



Supplement of

The return to 1980 stratospheric halogen levels: a moving target in ozone assessments from 2006 to 2022

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Table S1: Return to 1980 dates for mid-latitude EESC

| | Lickley et al. APCD (Engel et al., 2018 FRFs) | Given in Assessment |
|----------|--|------------------------------|
| WMO 1994 | | 2045 (page 13.13) |
| WMO 1998 | | 2048 (page 11.21) |
| WMO 2002 | | 2043.9 (page 1.69 & 1.70) |
| WMO 2006 | 2053.5 | 2048.9 (page 8.29) |
| WMO 2010 | 2056.9 | 2046.5 (page 5.17) |
| WMO 2014 | 2059.4 | 2047.6 (page 5.30) |
| WMO 2018 | 2061.9 | 2049.4 (page 6.36) |
| WMO 2022 | 2066 | 2066.0 (page 416) |

Table S2: Sources of incremental changes (in yrs) to EESC 1980 return date using Engel et al. (2018)

| | CFC-11 | CFC-12 | Halon-1301 | CCl ₄ | Other 12 | Total Change | EESC 1980 Return Date |
|--|--------|--------|------------|------------------|----------|--------------|-----------------------|
| 2006 Assessment Initial Return Date | | | | | | | |
| 2006 Assessment Initial Return Date Engel et al. | | | | | | | 2053.5 |
| Lifetime Update | +2.2 | +0.1 | +0.3 | +0.9 | | +3.4 | |
| Observed mole fractions since 2006 | -0.6 | +0.3 | +0.3 | +1.0 | | +1.0 | |
| Bank update | +1.8 | +0.8 | +1.4 | | | +3.9 | |
| Feedstock emissions | | | | +3.1 | | +3.1 | |
| Remaining gases | | | | | +1.2 | +1.2 | |
| Total updates by gas | +3.4 | +1.2 | +1.9 | +5.0 | +1.2 | +12.6 | 2066.1 |
| 2010 Assessment Initial Return Date | | | | | | | 2056.9 |
| Lifetime Update | +1.8 | +0.1 | +0.2 | +0.3 | | +2.6 | |
| Observed mole fractions since 2010 | -0.5 | +0.3 | +0.2 | +2.2 | | +2.2 | |
| Bank update | +2.0 | +0.8 | +0.9 | | | +3.7 | |
| Feedstock emissions | | | | +1.3 | | +1.3 | |
| Remaining gases | | | | | -0.5 | -0.5 | |
| Total updates by gas | +3.3 | +1.2 | +1.3 | +3.8 | -0.5 | +9.2 | 2066.1 |
| 2014 Assessment Initial Return Date | | | | | | | 2059.4 |
| Lifetime Update | 0 | 0 | 0 | +0.5 | | +0.5 | |
| Observed mole fractions since 2014 | -0.1 | +0.2 | 0 | +1.3 | | +1.3 | |
| Bank update | +2.2 | +0.7 | +0.7 | | | +3.5 | |
| Feedstock emissions | | | | +1.2 | | +1.2 | |
| Remaining gases | | | | | +0.1 | +0.1 | |
| Remaining Updates | +2.1 | +0.8 | +0.7 | +2.9 | +0.1 | +6.7 | 2066.1 |
| 2018 Assessment Initial Return Date | | | | | | | 2061.9 |
| Lifetime Update | 0 | 0 | 0 | -0.1 | | -0.1 | |
| Observed mole fractions since 2014 | 0 | +0.1 | 0 | +1.0 | | +1.1 | |
| Bank update | +2.3 | +0.7 | +0.7 | | | +3.7 | |
| Feedstock emissions | | | | -1.7 | | -1.7 | |
| Remaining gases | | | | | +1.2 | +1.2 | |
| Remaining Updates | +2.3 | +0.8 | +0.7 | -0.8 | +1.2 | +4.2 | 2066.1 |

Table S3: Atmospheric lifetimes (units of yr) for the 16 principal ODSs, given in each SAOD report

| | WMO 2006 | WMO 2010 | WMO 2014 | WMO 2018 | WMO 2022 |
|----------------------------------|----------|----------|----------|----------|----------|
| CFC-11 | 45 | 45 | 52 | 52 | 52 |
| CCl ₄ | 26 | 26 | 26 | 32 | 30 |
| halon-1301 | 65 | 65 | 72 | 72 | 72 |
| CFC-12 | 100 | 100 | 102 | 102 | 102 |
| CH ₃ Br | 0.7 | 0.8 | 0.8 | 0.8 | 0.8 |
| CFC-113 | 85 | 85 | 93 | 93 | 93 |
| halon-2402 | 20 | 20 | 20 | 28 | 28 |
| HCFC-142b | 17.9 | 17.2 | 18 | 18 | 17.1 |
| CH ₃ CCl ₃ | 5.0 | 5 | 5 | 5 | 5 |
| CFC-114 | 300 | 190 | 189 | 189 | 189 |
| CFC-115 | 1700 | 1020 | 540 | 540 | 540 |
| halon-1202 | 2.9 | 2.9 | 2.9 | 2.5 | 2.5 |
| halon-1211 | 16 | 16 | 16 | 16 | 16 |
| HCFC-141b | 9.3 | 9.2 | 9.4 | 9.4 | 8.81 |
| CH ₃ Cl | 1.0 | 1.0 | 0.9 | 0.9 | 0.9 |
| HCFC-22 | 12.0 | 11.9 | 11.9 | 11.9 | 11.6 |

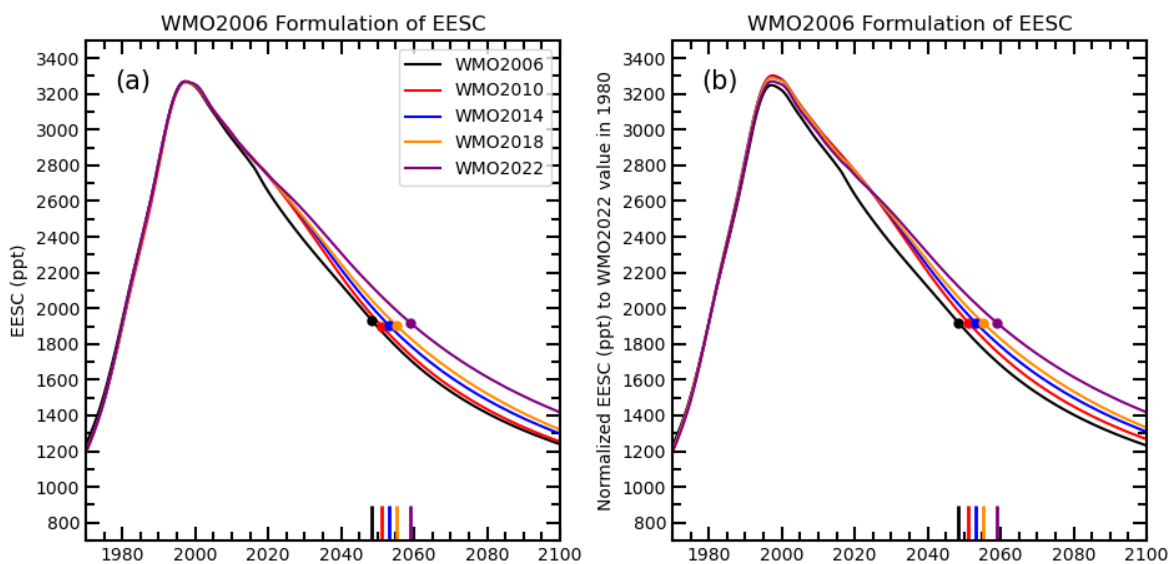


Figure S1: EESC calculation for each SAOD from 2006 to 2022 following the Daniel et al. (1995) formulation as it appears in the 2006 SAOD (WMO, 2006).