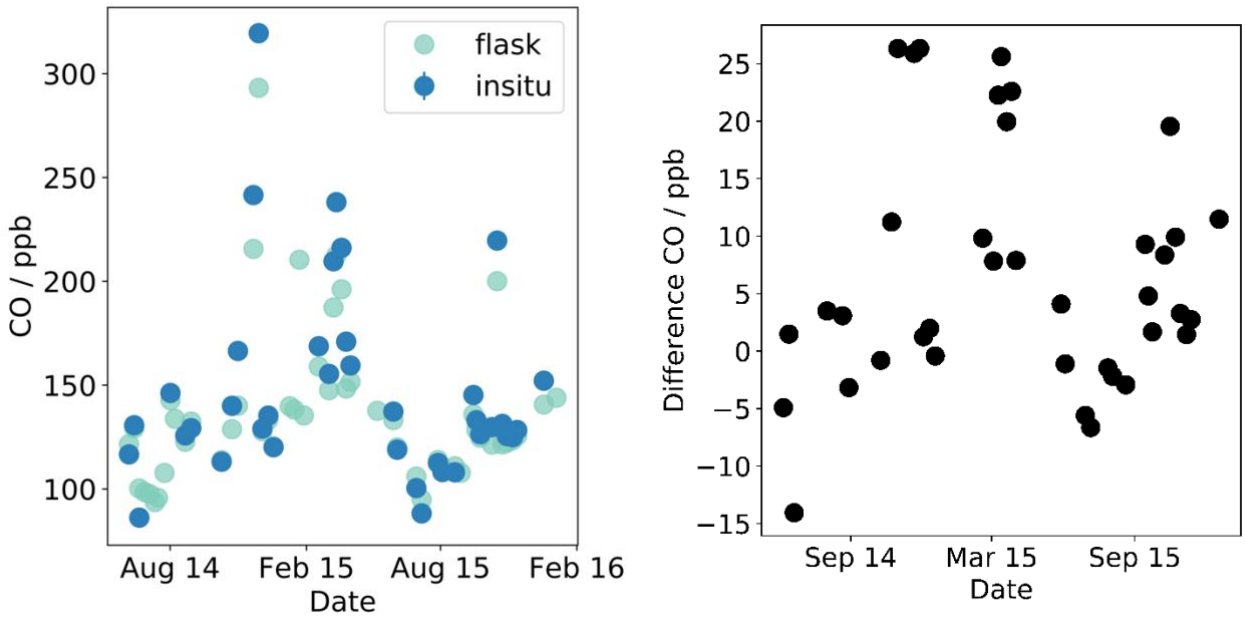
Supplementary material.

S.1. Comparison of TAC CO in situ observations (blue circles) on the CSIRO-98 scale with flask measurements (light green) on the WMO-2014 scale



S.2. Source sectors with sources and associated isotopic $\delta^{13}C$ and $\Delta^{14}C$ signatures with the source of information.

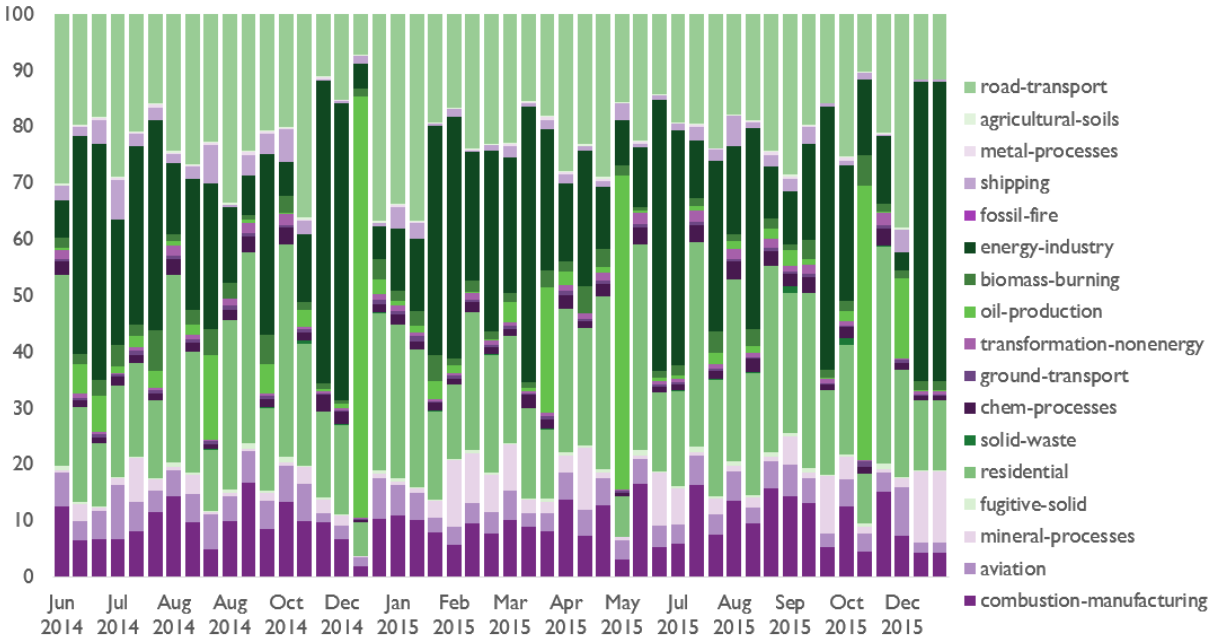
Sector	**$\delta^{13}C$ / ‰**	**$\Delta^{14}C$ / ‰**	**Comments**
Combustion manufacturing EDGAR 2010	-28.4 -31.4 to -25.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Aviation EDGAR 2010	-28.4 -31.4 to -25.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Mineral processes EDGAR 2010	0 -10 to 10	-1000 -1000 to -950	(Sharp, 2007) Mostly $CaCO_3$ from limestone
Fugitive solid EDGAR 2010	-24.1 -27.1 to -21.1	-1000 -1000 to -950	(Ciais et al., 1995) Coal
Residential EDGAR 2010	-44 -49 to -39	-1000 -1000 to -950	(Andres et al., 1994) Natural gas
Solid Waste EDGAR 2010	-40 -45 to -30	150 0 to 300	(Andres et al., 1994) $\delta^{13}C$: flaring, $\Delta^{14}C$: variable depends on the mean age
Chemical processes EDGAR 2010	-28.4 -31.4 to -25.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992

Ground Transport EDGAR 2010	-28.4 -31.4 to -25.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Non-energy transformation EDGAR 2010	-28.4 -31.4 to -25.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Oil Production EDGAR 2010	-28.4 -31.4 to -25.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Biomass burning EDGAR 2010	-24 -29 to -19	110 110 to 120	(Sharp, 2007) $\delta^{13}C$: C3 plants -33 to -23, $\Delta^{14}C$: average biomass
Energy industry EDGAR 2010	-28.4 -38.4 to -18.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Fossil fire EDGAR 2010	-28.4 -33.4 to -23.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Shipping EDGAR 2010	-28.4 -31.4 to -25.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Metal processes EDGAR 2010	-24.1 -27.1 to -21.1	-1000 -1000 to -950	(Andres et al., 1994) Coal
Agricultural Soils EDGAR 2010	-24 -29 to -19	110 80 to 140	(Sharp, 2007) $\delta^{13}C$: C3 plants -33 to -23
Road transport EDGAR 2010	-28.4 -31.4 to -25.4	-1000 -1000 to -950	(Ciais et al., 1995) Mean fossil 1990-1992
Net ecosystem exchange NASA-CASA	-24 -27 to -21	18 15 to 21	(Sharp, 2007) Climatology
Net ocean exchange (Takahashi et al., 2002)	0 -3 to 3	50 47 to 53	(Sharp, 2007), GLODAP V2 extrapolated climatology
Hetrotrophic respiration NASA-CASA	-24 -27 to -21	110 107 to 113	NASA CASA simulations available at: https://nacp-files.nacarbon.org/nacp-kawa-01/

S.3. Emissions from La Hague used for the nuclear correction for each month over the sample collection period. Monthly emissions are shown in Becquerels.

Month	Monthly emission / Bq	Month	Monthly emission / Bq	Month	Monthly emission / Bq
01/2014	0.548E+12	09/2014	1.207E+12	05/2015	1.989E+12
02/2014	2.386E+12	10/2014	1.300E+12	06/2015	1.318E+12
03/2014	2.389E+12	11/2014	2.204E+12	07/2015	2.063E+12
04/2014	2.600E+12	12/2014	1.248E+12	08/2015	2.056E+12
05/2014	2.739E+12	01/2015	0.984E+12	09/2015	1.67E+12
06/2014	2.048E+12	02/2015	1.197E+12	10/2015	6.55E+11
07/2014	1.401E+12	03/2015	1.527E+12	11/2015	1.73E+12
08/2014	1.882E+12	04/2015	2.069E+12	12/2015	2.14E+12

S.4. Modelled sector specific influence on each isotope sample taken during the experiment. Sectors are details in the key and are as follows, displayed from top to bottom: road transport, agricultural soils, metal processes, shipping, fossil fire, energy industry, biomass burning, oil production, transformation non-energy, ground transport, chemical processes, solid waste, residential, fugitive soils, mineral processes, aviation and combustion manufacturing.



S.5. CO_2 modelled at TAC using the EDGAR emissions inventory in NAME compared to CO_2 calculated using the observed CO at TAC minus the MHD background CO all divided by the CO factor (4.39 for all data without the November peak derived in Table 2) (green).