

1 **Perfluorocyclobutane (PFC-318, $c\text{-C}_4\text{F}_8$) in the global**
2 **atmosphere**

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Revised figures ONLY.

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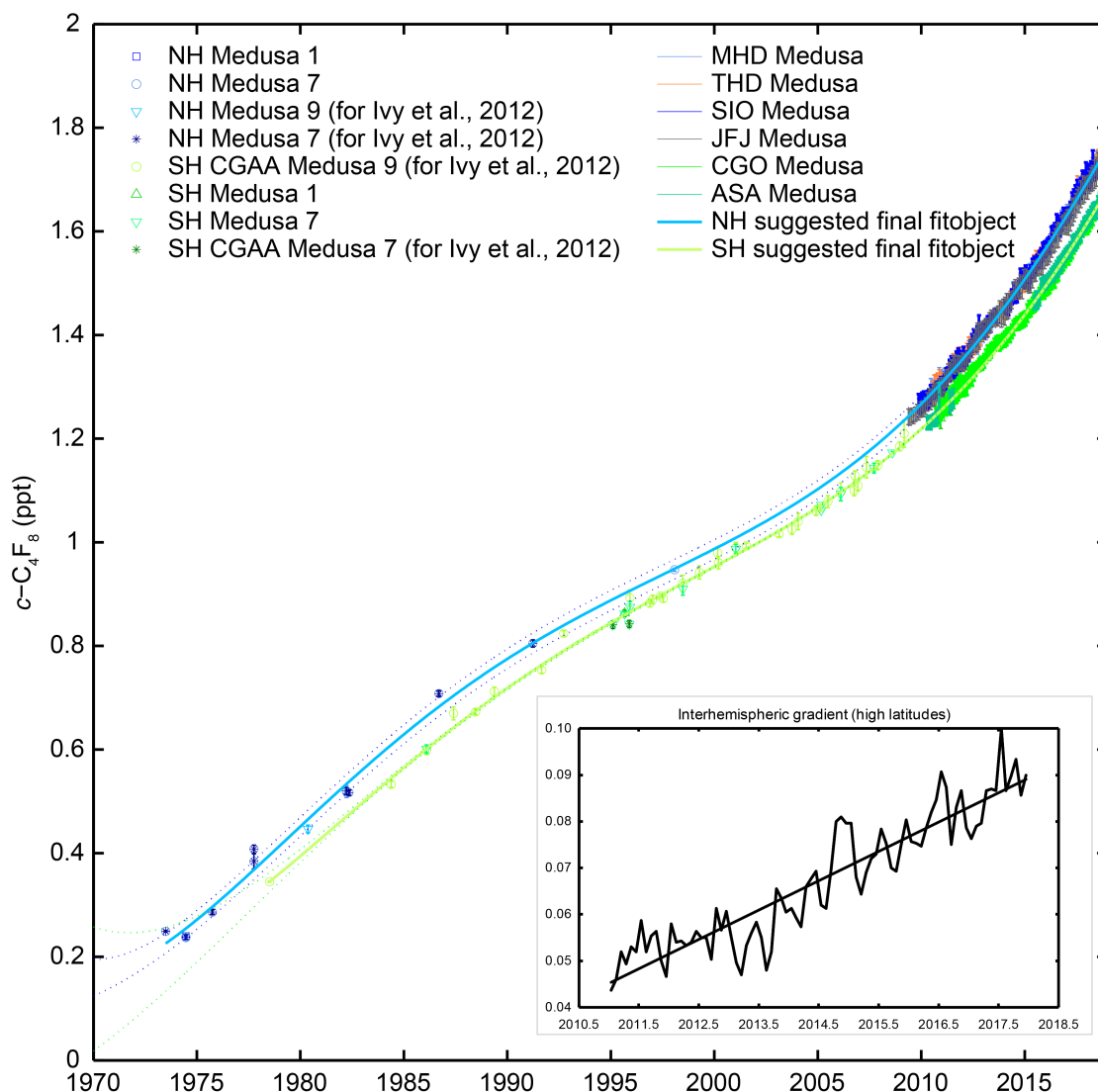


Figure 1. $c\text{-C}_4\text{F}_8$ mole fractions reconstructed from the late 1970s to 2018 from archived air samples and in situ measurements in both hemispheres. Cape Grim Air Archive (CGAA) and archived NH air samples are shown with symbols in shades of green and blue, respectively, reflecting different data subsets. For recent years, in situ measurements are shown as pollution removed monthly means for extra-tropical stations in the NH (MHD in light blue, THD in orange, SIO in darker blue, JFJ in grey) and in the SH (CGO in lighter green, ASA in pale green). Shown are the final data after an iterative filtering process described in the main text. The final suggested fits are shown as bold light green (SH) and bold light blue (NH) polynomial fits. Confidence bands (2σ) are shown as dotted lines. Results for the tropical stations, RPB and SMO, the Asian stations, GSN and SDZ, and the Arctic station, ZEP, are omitted here for clarity. For individual samples, error bars reflect measurement precisions. For monthly means, error bars represent standard deviations. The inset shows the interhemispheric gradient from in situ measurements at high latitudes (MHD, THD, SIO, and CGO) from 2011 to 2017

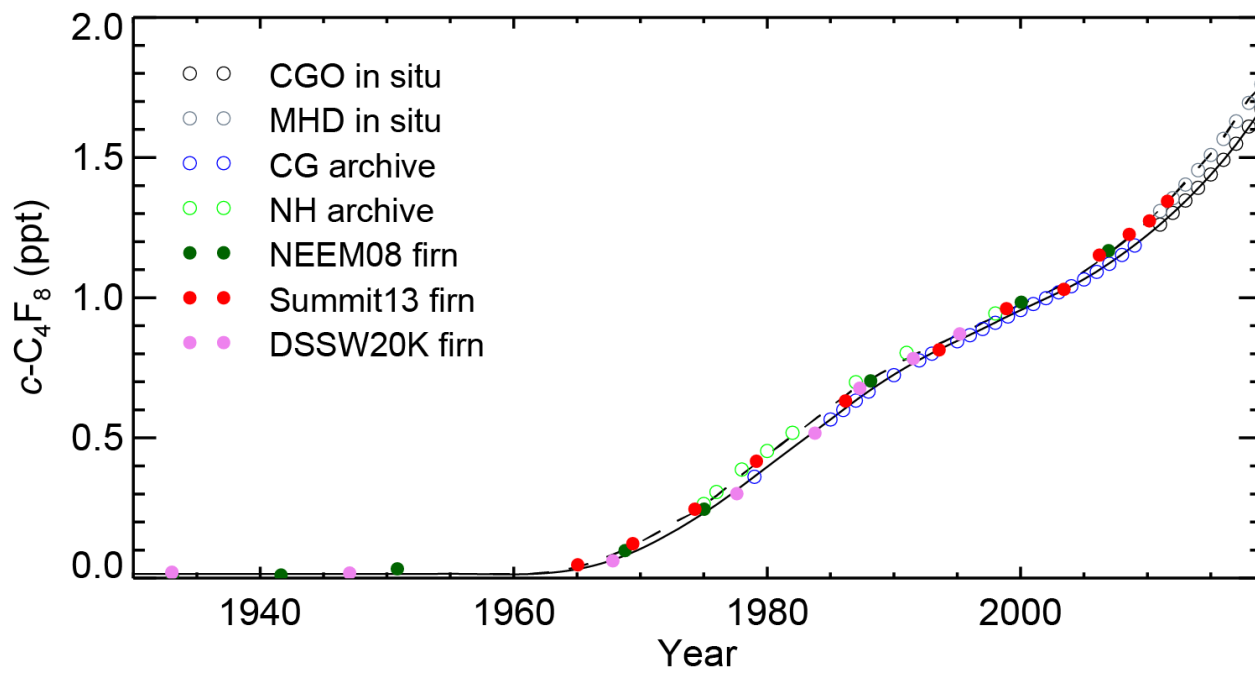


Figure 3. Historic atmospheric $c\text{-C}_4\text{F}_8$ mole fractions reconstructed for the extra-tropical Northern and Southern Hemispheres from air extracted from polar firn (full circles, NEEM08 in dark green, Summit13 in red, DSSW20K in

1273 pink, against mean or effective ages; SPO01 with mean age of ~1890 is not shown), annual values from spline fits to
1274 Cape Grim Air Archive (CG archive, open blue circles) and in situ measurements at Cape Grim (CGO, open black
1275 circles), archived air samples (NH archive, open green circles) and in situ measurements at Mace Head (MHD, open
1276 grey circles). Also shown are reconstructed abundances based on optimized emissions determined by the CSIRO
1277 inversion for the extra-tropical SH (black line) and NH (dashed black line).
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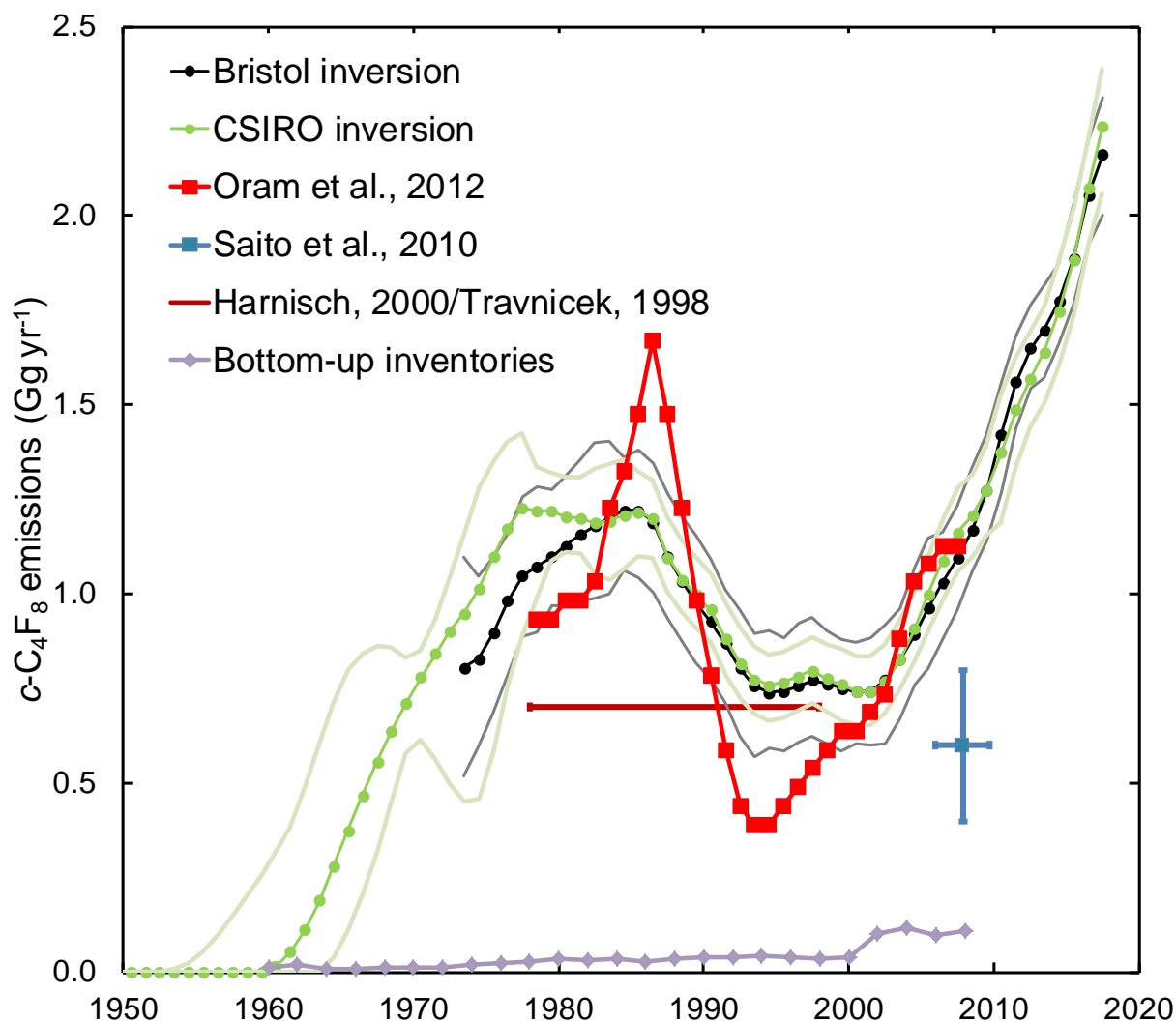


Figure 5. Global $c\text{-C}_4\text{F}_8$ emissions reconstructed by the CSIRO inversion (green dots and line, light green 2 σ uncertainty bands) from 1950 and by the Bristol inversion (black dots and line, grey 1 σ uncertainty bands) from the early 1970s to present. In situ and archive data are used in both inversions, while firn air data are only used in the CSIRO inversion. Emission estimates by Oram et al., 2012 (red), Saito et al., 2010 (blue), Harnisch, 2000/Travnicek, 1998 (brown) and from available bottom-up inventory information (grey) are shown for comparison.

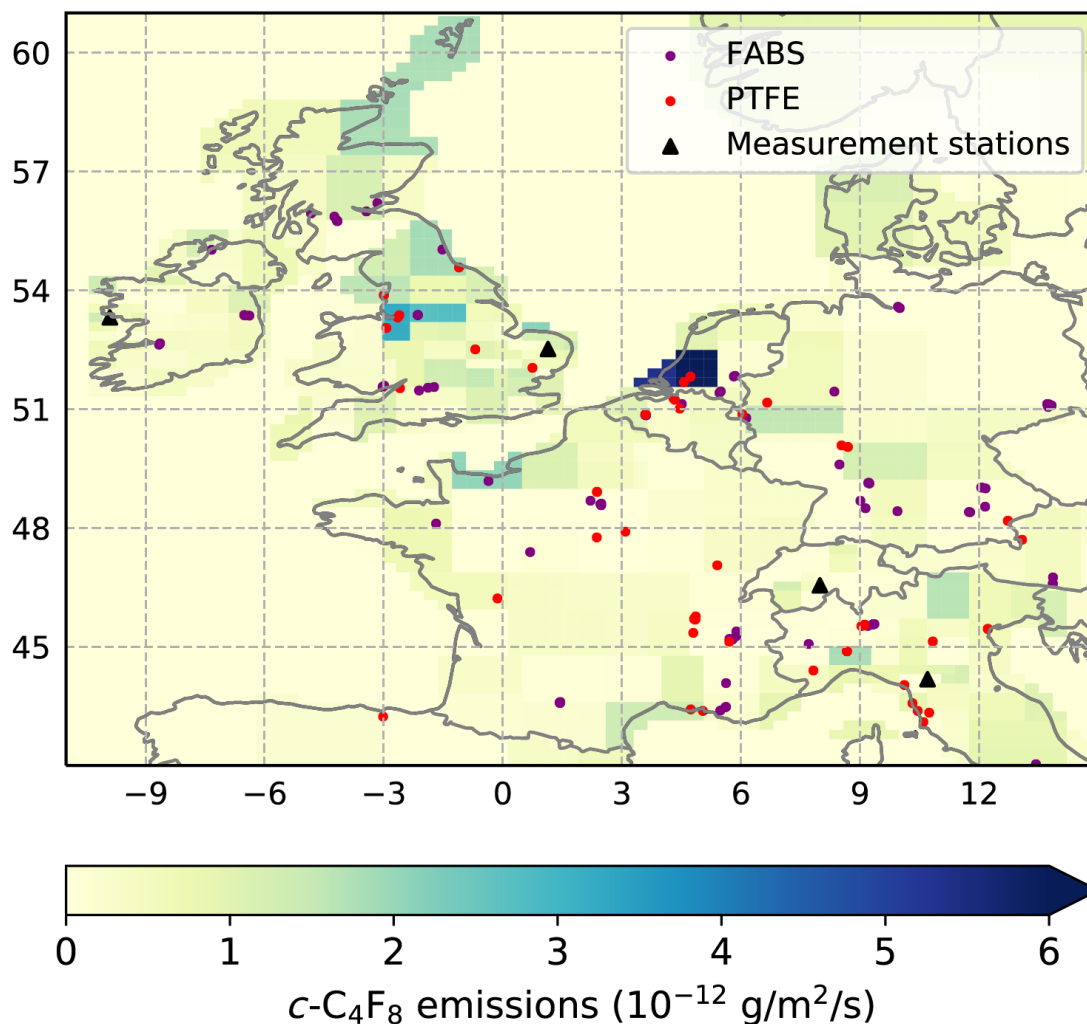


Figure 8. Mean $c\text{-C}_4\text{F}_8$ emission strength (shades of green and blue, $10^{-12} \text{ g m}^{-2} \text{ s}^{-1}$) in North Western Europe (42° N to 59° N and -11° E to 15° E) from 2013–2017 determined by the InTEM inversion from measurements at four sites (Mace Head, Ireland, Tacolneston, United Kingdom, Jungfraujoch, Switzerland, and Monte Cimone, Italy, black triangles). Also shown are potential industrial emitters of $c\text{-C}_4\text{F}_8$. Locations of potential TFE/HFP/PTFE/FEP production facilities (red dots) are based on company websites (3M, Chemours, Daikin, DuPont, Saint-Gobain, and Solvay) and are much less certain than the corresponding location information for eastern Asia. Also shown are semiconductor fabrication plants (purple dots, en.wikipedia.org/wiki/List_of_semiconductor_fabrication_plants, www.10stripe.com/featured/map/semiconductor-fabs.php, and other sources).