

# Ozone Depleting Substances (ODSs) in California: Overview, Issues, and Reduction Opportunities

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# Climate Forcers in California

## Preliminary Calculations

Climate Forcer	100-year Global Warming Potential <sup>a</sup>	MMT <sup>b</sup> (2005)	MMTCO <sub>2</sub> E	2005-2020 Change <sup>c</sup>
CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFC, PFC, SF <sub>6</sub>	1 – 23,900	--	500	-15%
CO	1.0 – 3.0	4.56	5 – 15	-36%
ROG	1.1 – 6.2	0.81	1 – 5	-18%
NO <sub>x</sub>	-10 – 5	1.07	-10 – 5	-32%
Diesel PM	500 – 1,200	0.029	15 – 35	-85% <sup>d</sup>
Other PM	unknown	--	likely negative	--
CFC, HCFC	100 – 10,000	0.014	40 – 100	unknown

<sup>a</sup> Fossil fuel soot GWP range from Hansen et al. (2007) and Jacobson (2005), all others from IPCC

<sup>b</sup> CFC and HCFC estimate from USEPA Vintaging model, all others from CARB emission inventory

<sup>c</sup> CO<sub>2</sub> etc.: AB 32 target. CO, ROG, NO<sub>x</sub>: CARB emission inventory for rules already adopted.

<sup>d</sup> Diesel PM: 2000 to 2020 Diesel Risk Reduction Plan target.

# Key Points

- Ozone Depleting Substances (ODSs) deplete ozone in the stratosphere but are also potent greenhouse gases
  - GWPs from 100 -10,000
- There are large banks of ODSs that are expected to be emitted over time
  - Banks are the total amount of substances contained in existing equipment, chemical stockpiles, foams and other products not yet released to the atmosphere
- ODSs are cost-effective options for additional reductions of greenhouse gases

# Major International Regulations

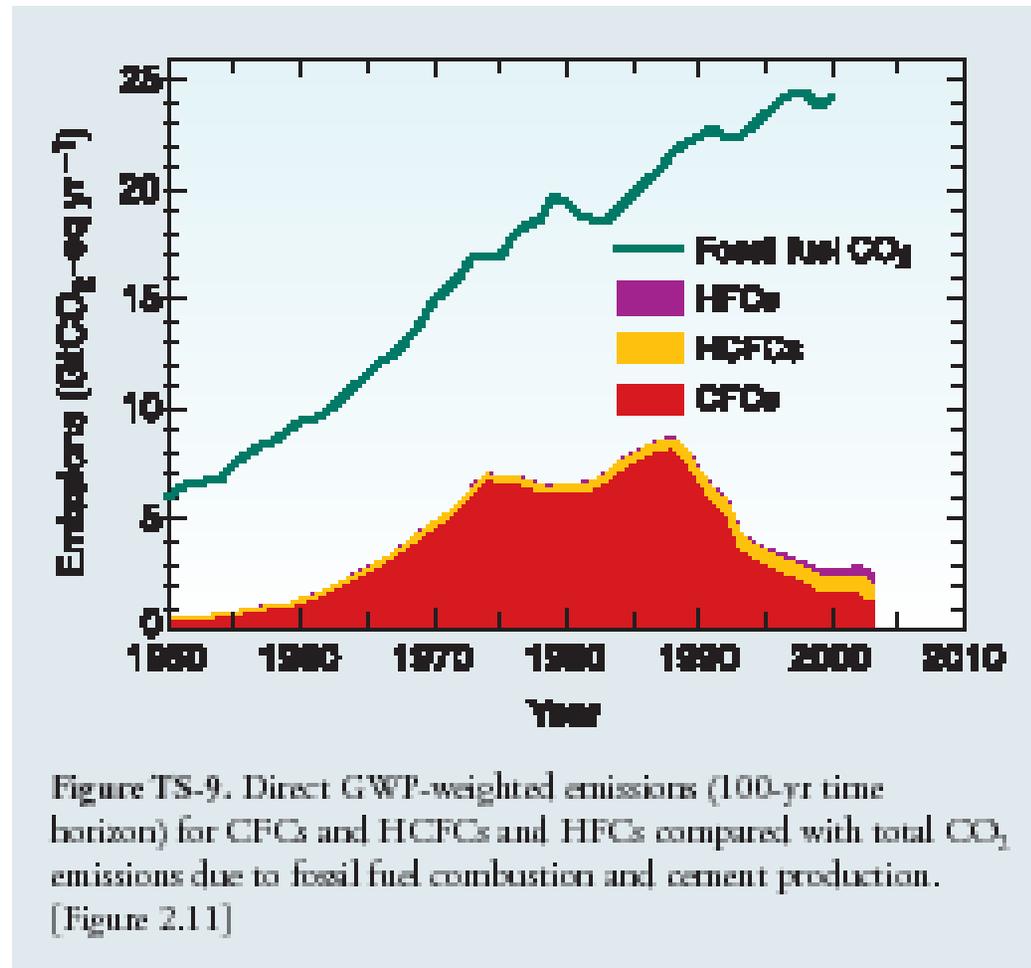
## ❖ Kyoto Protocol

- International treaty on climate change to reduce emissions of six greenhouse gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, SF<sub>6</sub>, HFCs, and PFCs)

## ❖ Montreal Protocol

- International agreement designed to protect the stratospheric ozone layer.
- Reduces the production and consumption of compounds that deplete ozone in the stratosphere.

# Major International Climate Change Regulation

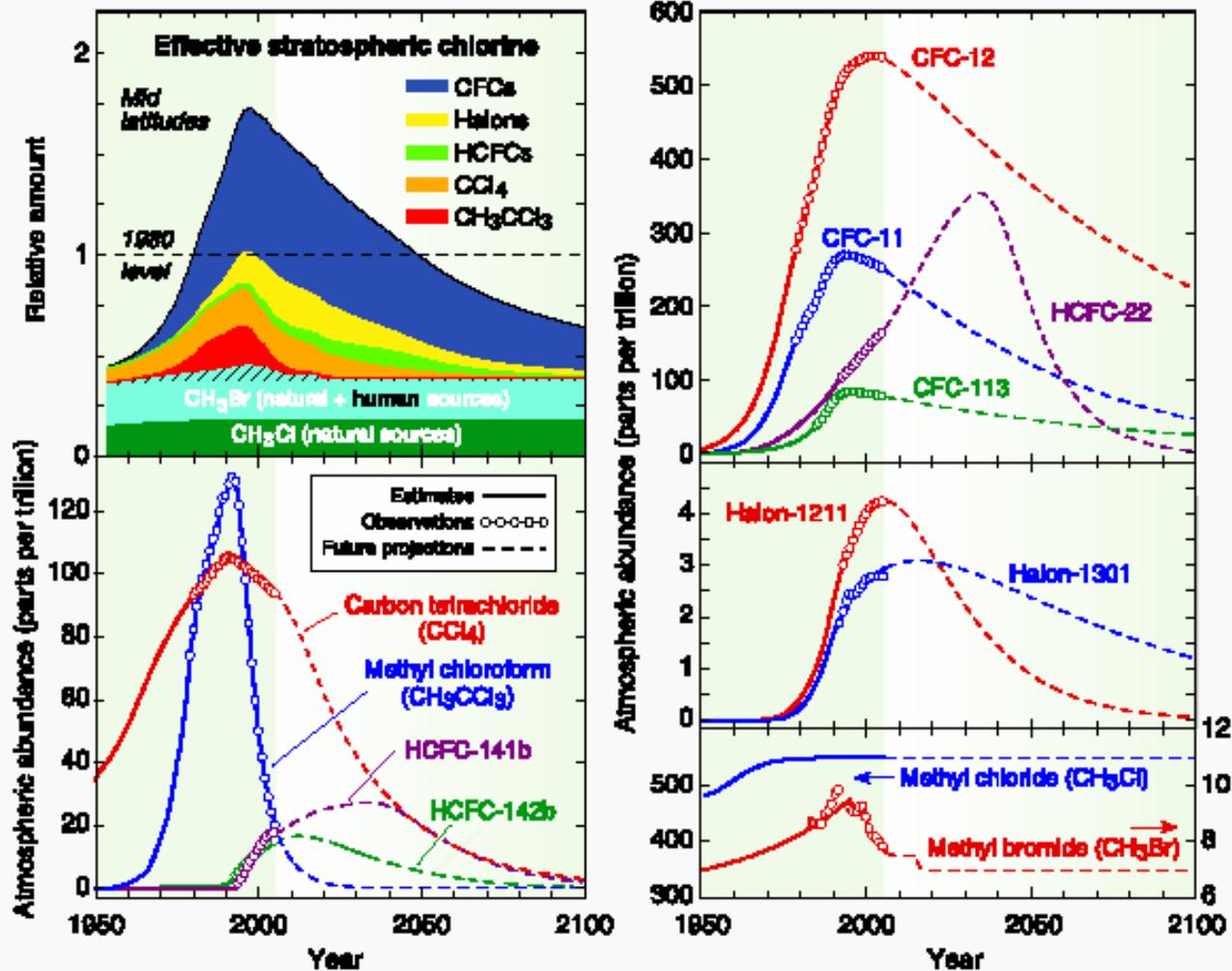


# What Are Ozone Depleting Substances (ODSs)?

- Ozone-depleting substances (ODSs) include the CFCs and HCFCs among other chemicals.
  - Used in a wide range of processes and products: refrigeration and air conditioning (RAC), foams, fire extinguishing, propellants, solvent cleaning.
  - ODSs are potent greenhouse gases with 100-year GWP of 100 to 10,000 after considering any offsetting ozone depleting effects.
  - More climate benefit can be achieved with additional and accelerating ODS regulations.

# Past, Present and Future Global Abundances of ODSs

Past and Expected Future Abundances of Atmospheric Halogen Source Gases



# ODS Inventories- Banks and Emissions

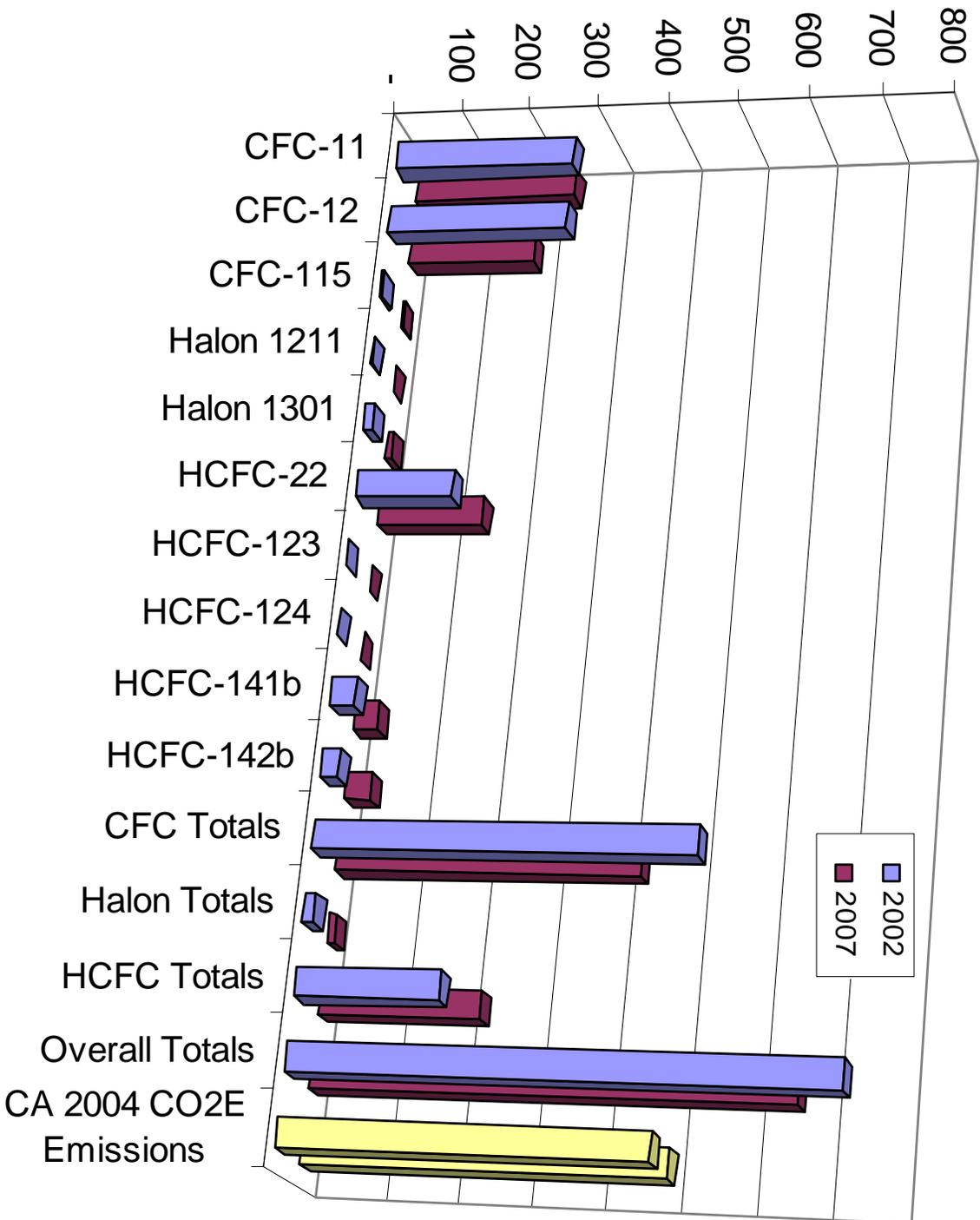
- Because they have been produced for so long, large banks of these chemicals exist, and will eventually be emitted into the atmosphere during use or end-of-life if not properly recovered and destroyed.
  - ODS banks and emissions are not regulated under the Montreal Protocol or the Kyoto Protocol
  - ODSs in consumer products are regulated by ARB in California:  
<http://www.arb.ca.gov/consprod/regs/cp.pdf>

# ODSs Inventories from The Vintaging Model

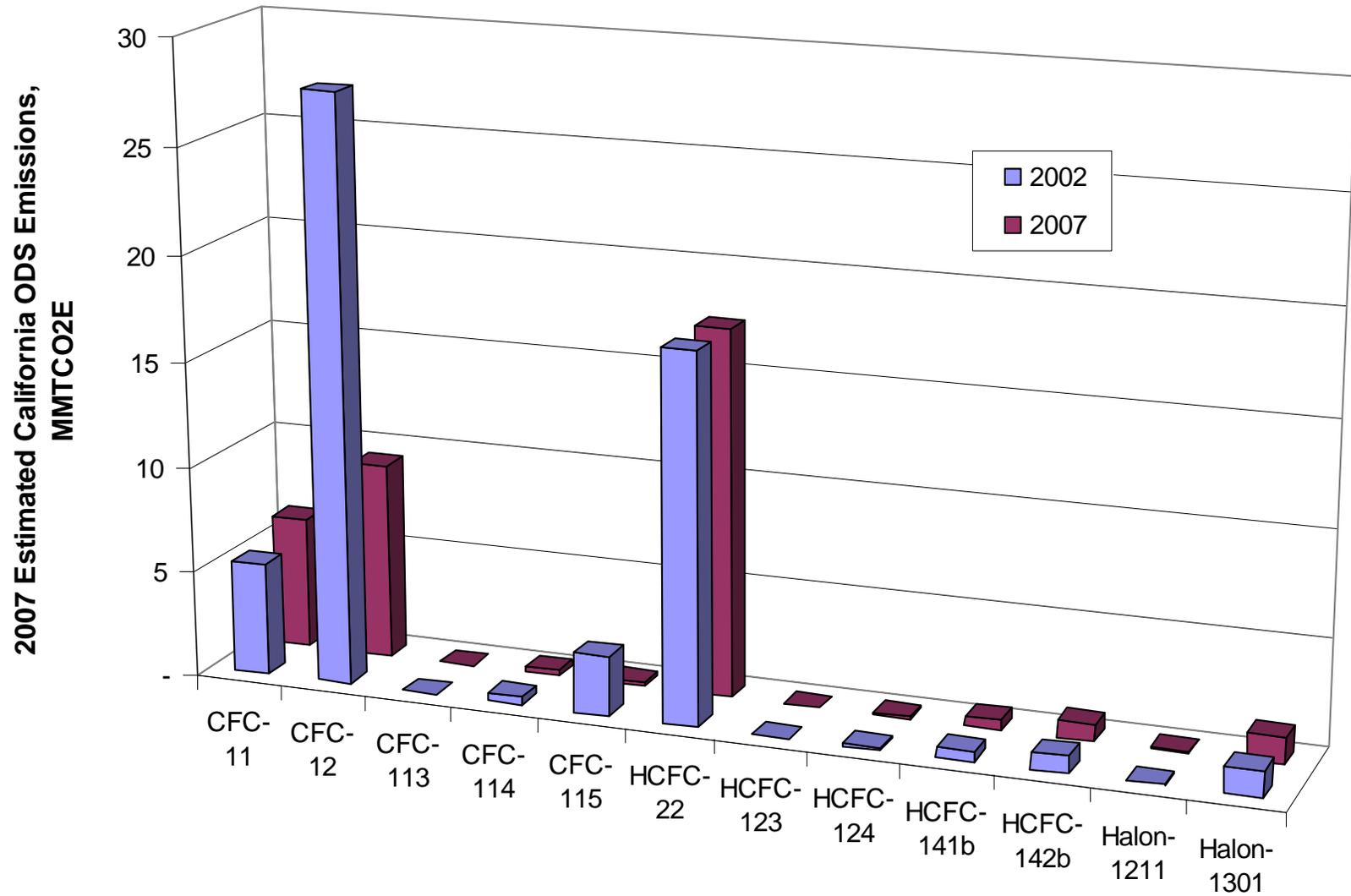
- The USEPA has developed a “Vintaging Model” to estimate banks and emissions of high GWP gases on the national level.
- USEPA has provided ARB with Vintaging Model output, and the data were distributed to California by population fraction.

## 2007 Estimated California ODS Banks, MMTCO2E

### Vintaging Model Estimates of Banked Non-Kyoto Gases in California, 2007 (CFCs, HCFCs, Halons)



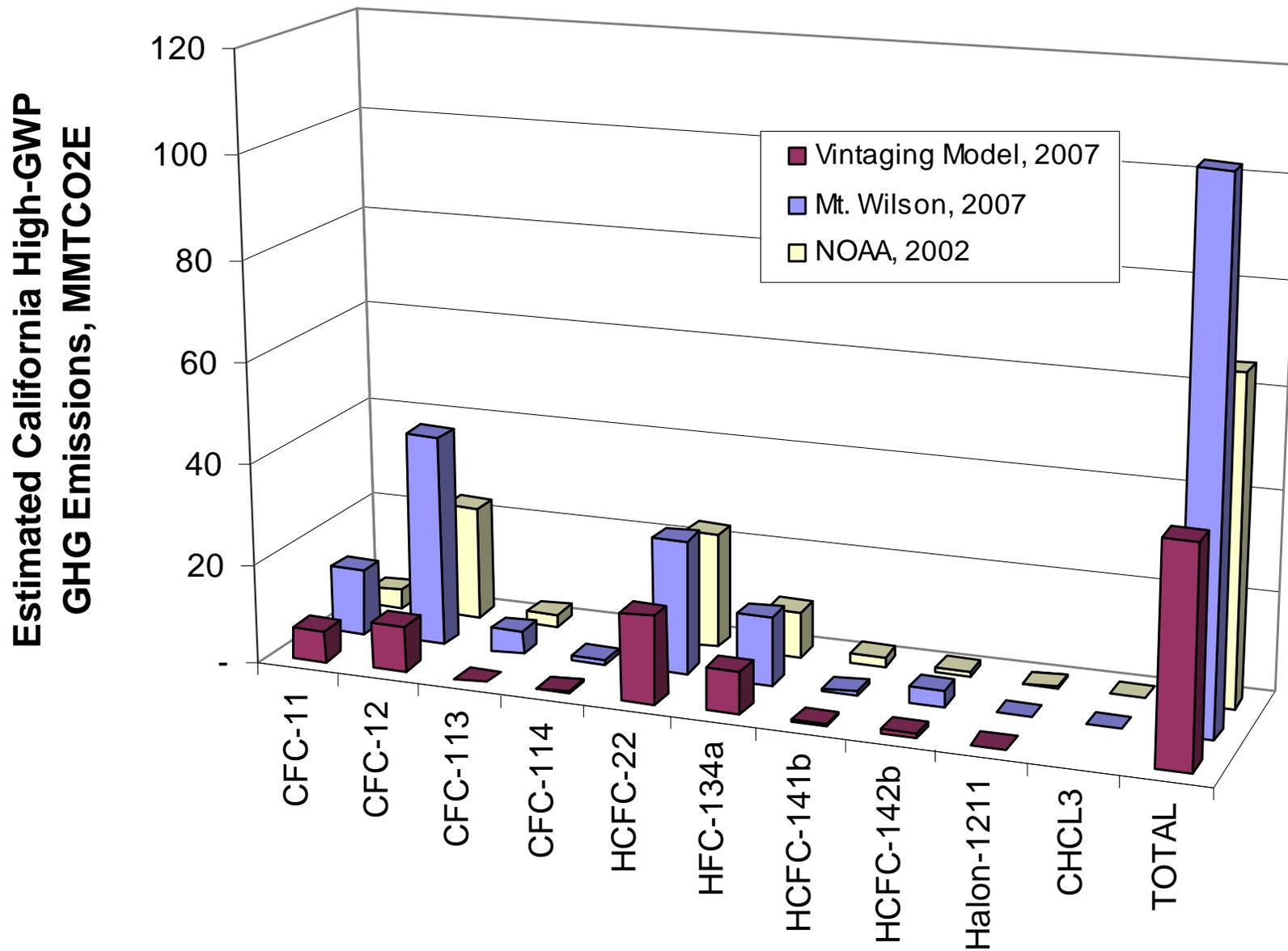
## Vintaging Model Estimates of Non-Kyoto Gas Emissions in California: 2002, 2007 (CFCs, HCFCs, Halons)



# Mount Wilson Experiment and NOAA Data

- Mt. Wilson
  - Pilot project to explore the potential for a “top-down” inventory of non-CO<sub>2</sub> GHGs.
  - Tracer/receptor approach to calculate emissions using dilution ratios.
    - CO used as an inert tracer; emissions of high-GWP GHGs calculated using measured concentrations of species of interest as well as measured concentrations of CO at Mount Wilson, and known emissions of CO from ARB’s inventory.
- NOAA
  - single date measurements in 2002 collected on a flight from L.A. to Moffatt Field.

## Estimates of High-GWP GHG Emissions in California: NOAA 2002, Mt. Wilson 2007, VM 2007



# ODS Regulation in the US

- EPA has issued regulations<sup>a</sup> to implement the Montreal Protocol and phase out the production of several ODSs.
- Some issues that are not addressed include:
  - Emissions from banks are not significantly restricted; destruction of ODSs is not required as old equipment is decommissioned.
  - Equipment that is pre-charged with ODSs in other countries can be imported.
  - Black market trading may be an issue (developing countries can still produce the substances of concern) .
  - Enforcement of federal rules is limited; end-of-life (EOL) is a particularly important issue.

<sup>a</sup>Section 602 - 613 of the Code of Federal Regulations

# ODSs in California- Potential Regulation Under AB 32

- AB 32 does not preclude ARB from regulating these substances
- California has an opportunity to serve as a national and international model for effectively dealing with a large problem.
  - Mitigation of ODS emissions from banks and new equipment also has the added benefit of reducing stratospheric ozone depletion.

# ODSs in California- Next Steps

- Inventory Development
  - Three research projects and one survey to improve the high-GWP GHG inventory in California (including ODSs).
- Early Actions
  - Early Action strategies and associated workplans to limit emissions, encourage equipment turnover, and to recover and destroy ODSs.