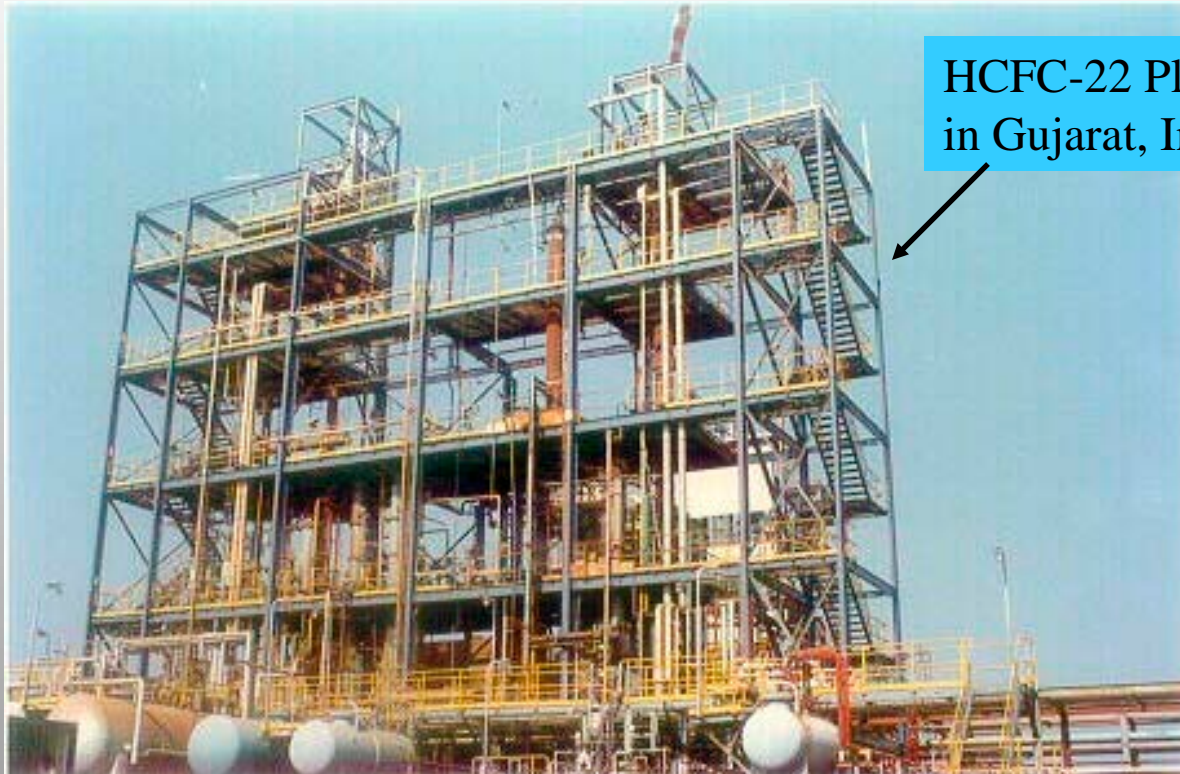


CHF₃ (HFC-23) emission trend response to CHClF₂ (HCFC-22) production and recent emission abatement measures.



HCFC-22 Plant
in Gujarat, India



B. R. Miller^{1,2}, M. Rigby³, L. J. M. Kuijpers⁴, P. B. Krummel⁵, L. P. Steele⁵, M. Leist⁵, P. J. Fraser⁵, A. McCulloch⁶, C. Harth², P. Salameh², J. Mühle², R. F. Weiss², R. G. Prinn³, R. H. J. Wang⁷, S. O'Doherty⁶, B. R. Grealley⁶ and P. G. Simmonds⁶

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³ **Center for Global Change Science**, Massachusetts Institute of Technology, Cambridge, Massachusetts

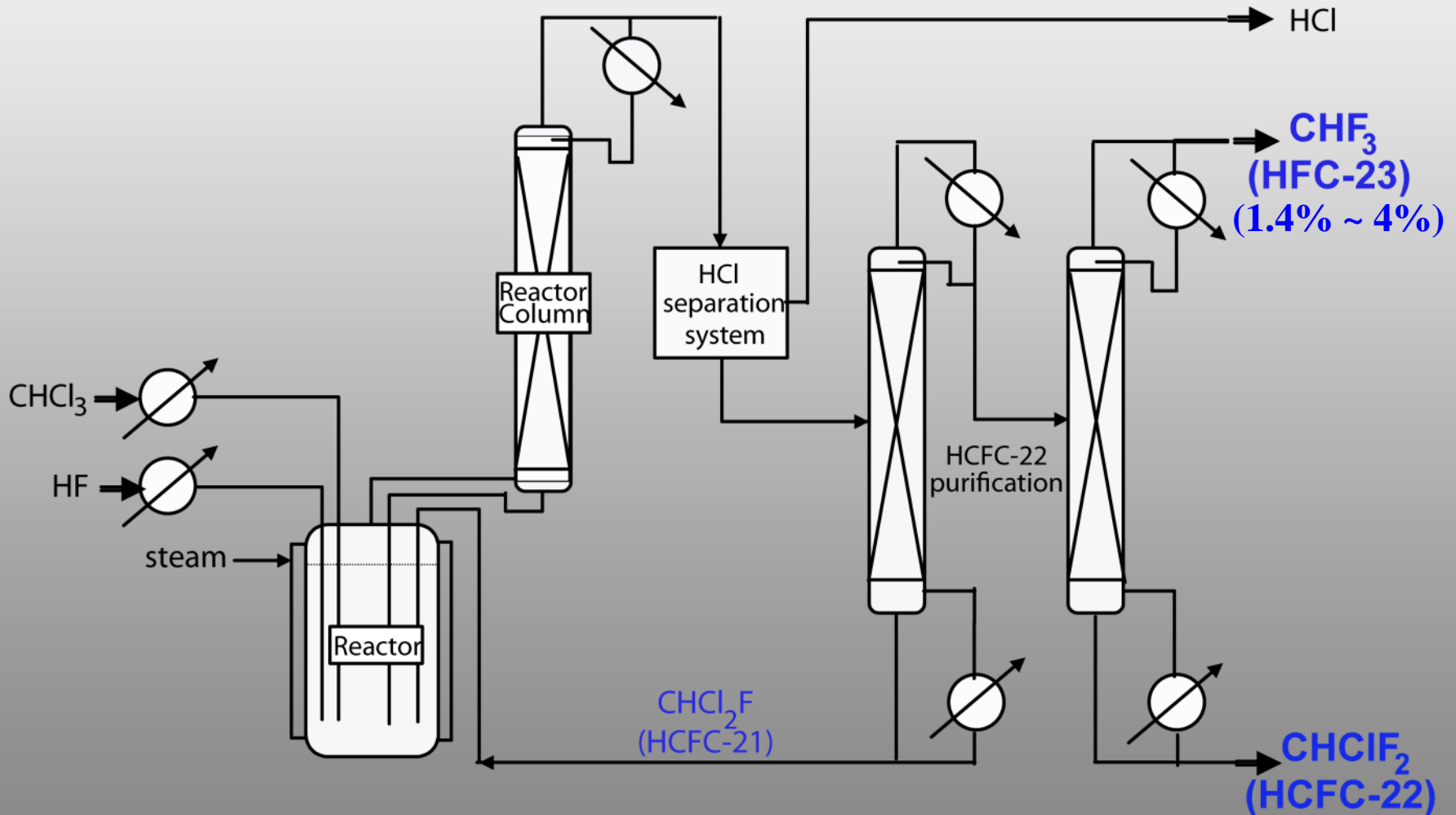
⁴ **Eindhoven Centre for Sustainability**, Technical University Eindhoven, Eindhoven, Netherlands

⁵ **Centre for Australian Weather and Climate Research**, CSIRO Marine and Atmospheric Research, Aspendale, Victoria, Australia

⁶ **School of Chemistry**, University of Bristol, Bristol, United Kingdom

⁷ **School of Earth and Atmospheric Sciences**, Georgia Institute of Technology, Atlanta, Georgia, USA

HFC-23.... an inevitable by-product in HCFC-22 production



Adapted from A. McCulloch, "Incineration of HFC-23 Waste Streams for Abatement of Emissions from HCFC-22 Production: A Review of Scientific, Technical and Economic Aspects" prepared for the UNFCCC.

HFC-23.... an inevitable by-product in HCFC-22 production

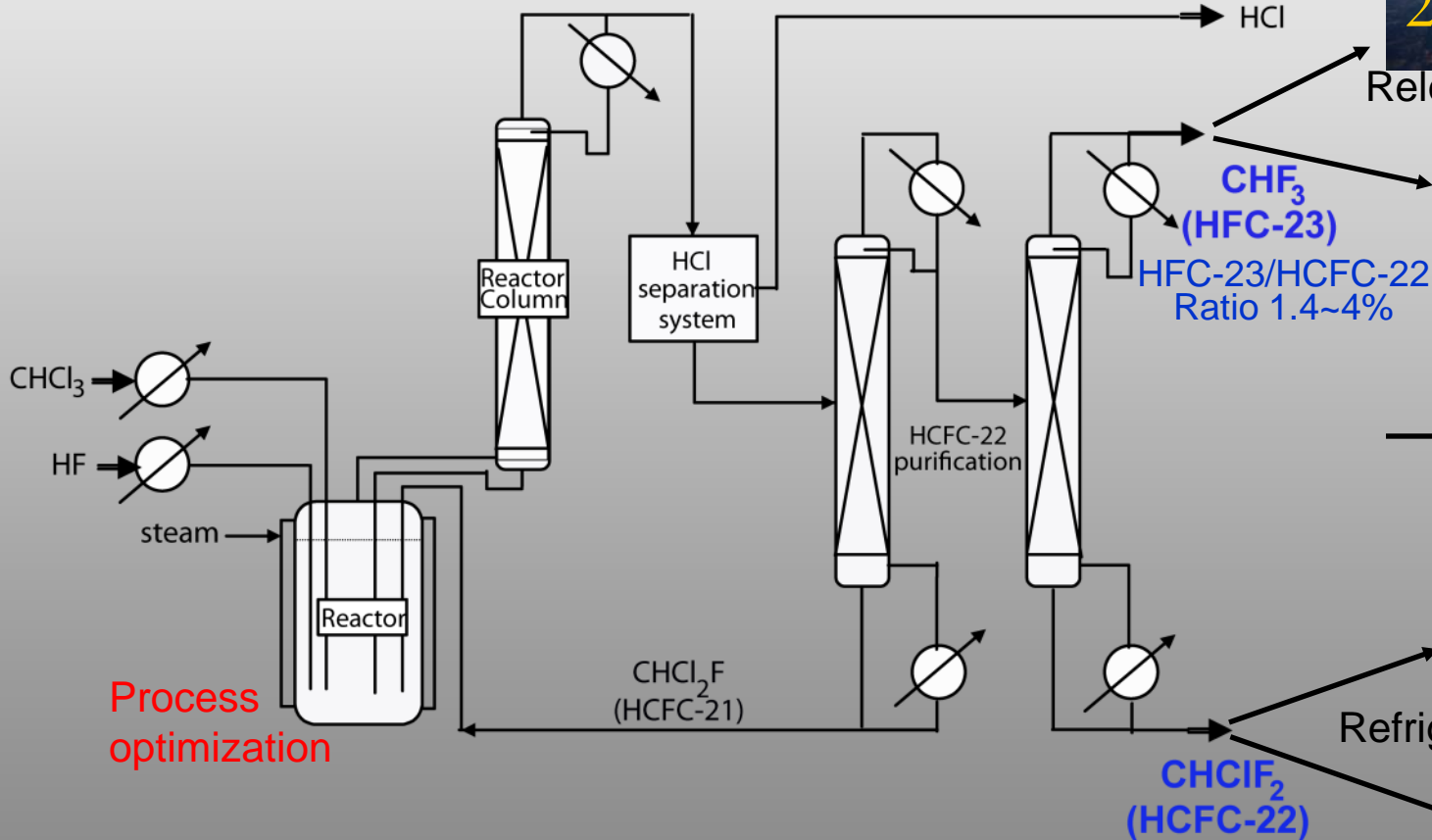
How can emissions be reduced?

GWP 14,800
260 yr τ_{trop}
2347 yr τ_{strat}

Release to Atmosphere



Incineration



Refrigeration (Dispersive)



Feedstock for Fluoropolymers

UNFCCC Clean Development Mechanism Certified Emission Reduction (CER) Credits

Breakdown of 1,534 projects in the CDM pipeline.

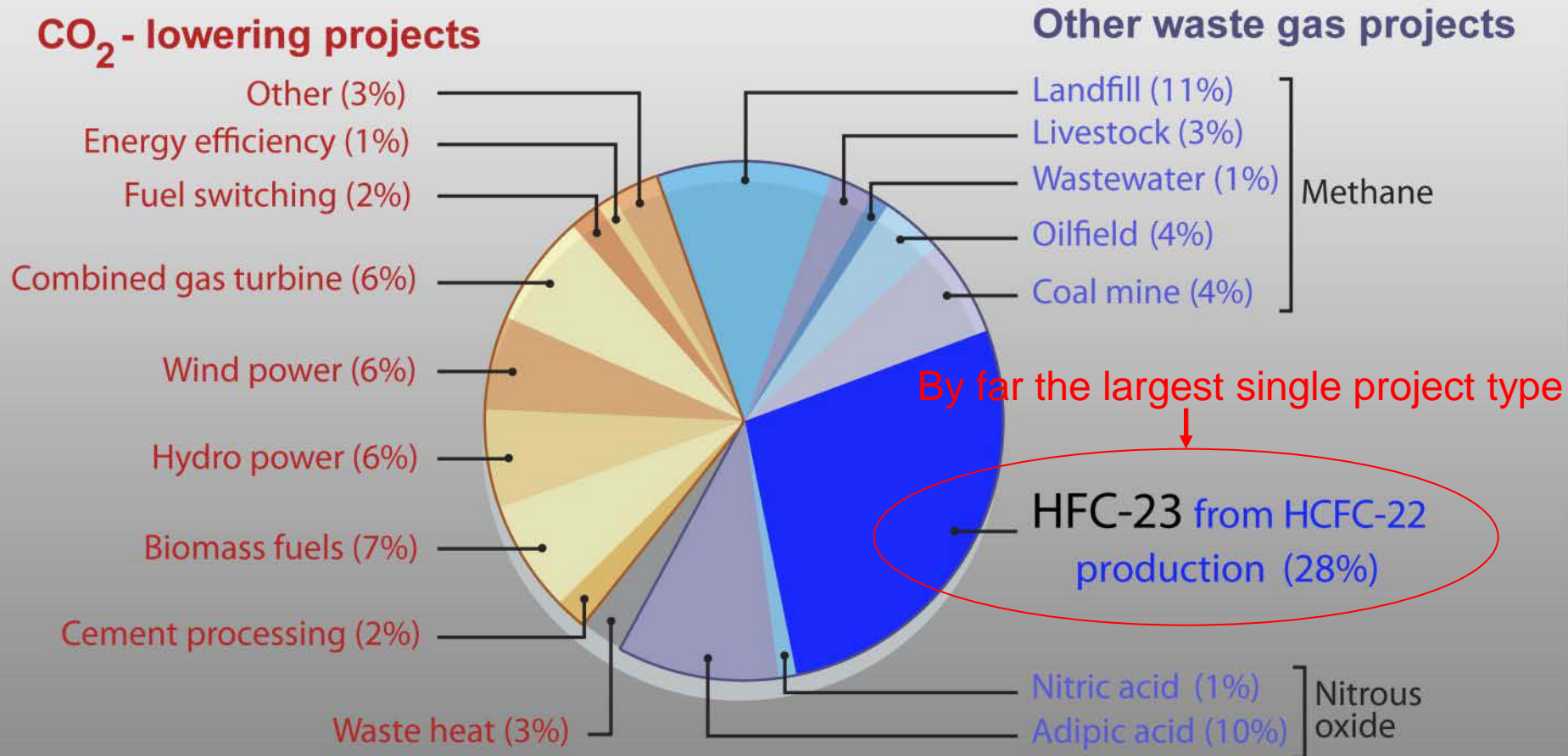
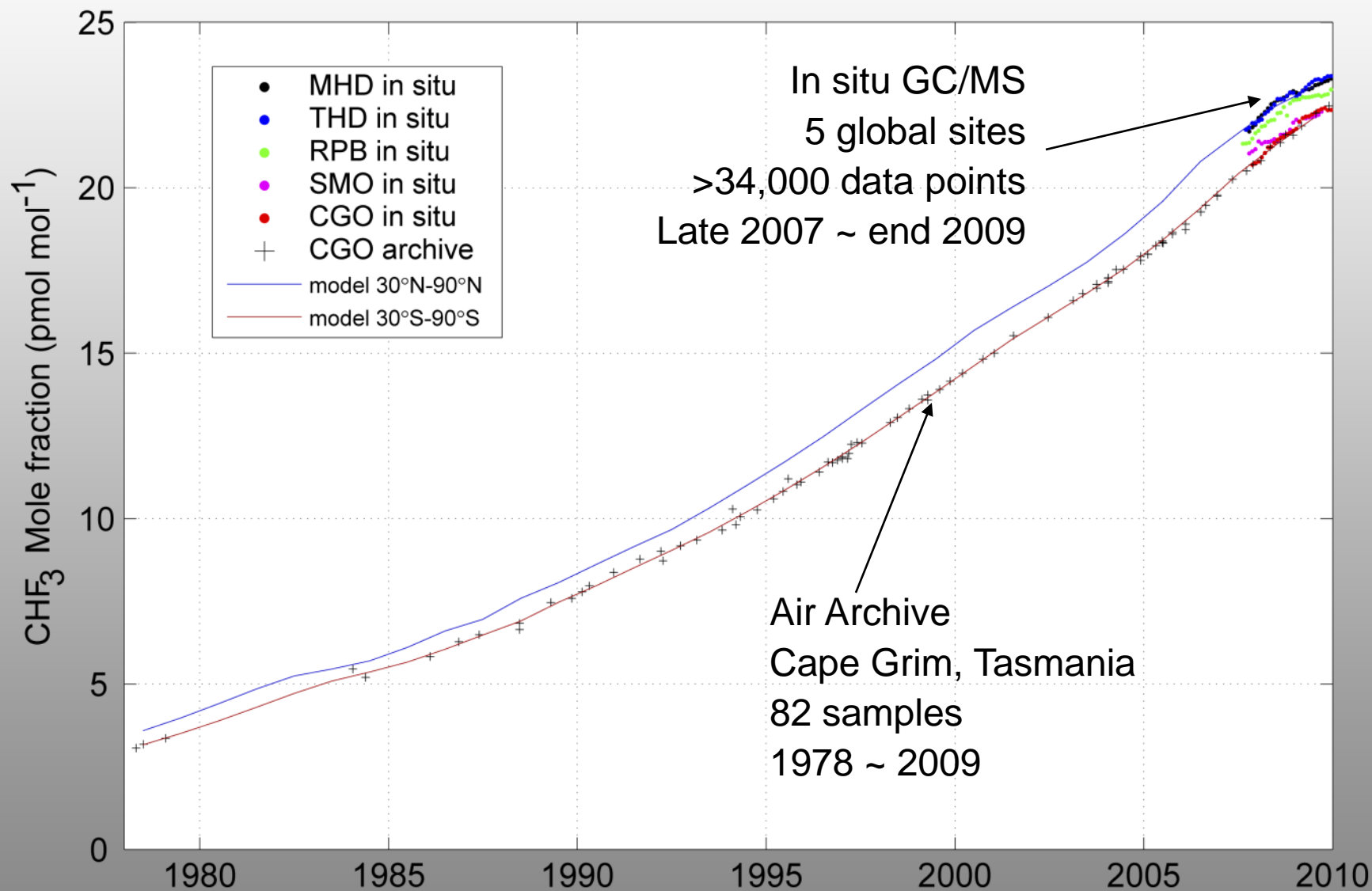
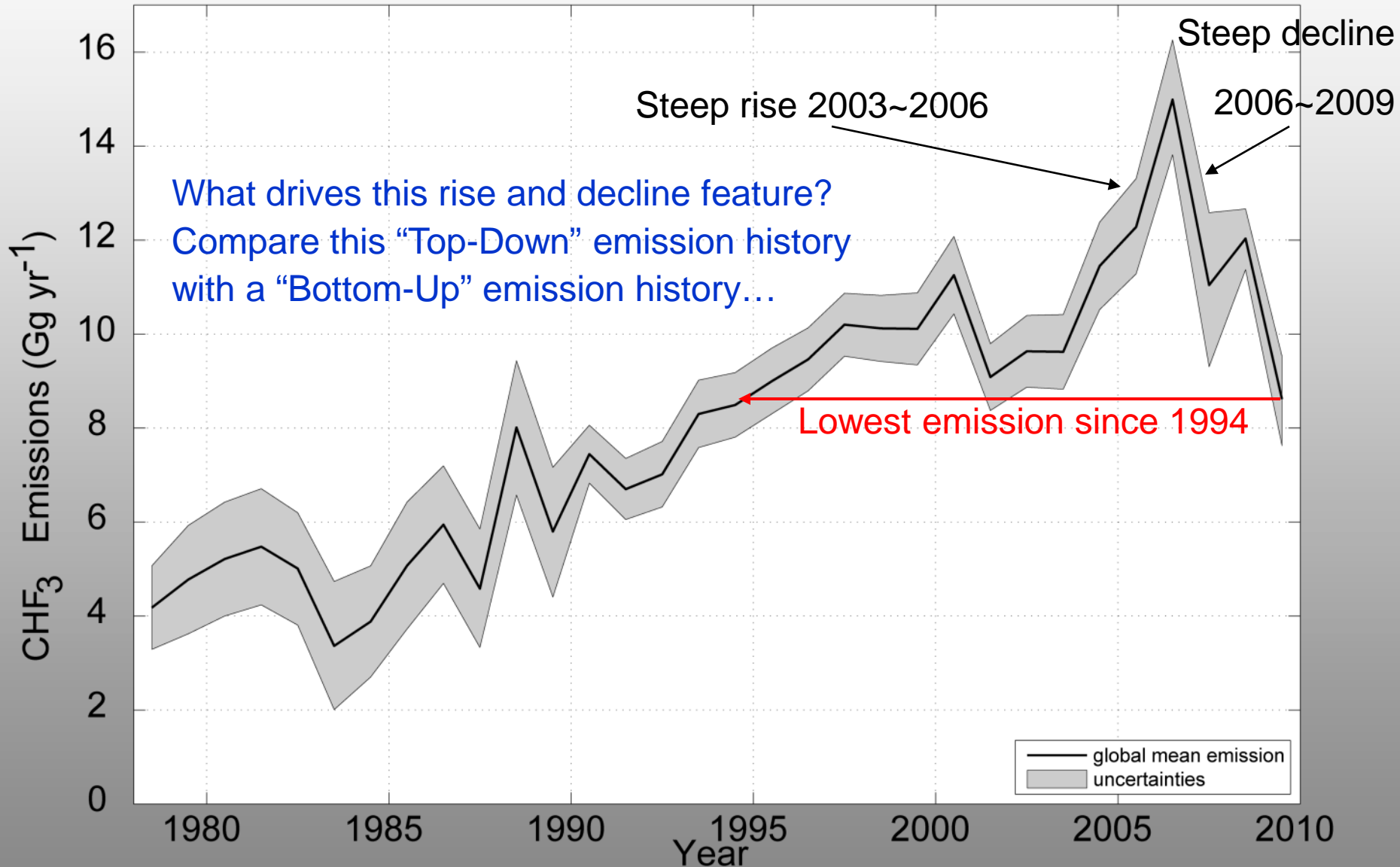


Figure adapted from Wara, M., Nature, v445, Feb. 2007

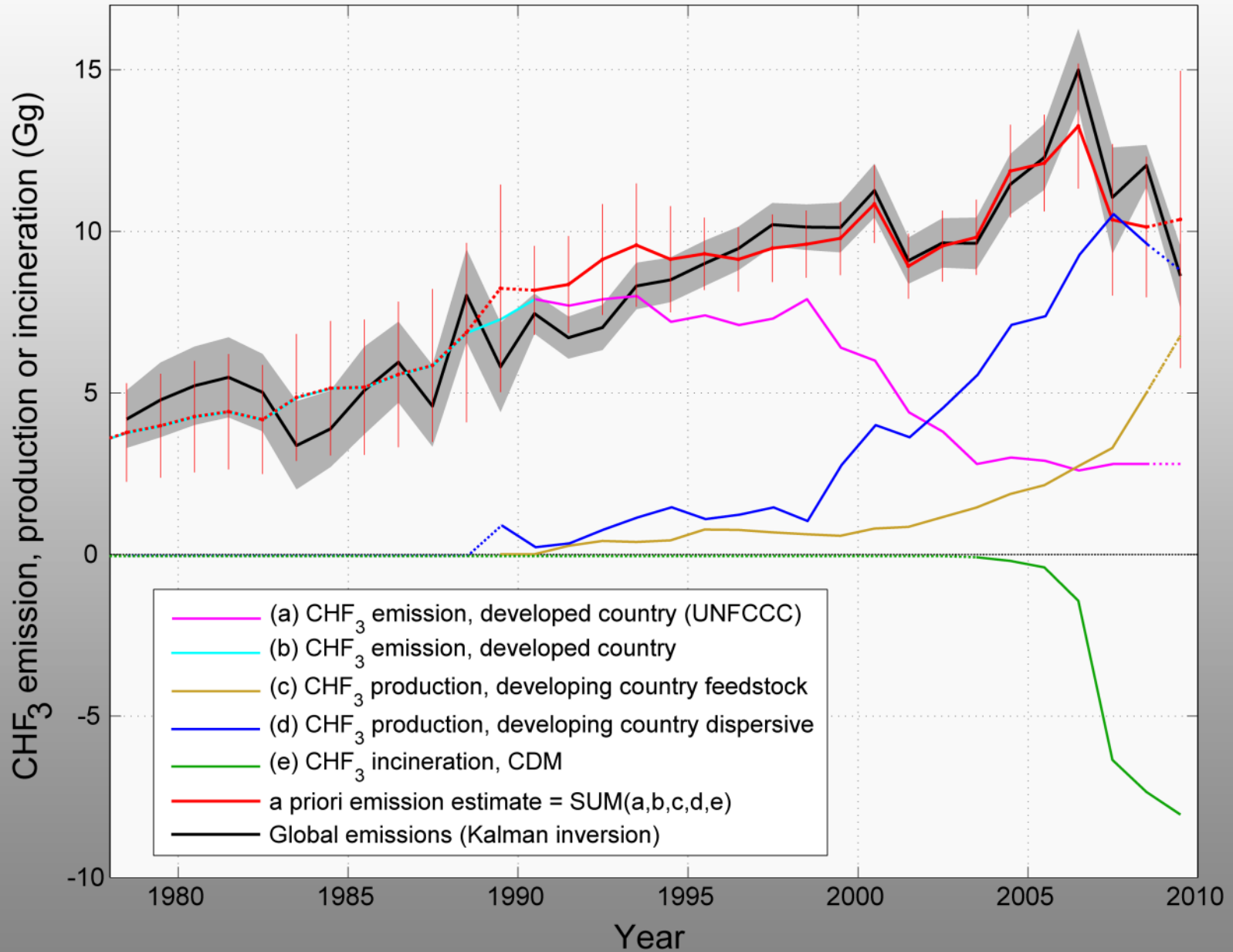
HFC-23 Atmospheric Measurements



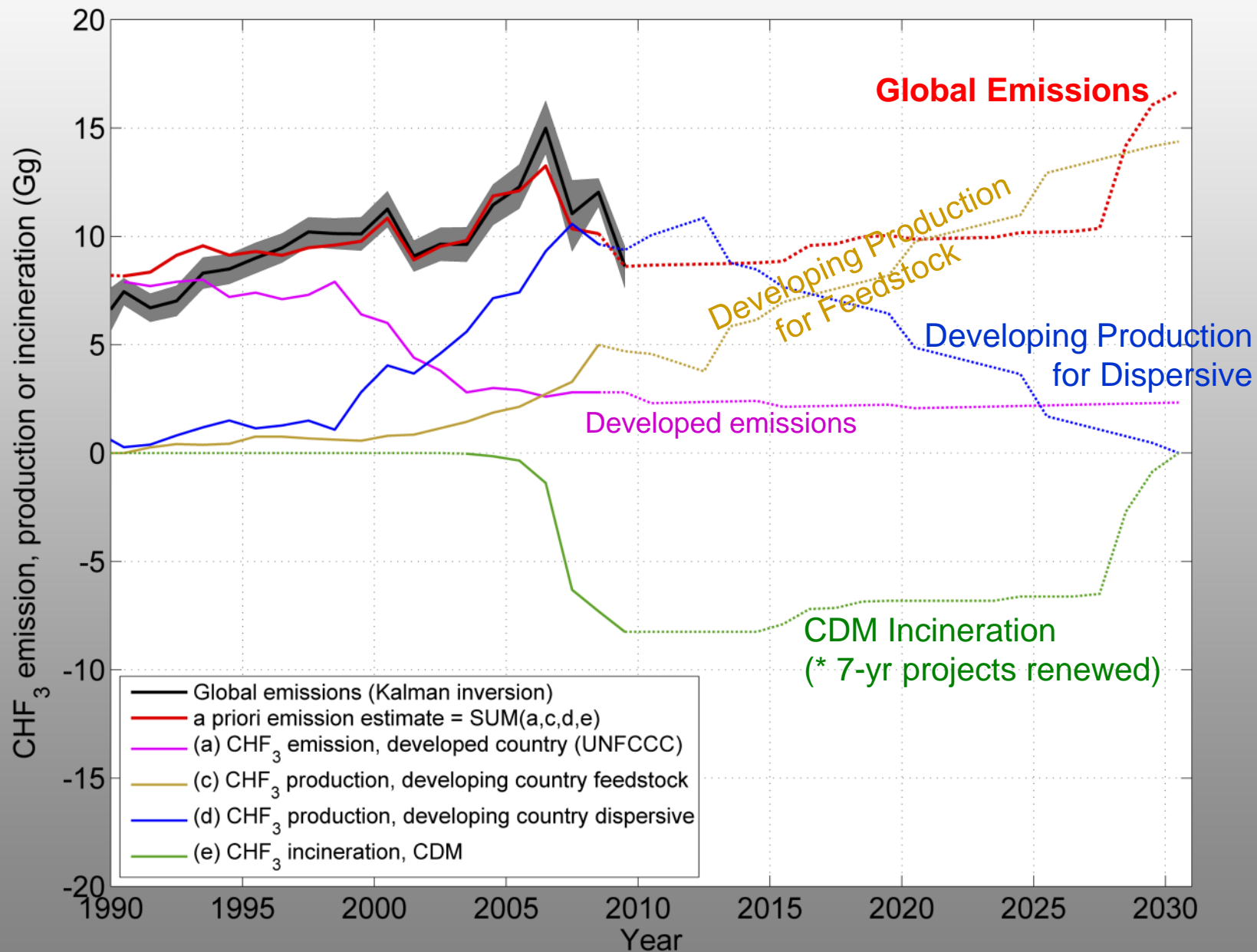
Inversion with 12-box model and Kalman filter optimization



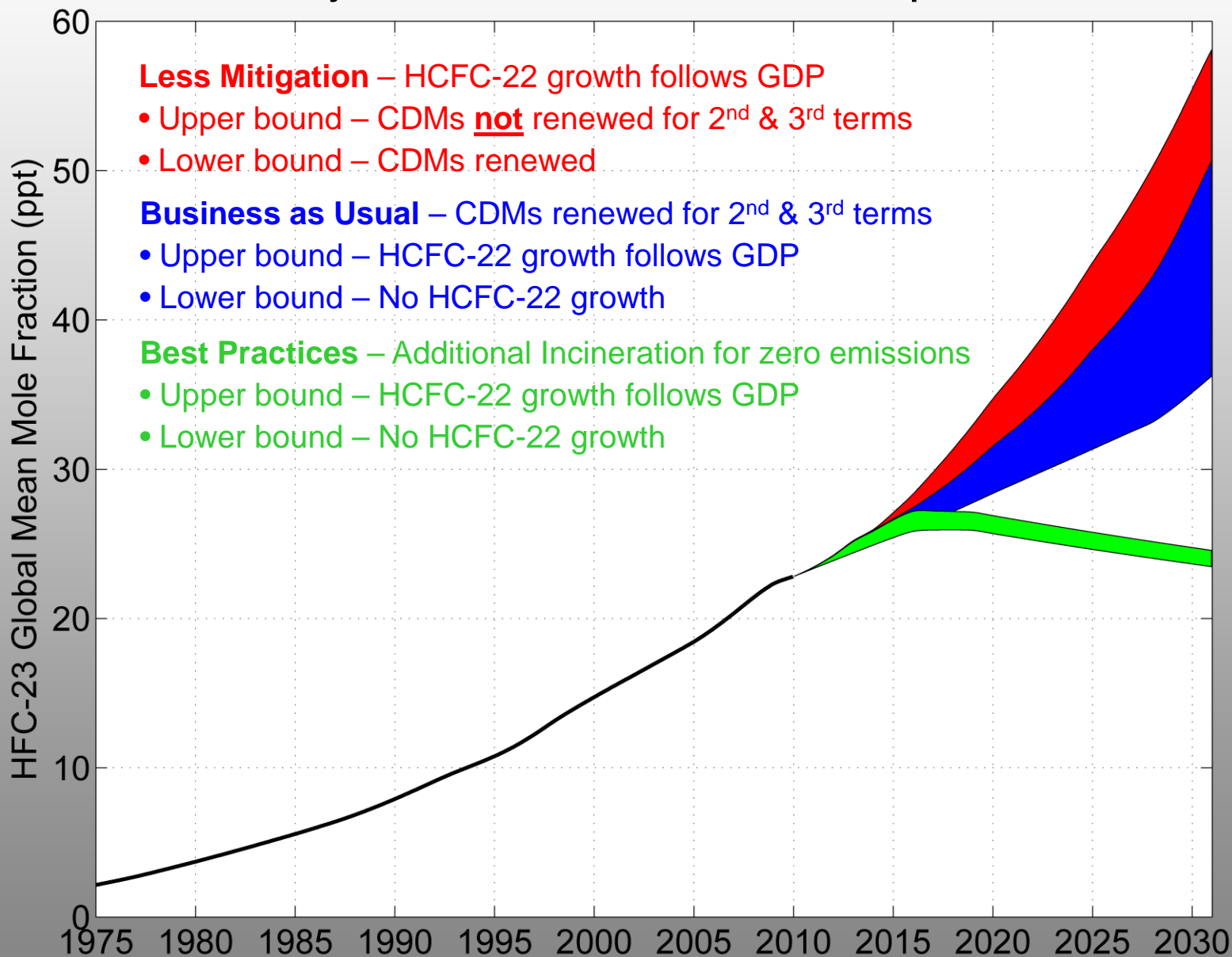
CHF₃ (HFC-23) : Bottom-up vs. Top-Down Emissions



Future Projections of HFC-23 Emission Growth



Future Projections of HFC-23 Atmospheric Growth



In summary...

- New measurements create a **30-yr HFC-23 atmospheric record**.
- Inverse modeling yields **HFC-23 emission** history which shows:
 - Steep emission increase 2003~2006 associated with developing world HCFC-22 production increase.
 - **Steep emission decrease 2006~2009 associated with recent developing world emission abatement (CDMs)**.
- **Future HFC-23 emissions largely controlled by:**
 - **Growth of HCFC-22 production for feedstock** (not controlled by Montreal).
 - **Measures to continue HFC-23 incineration and add new incineration capacity.**

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- **Nick Campbell** (ARKEMA)
- **Andrew Lindley** (Mexichem Fluor)

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Thank you for listening!