Analysis of stratospheric ozone recovery

Are we seeing signs of ozone recovery?

CSD role: Major contributions to the WMO ozone assessment

- Construction of global ozone time series for model evaluations
- Leading role in international initiatives looking at stratospheric ozone data
- Increasing the fundamental understanding of ozone-climate interactions

- Ozone data for modeling
- Influence of dynamics on ozone recovery
- Changes in ozone depleting chemistry over time
- Searching for significant ozone increases globally

ESC: Ozone depleting substances

(Fahey & Hegglin, WMO Ozone Assessment, 20 Questions, 2011)
Global, zonal mean, monthly mean, gap-free ozone data set, based on observations

- Used as boundary conditions for climate models
- Studies about ozone depletion – climate change interactions

(Solomon et al., GRL, 2012)
(Bodeker et al., ESSD, 2013)
(Hassler et al., JGR, 2013)
(Young et al., GRL, 2014)

Expertise in providing global ozone data sets for different applications
How do atmospheric dynamics influence the detection of ozone recovery?

- Variability in ozone can be caused by atmospheric dynamics rather than chemistry
- Shift in polar vortex location over the last decades
- Total column ozone data from Antarctic stations

(Hassler et al., GRL, 2011, Figure 1a) (NASA, Ozone Hole Watch)

➢ Changes in atmospheric dynamics add a layer of complexity to the detection of ozone recovery
Can we use knowledge about ozone depletion chemistry to predict ozone recovery?

- High quality ozone soundings from South Pole station
- Determining ozone loss rates for different time periods
- Statistically significant changes in chemically driven ozone loss rates can be expected in ≈2020s

(Hassler et al., JGR, 2011, Figures 4 & Figure 8)
Is it possible to detect statistically significant ozone increases in global measurements?

- Analysis of different measurement systems for positive trends in the last decade
- Statistical methods still have limitations detecting ozone increase
- Results used to inform Ozone Research Managers at WMO in Geneva, 2014

Ozone trends [%/decade] for 35°N – 60°N
1979 - 1997
1998 - 2012

(Hassler et al., AMT, 2014)
(Tummon et al., ACP, 2015, accepted)
(Harris et al., submitted, 2015)

Detection of ozone increases still inconclusive

Future plan: Continuing the analyses of ozone time series for the detection of ozone recovery