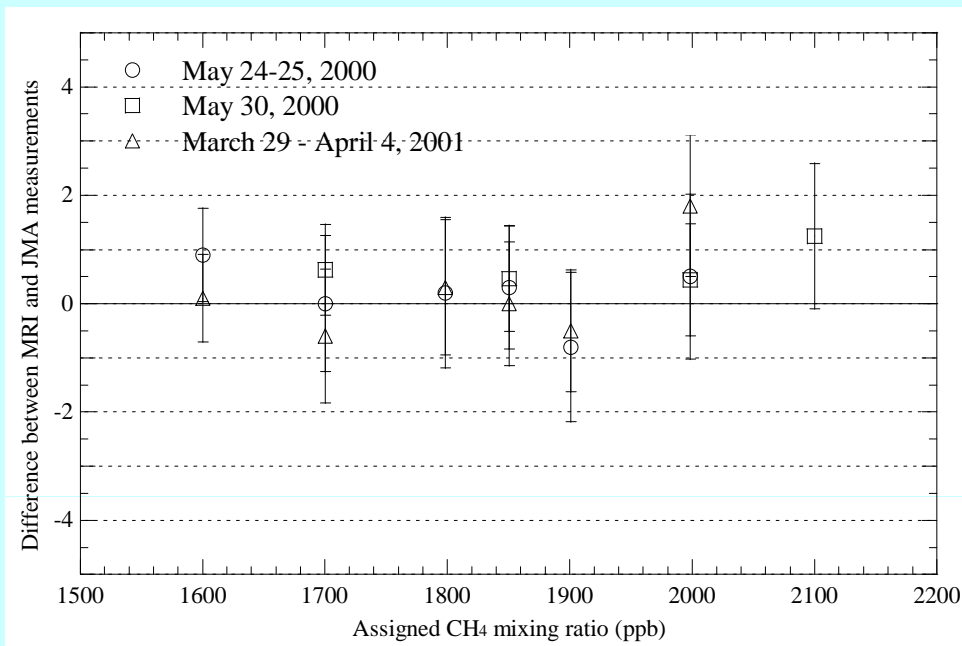
Intercomparison results of CO₂ standard gases during 2003 – 2009



History of CH₄ Standard Gases in JMA

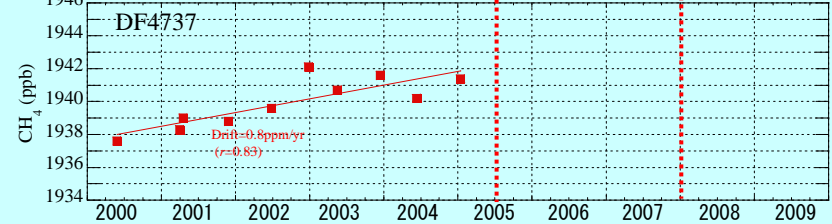
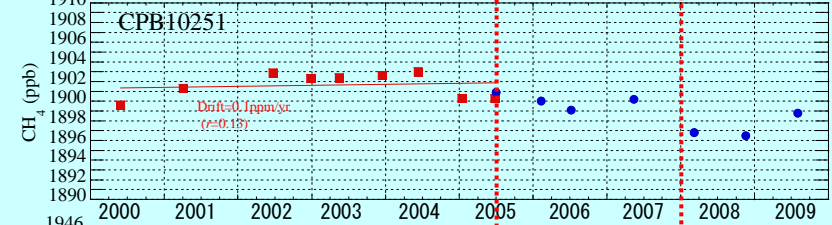
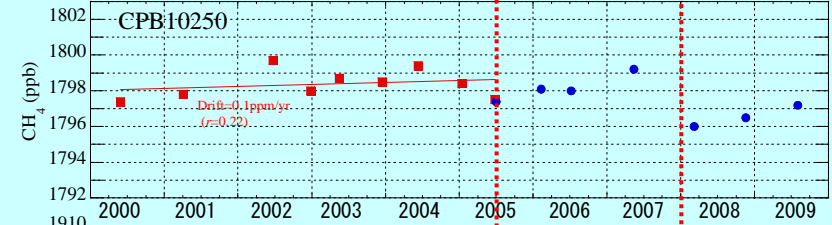
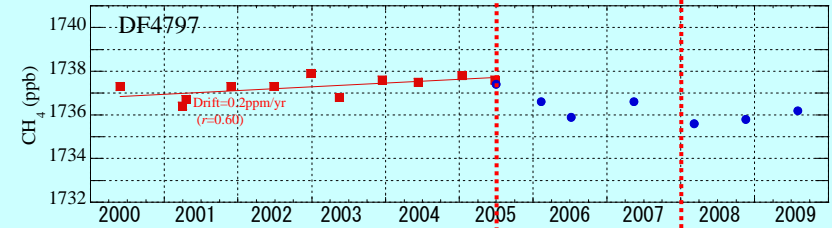
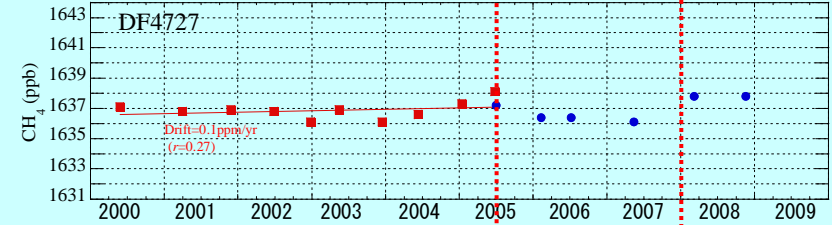
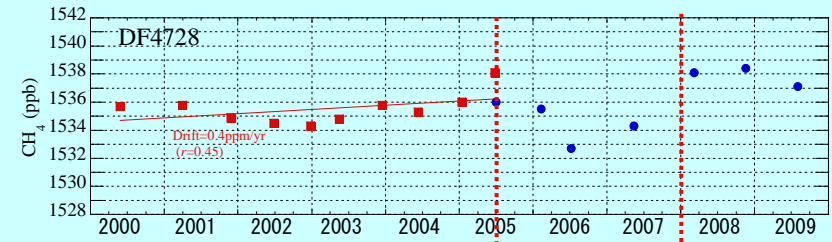
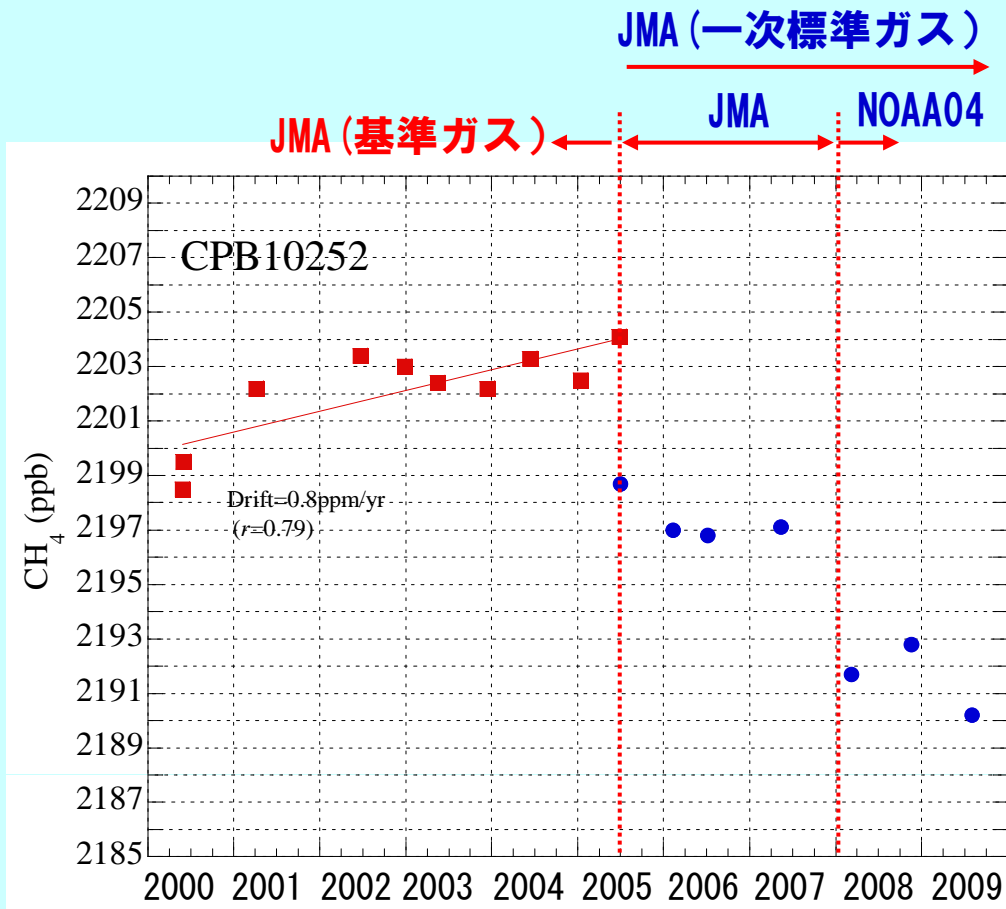


Intercomparisons of CH₄ standards between MRI and JMA twice a year

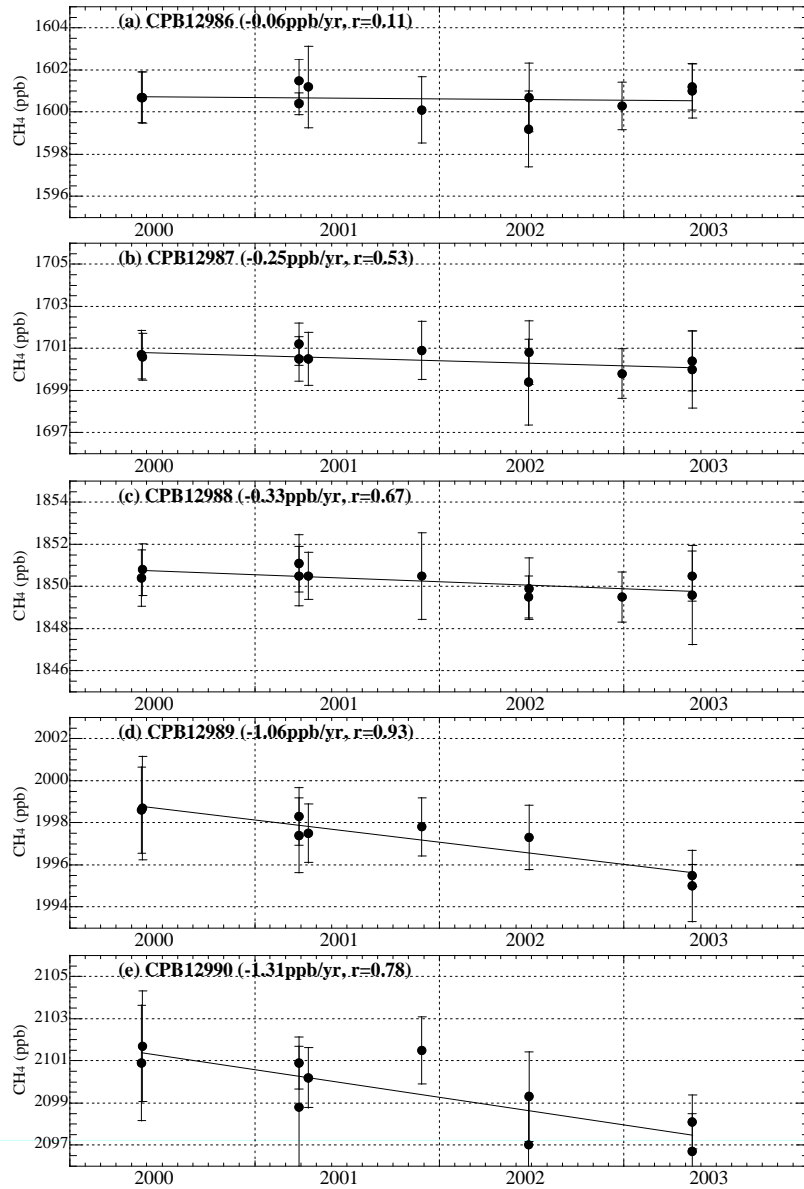


Matsueda et al. (2004)
 Papers in Meteorology and Geophysics,
 54, 91-109

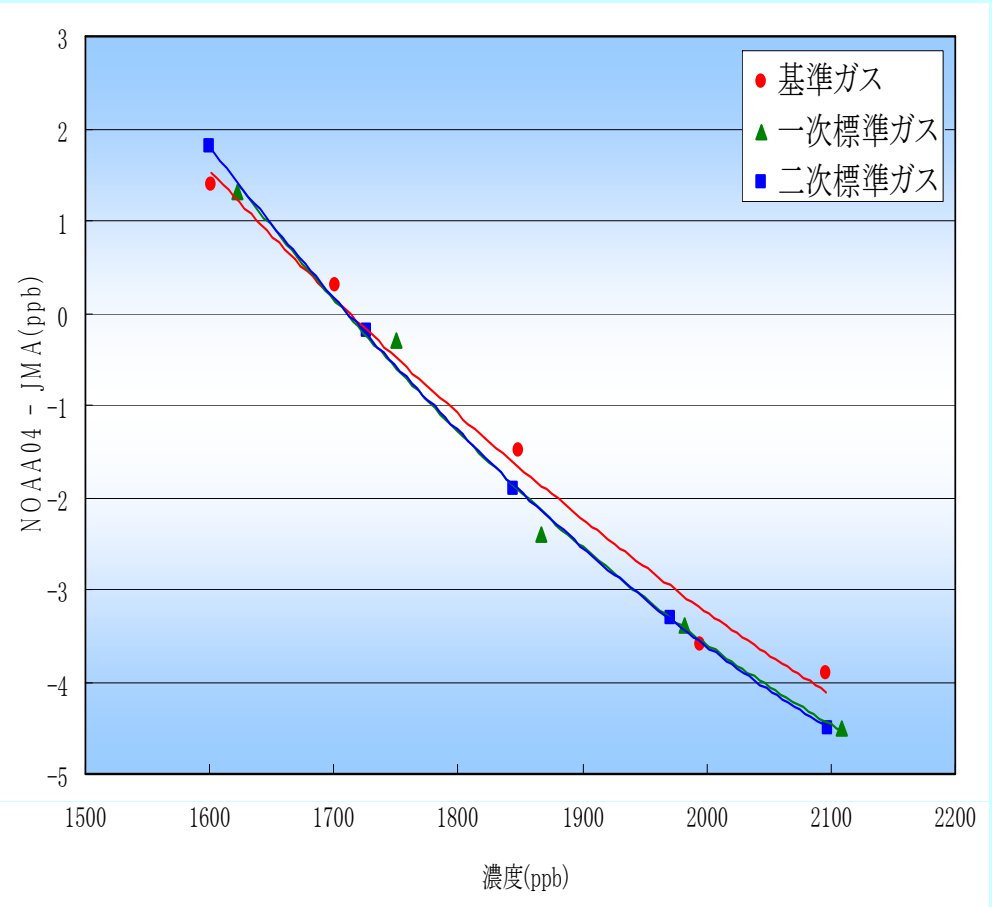
Intercomparison results of CH₄ standard gases during 2000 - 2009



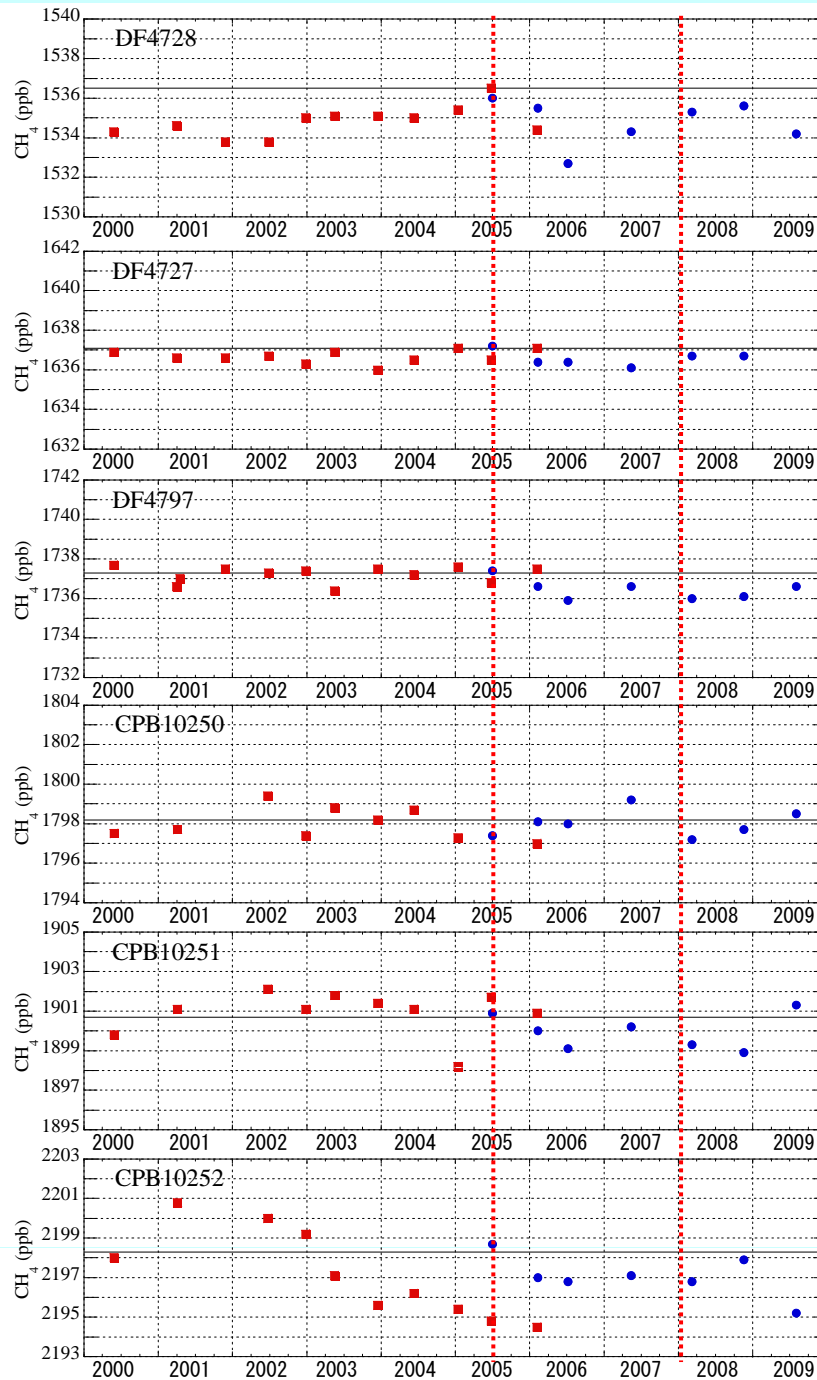
Estimated Drift of JMA Standards



Difference of CH₄ Scale between JMA and NOAA (04)



Dlugokencky et al. (2005) JGR,
110, D18306, doi:10.1029/2005JD006035.



Consistency of CH₄ Standard Scale

- 1) All values were re-calculated based on the JMA scale.
- 2) Drift of CH₄ content were corrected.

Conclusions

- Intercomparisons of CO₂ and CH₄ standard gases between MRI and JMA had been made twice a year.
- It was found that the assigned values of CO₂ standards from WMO/CCL were not consistent, but their consistency was recovered and validated based on the intercomparison results.
- The Intercomparisons were useful for evaluating long-term stabilities of CO₂ and CH₄ contents in high-pressure cylinders.

Acknowledgements

We would like to thank the staff members of the Japan Meteorological Agency for organizing the intercomparison experiments and for maintaining the calibration system for a long period of time.