



ESRL Integrating Theme: Stratospheric Ozone Depletion and Recovery

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K. Rosenlof and G. Reid



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Oral Presentations

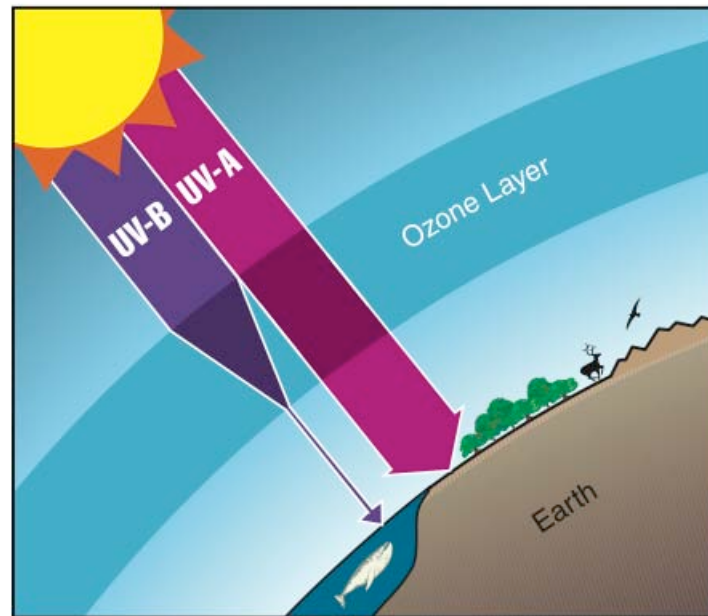
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|------|----------------------------|----------------------------------|
| I. | Overview | John Daniel |
| II. | Laboratory Measurements | Jim Burkholder |
| III. | Ozone-Depleting Substances | Steve Montzka |
| IV. | Ozone Measurements | Dave Hofmann |
| V. | Ozone/Climate Interactions | Judith Perlwitz
Susan Solomon |

What Causes Ozone Depletion and Why Do We Care?

Ozone is a naturally-occurring molecule

Filters out UV

UV Protection by the Ozone Layer



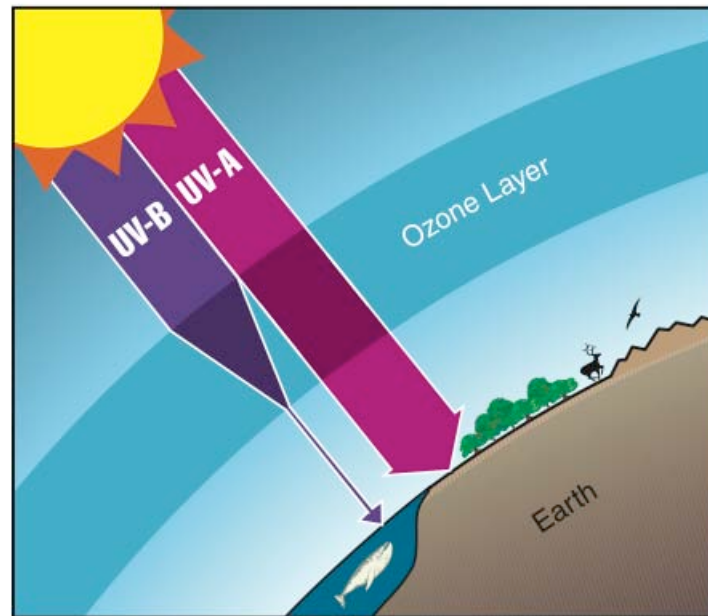
from WMO, 2006, Q&A

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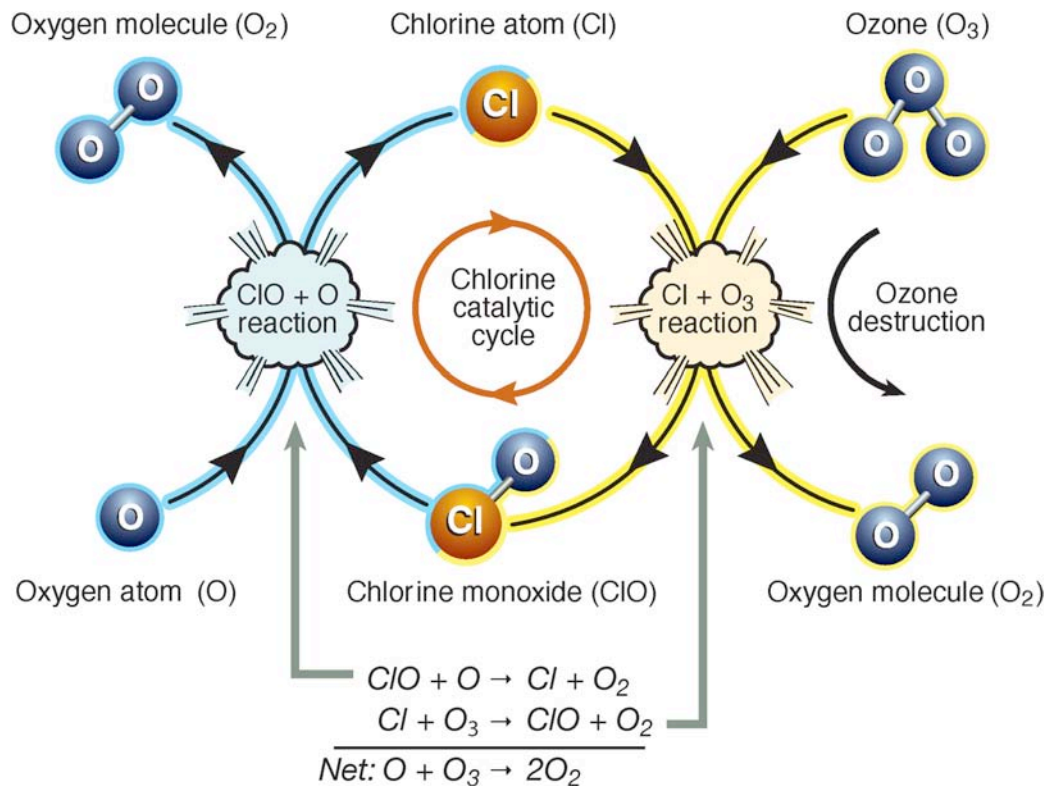
from WMO, 2006, Q&A

Depletion refers to reductions in stratospheric ozone below the natural equilibrium due to human activity

What Causes Ozone Depletion?

Reactive chlorine- and bromine-containing gases in the stratosphere

“Catalytic” cycles allow a single chlorine or bromine atom to destroy many hundreds of ozone molecules

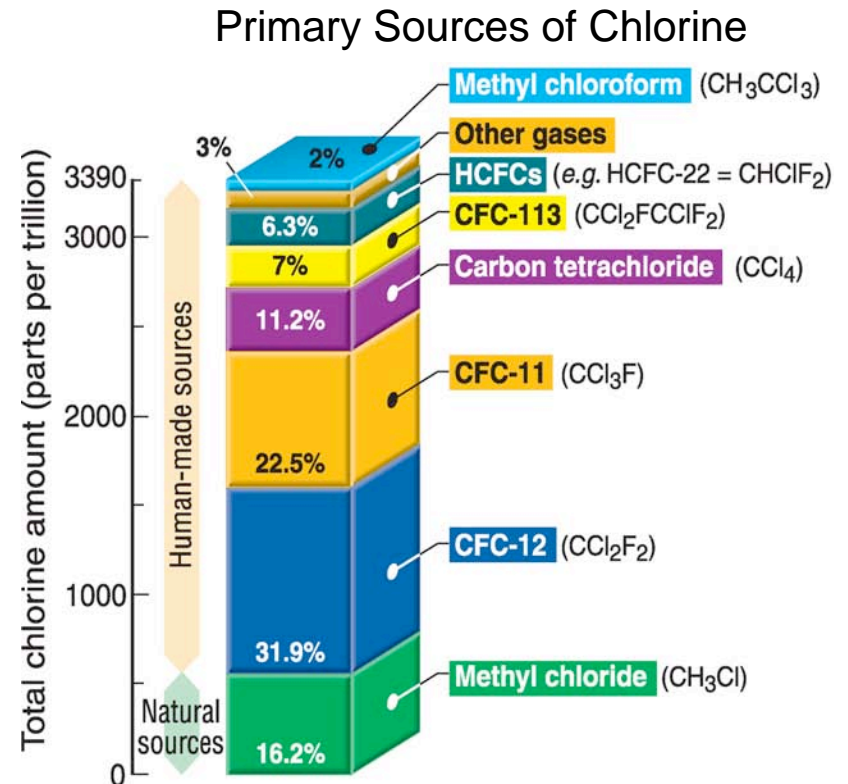
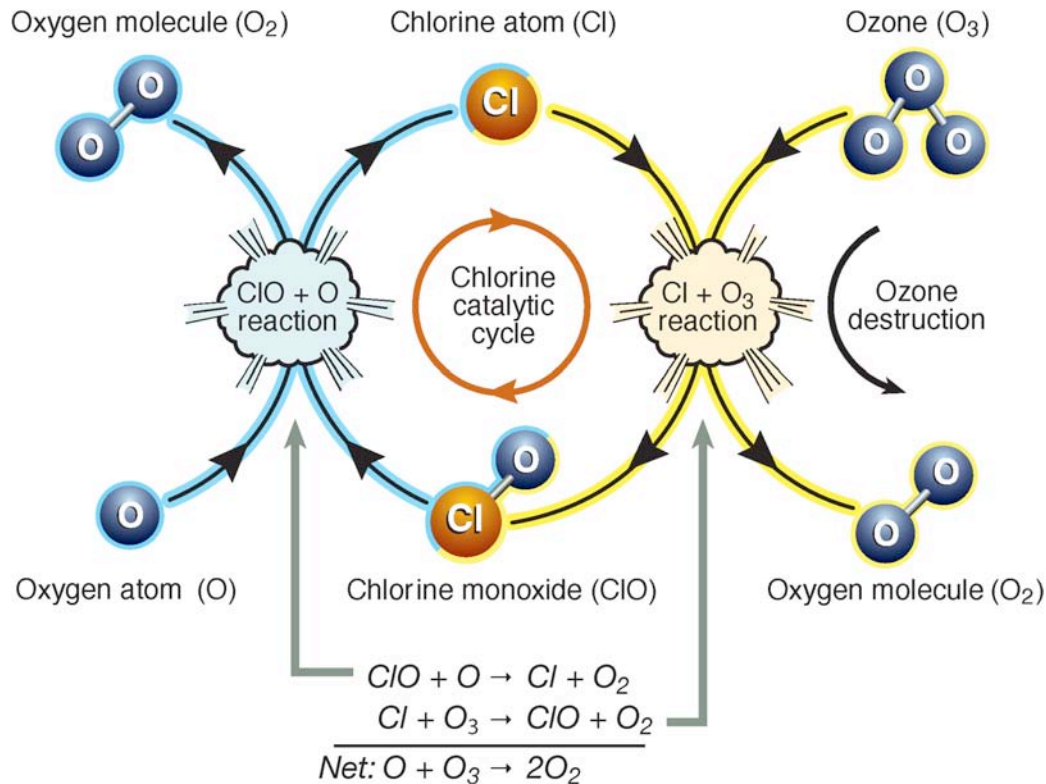


Figures from WMO, 2006

What Causes Ozone Depletion?

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Figures from WMO, 2006

History of Ozone-Depleting Substances



CFC Production

1930

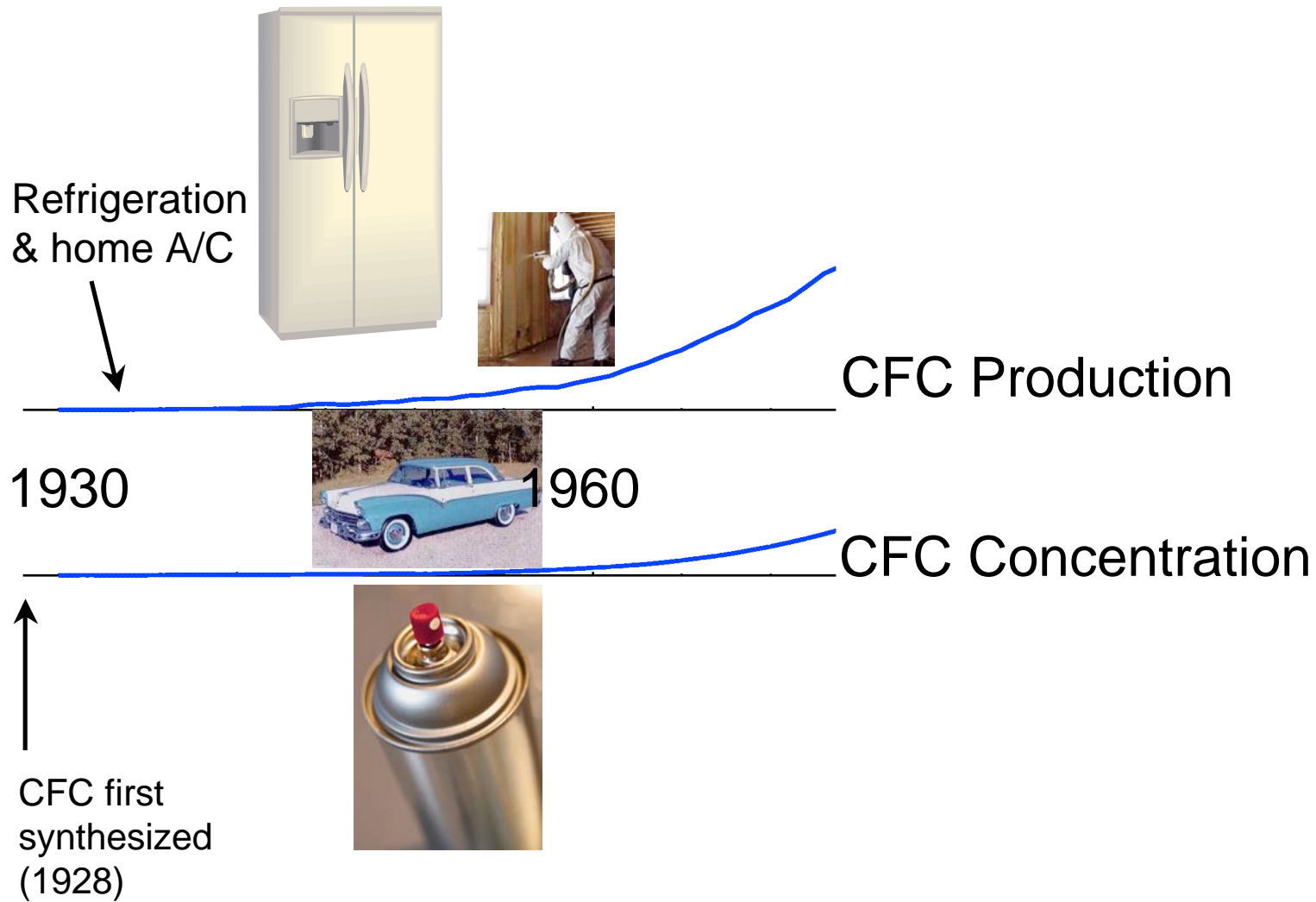
1960

CFC Concentration

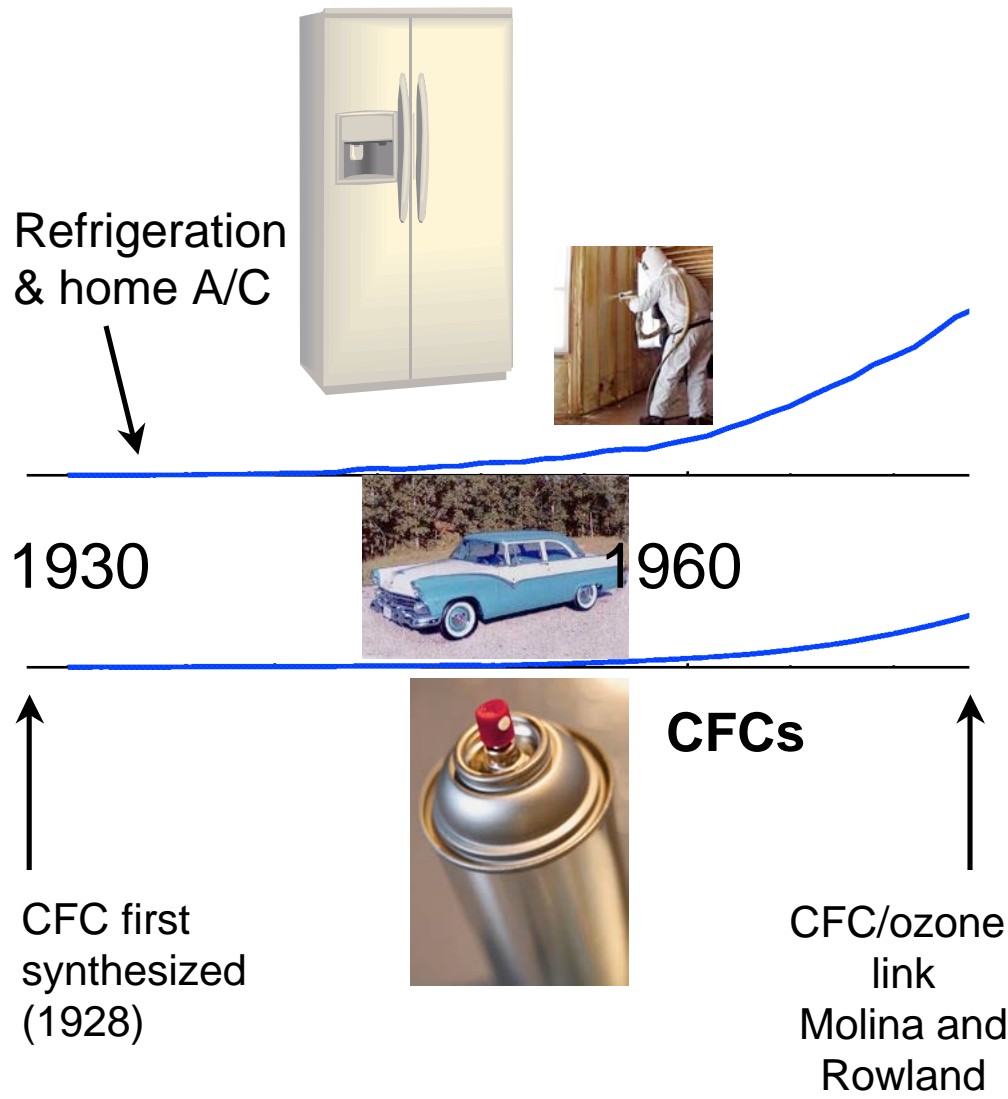


CFC first
synthesized
(1928)

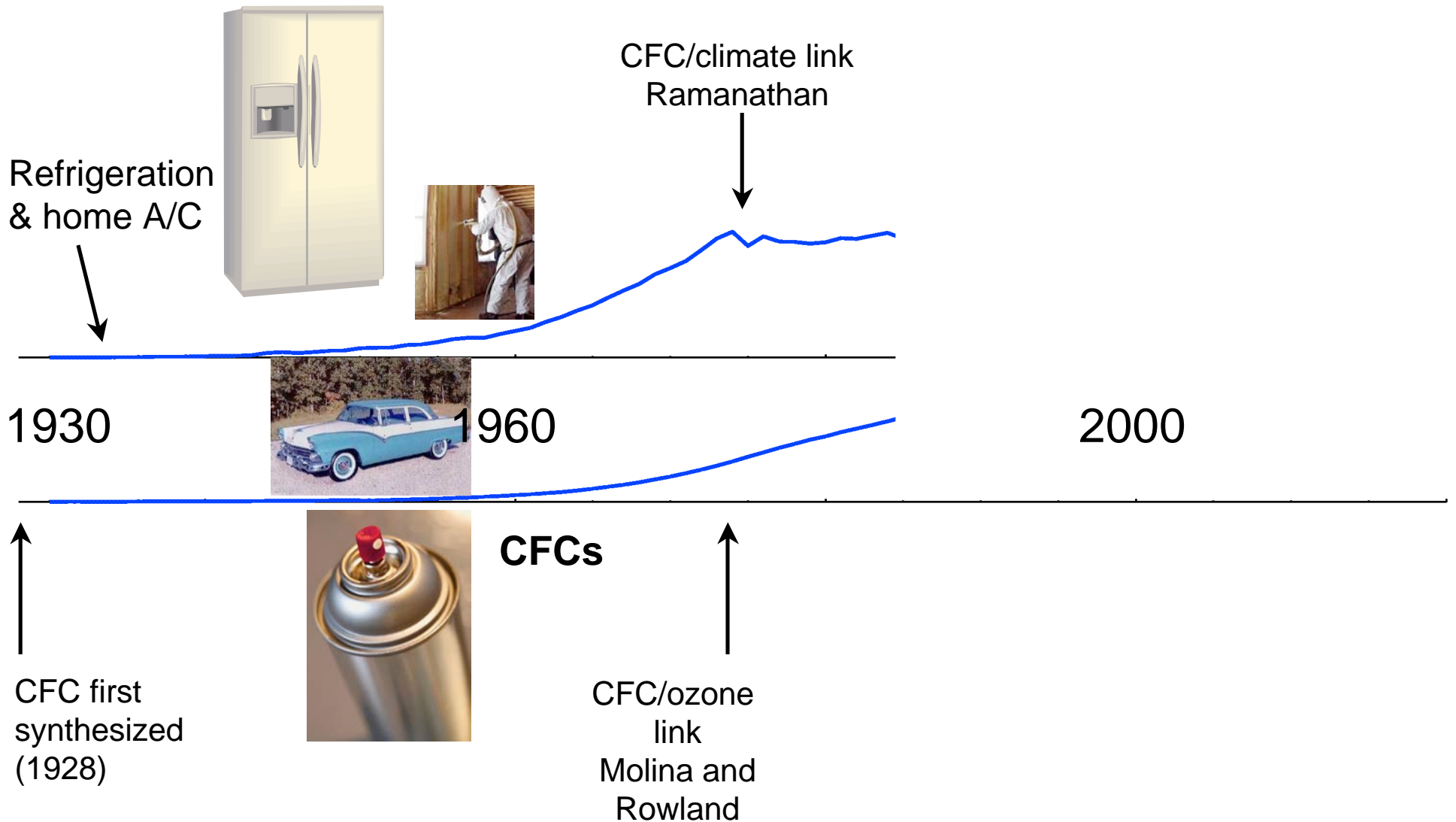
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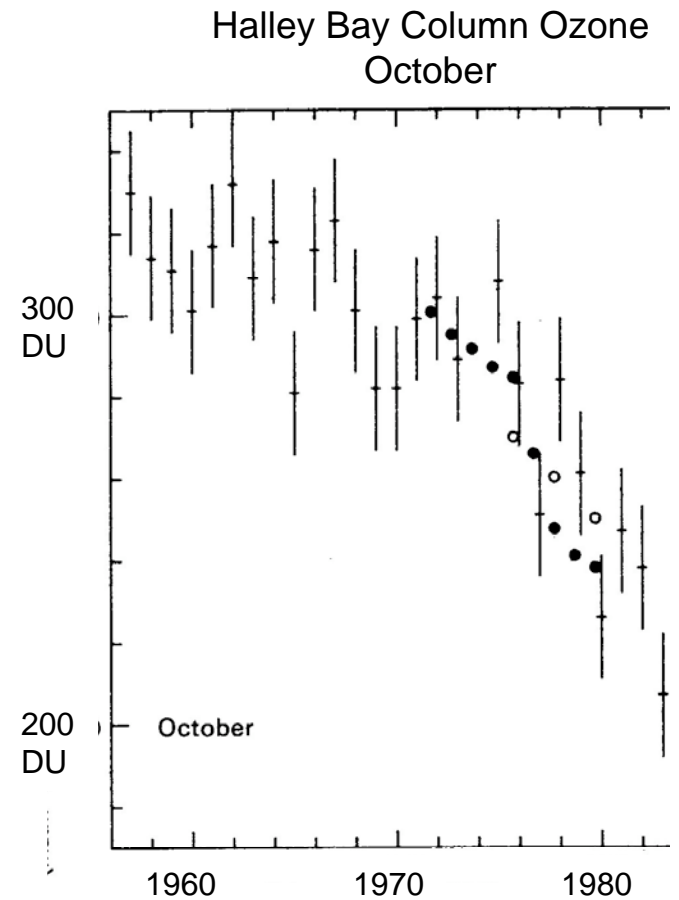
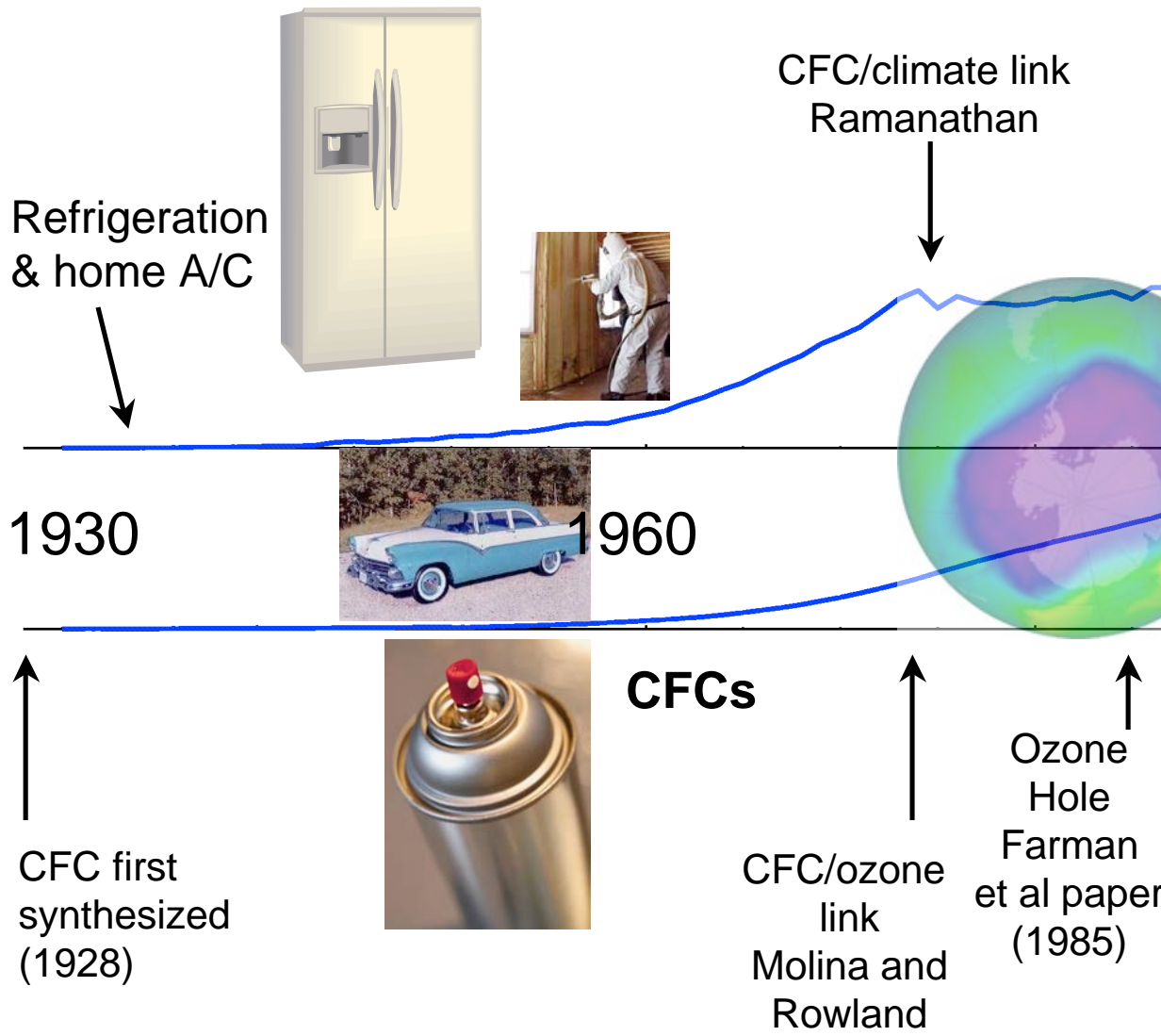
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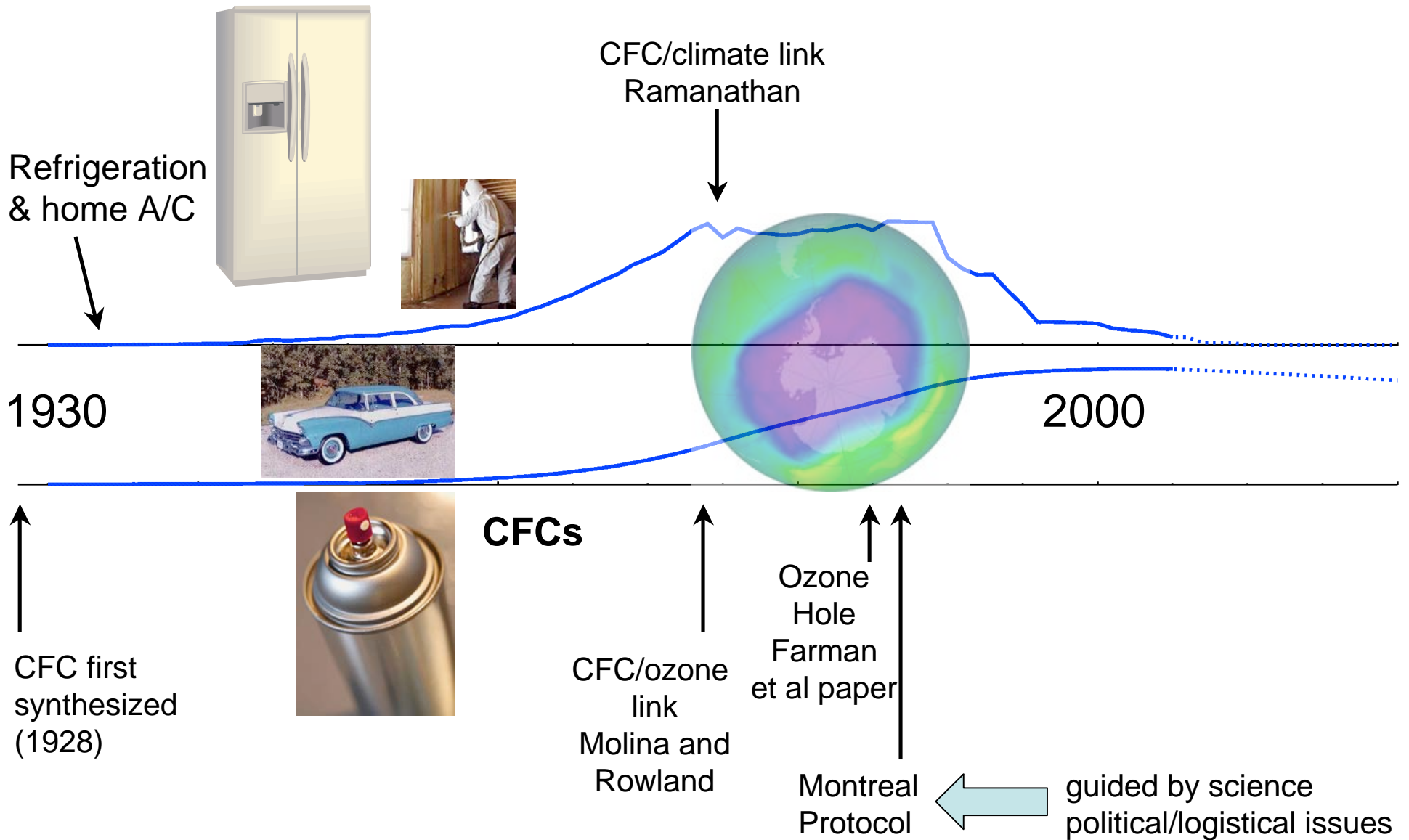
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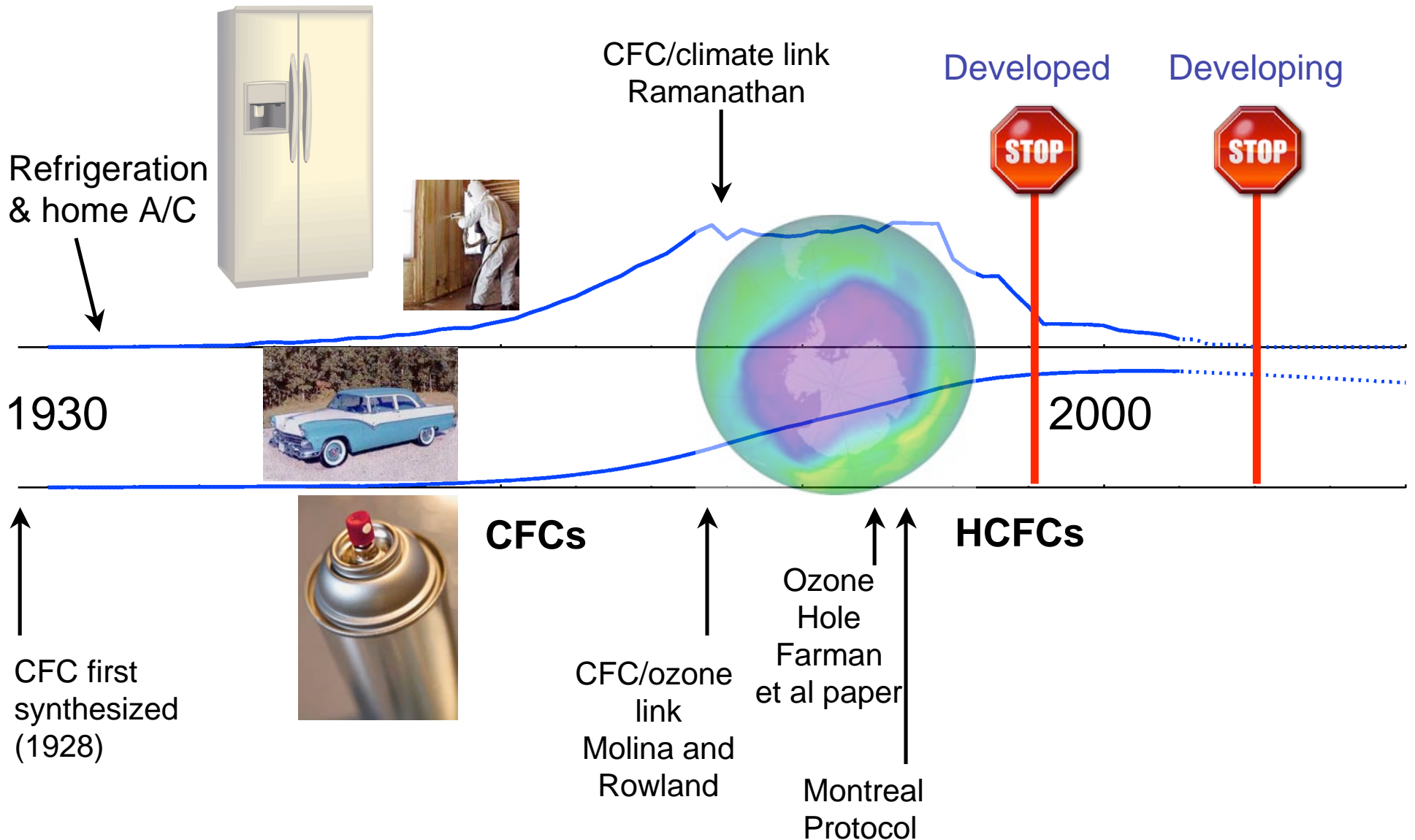
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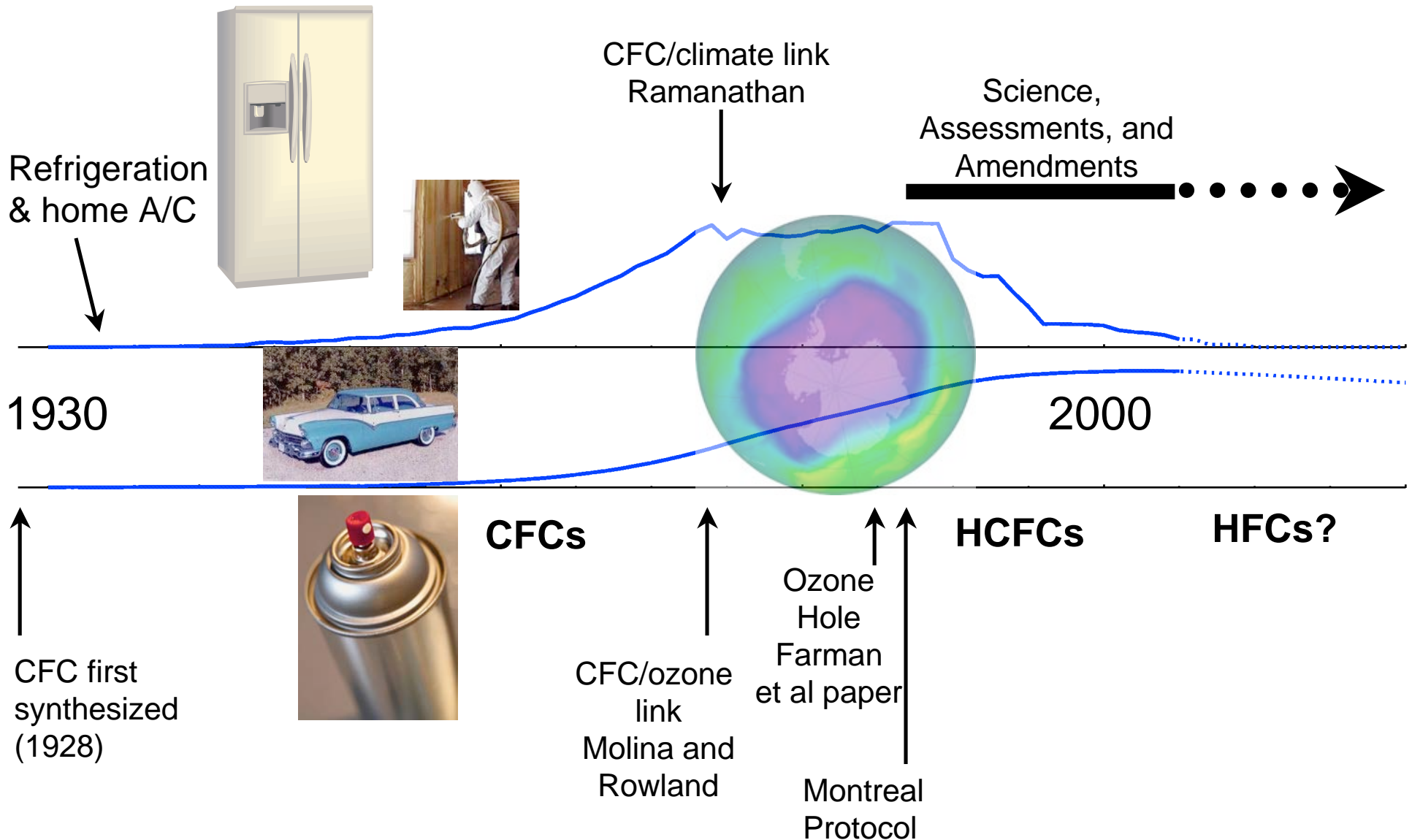
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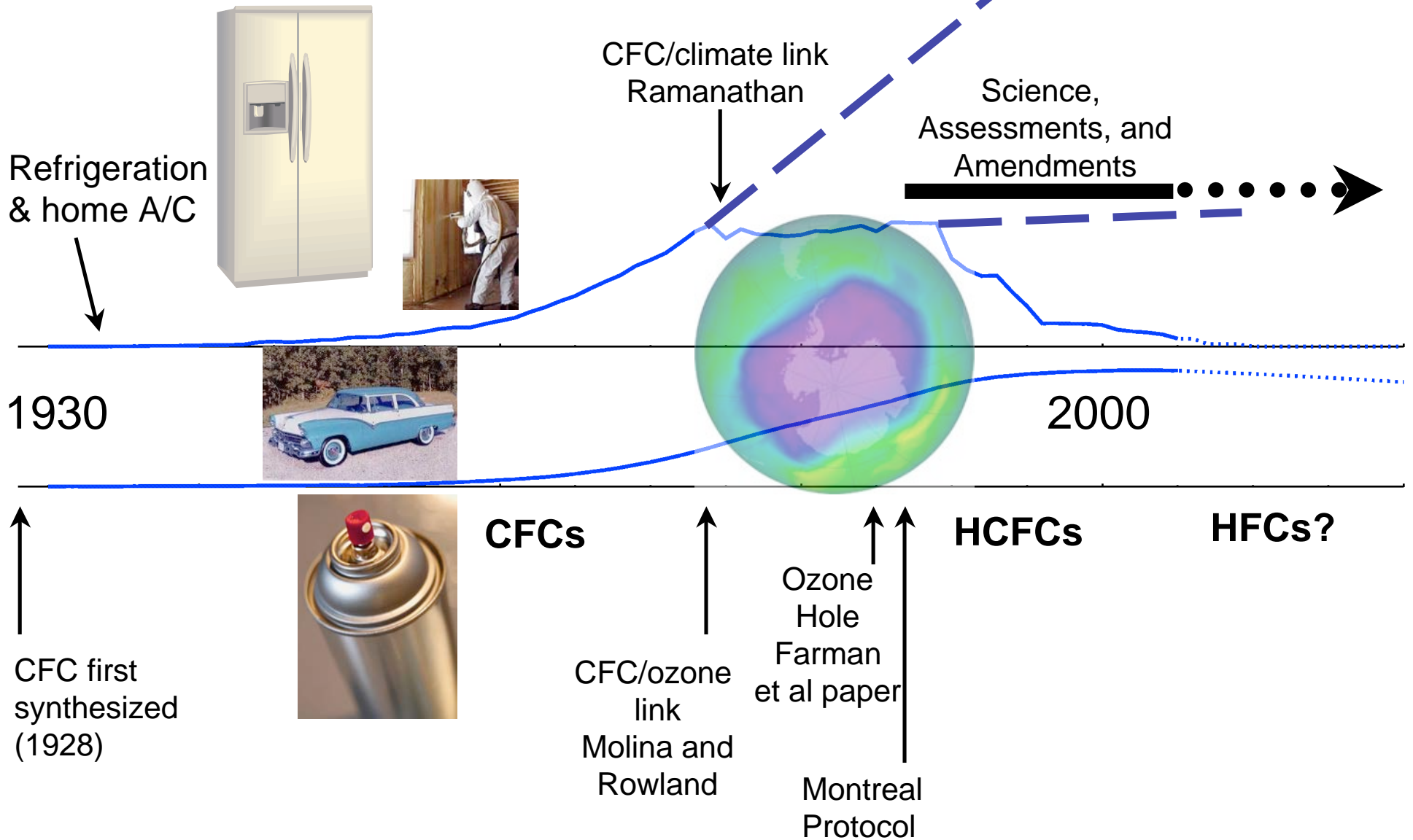
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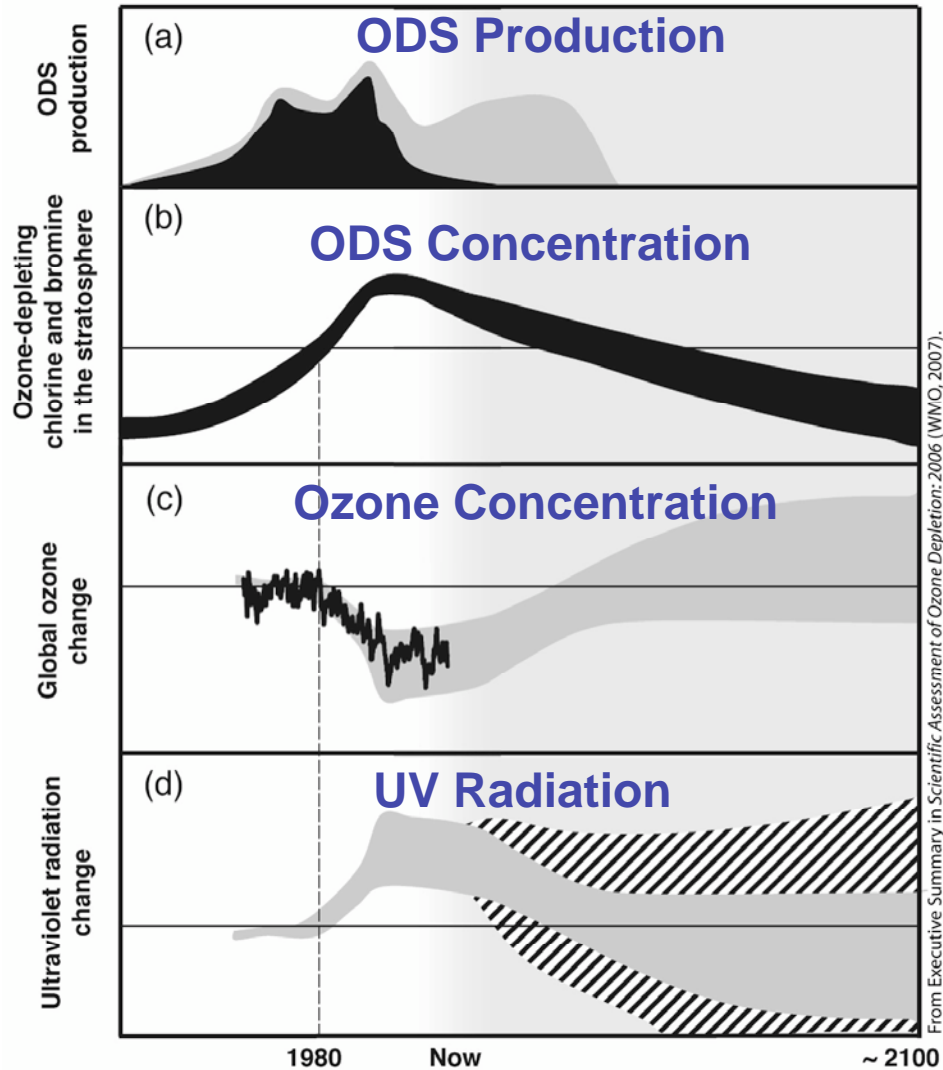
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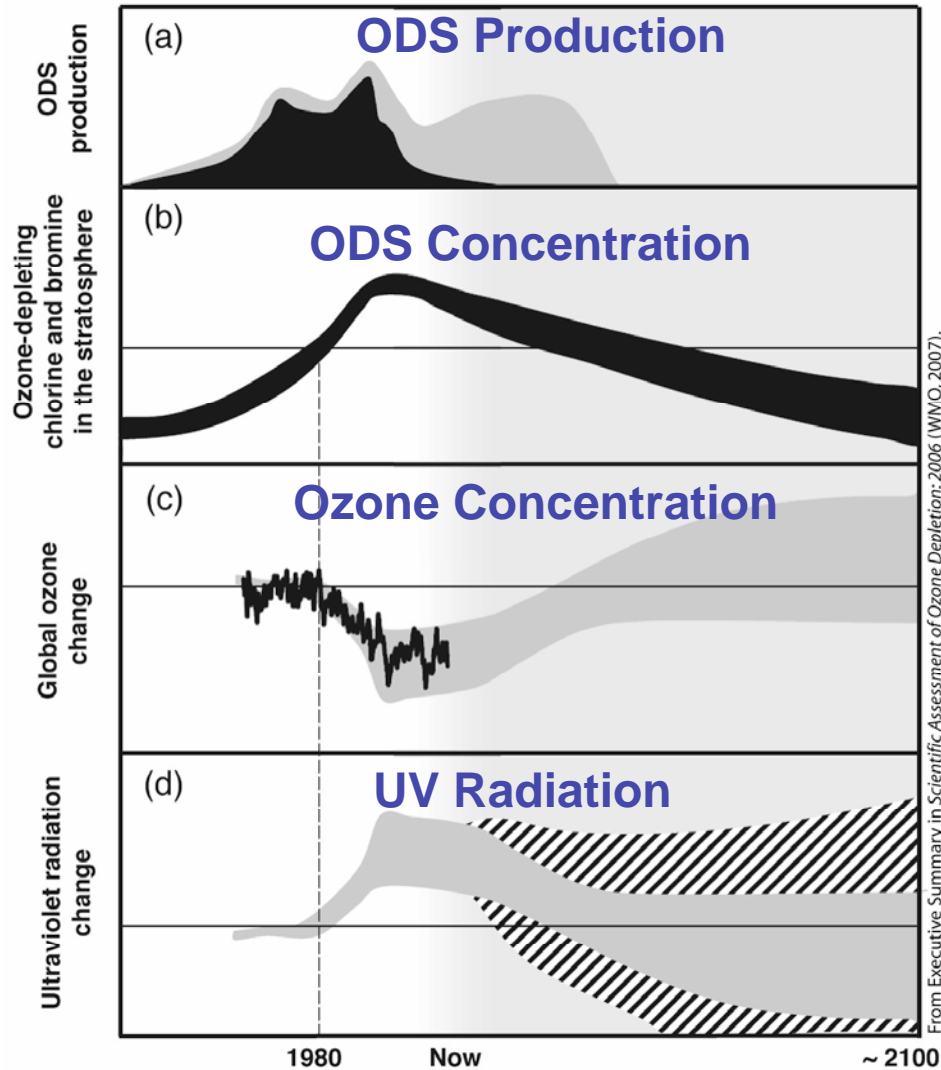
History of Ozone-Depleting Substances



ESRL's End-to-End Scientific Contributions



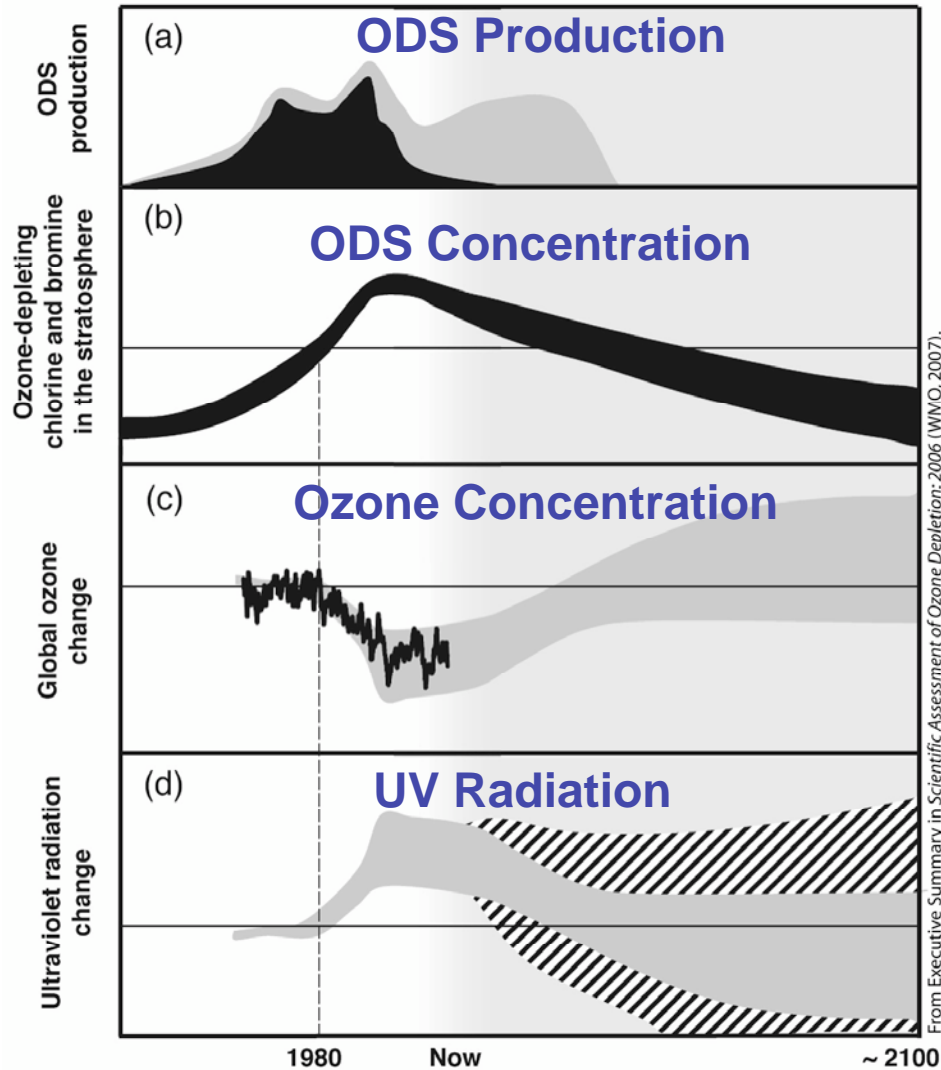
ESRL's End-to-End Scientific Contributions



Global & Regional emissions
Replacements
ODSs in equipment

Observations of ODSs
and replacements
Monitor recovery

ESRL's End-to-End Scientific Contributions



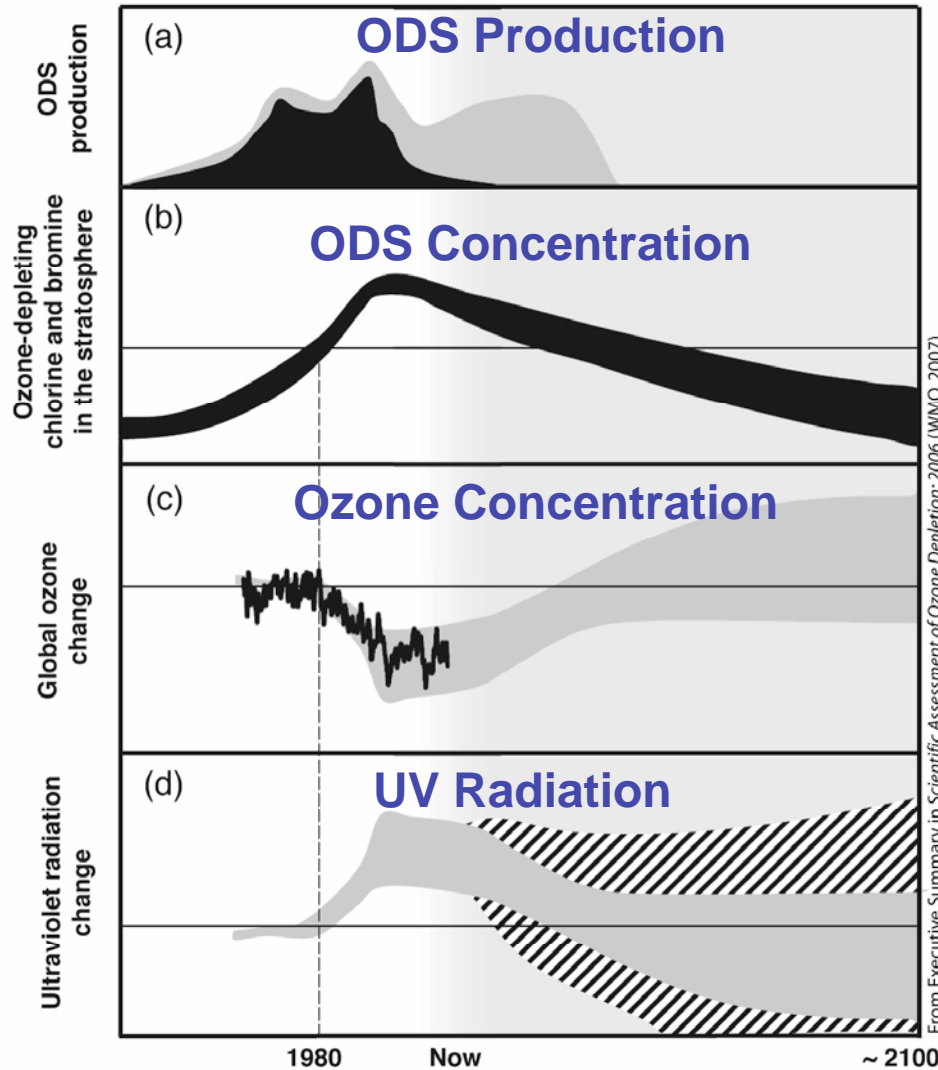
From Executive Summary in Scientific Assessment of Ozone Depletion: 2006 (WVCO, 2007).

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Ozone observations
Ozone/climate link

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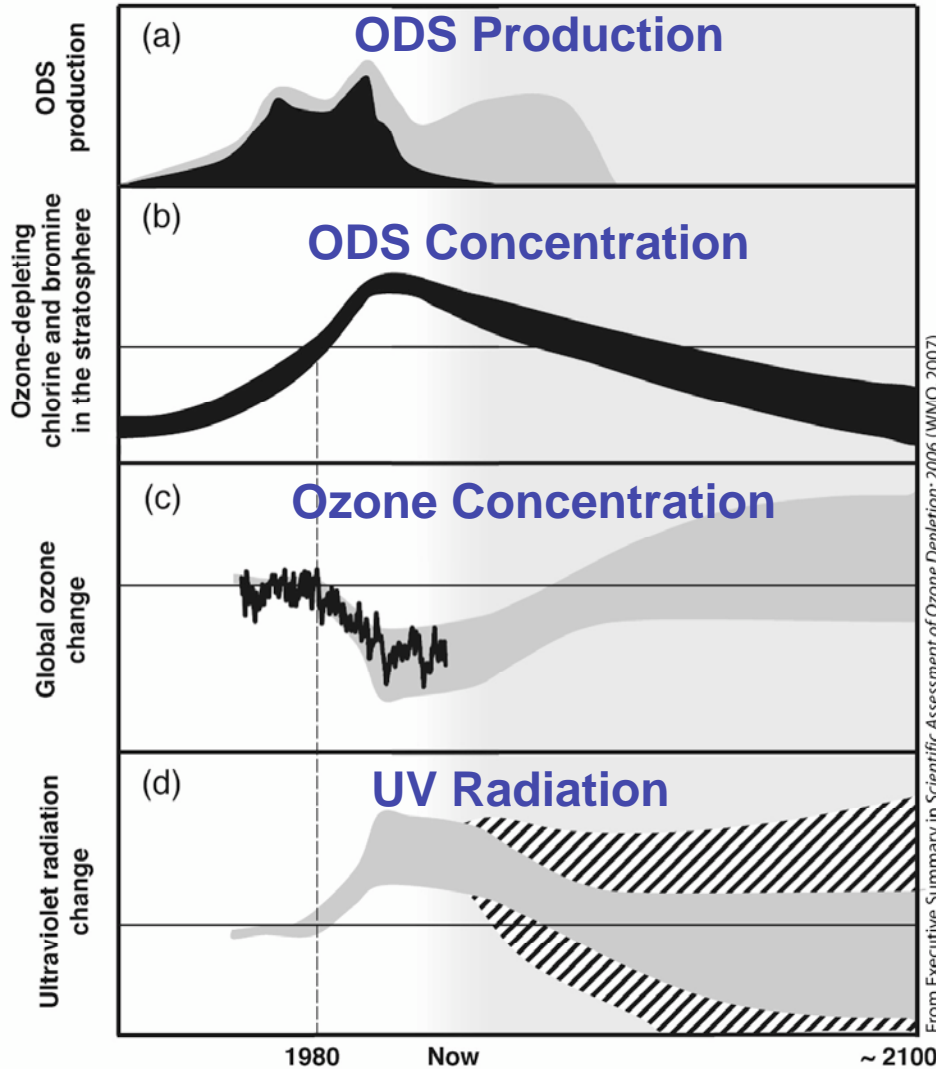
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UV observations
Calculations from ozone observation

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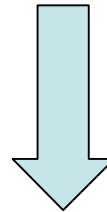
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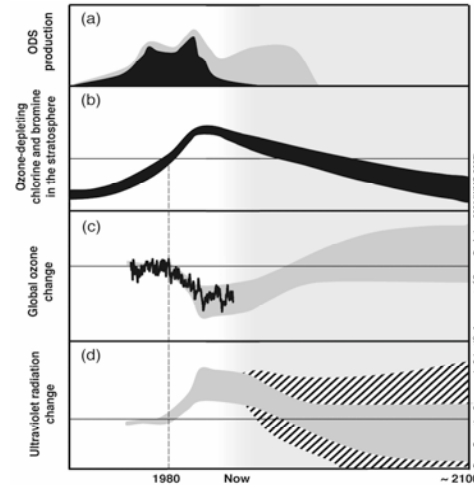
UV observations
 Calculations from ozone observation

Laboratory analysis
 Process studies
 Modeling



**Understanding
 Projections**

ESRL's End-to-End Scientific Contributions

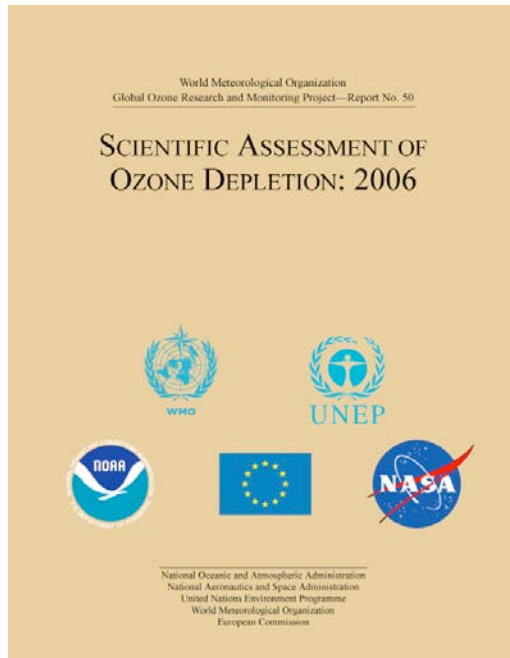


Observations of ODSs
Regional emissions
Bank analysis

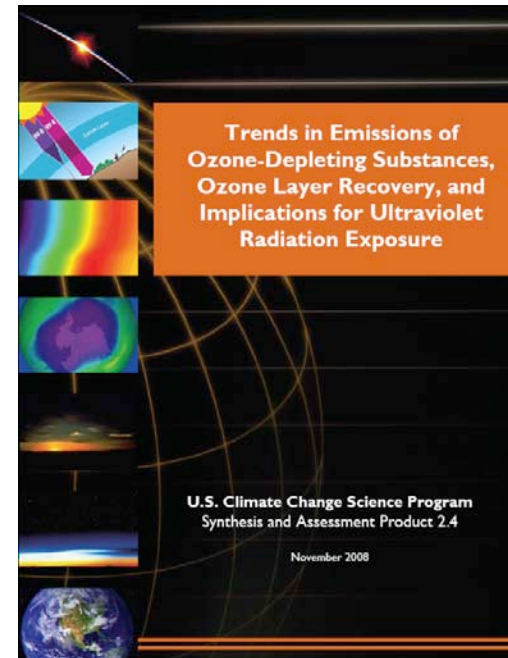
Laboratory analysis
Process studies

Ozone observations
Modeling
Recovery projections

UV observations
Calculations from ozone observation



Policy impact



First assessed
US focus

ESRL's Continuing Contributions

NOAA Mission: *“To understand and predict changes in Earth’s environment ... to meet our Nation’s economic, social, and environmental needs”*

- Ozone / climate link
- Accountability phase of Montreal Protocol
- Future involvement with assessments and projections
- Transitioning through HCFCs and the role of HFCs
- Gaps in scientific understanding of ozone depletion

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Important and exciting opportunities and responsibilities for ESRL



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- IV. Ozone Measurements Dave Hofmann (*GMD*)
- V. Ozone/Climate Interactions
Judith Perlwitz (*PSD*)
Susan Solomon (*CSD*)