Table S1: Emissions Factors and Ratios from Literature

Source	**Type / Location**	**Reported values**	**Computed/Reported ER**
Primary data, convertible to OCS / CO and/or OCS / CO_2			
Akagi 2013	Extratropical Forest Prescribed Fires South Carolina Field Experiment	Ground-based (average values) 0.122 ± 0.187 g OCS / kg DM 1452 ± 130 g CO_2 / kg DM 173 ± 43 g CO / kg DM Airborne (average values) 0.01 ± 0.003 g OCS / kg DM 1675 ± 42 g CO_2 / kg DM 79 ± 19 g CO / kg DM	Ground-based 3.29×10^{-4} mol OCS / mol CO 6.16×10^{-5} mol OCS / mol CO_2 Airborne 5.91×10^{-5} mol OCS / mol CO 4.38×10^{-6} mol OCS / mol CO_2
Andreae 1996* [cited in Delmas 1995 as Andreae 1995b] Table 27.8 In *Biomass Burning and Global Change* v.1]	Tropical Savanna Ivory Coast Field Experiment (SAFARI 92)	0.01 mol OCS / 1000 mol CO_2 62 ± 10 mol CO / 1000 mol CO_2	1.61×10^{-4} mol OCS / mol CO 1×10^{-5} mol OCS / mol CO_2
Balachandran 2013	Temperate Forest (US)	Flaming: 0.0061 ± 0.0030 g OCS / kg DM 48.08 ± 35.02 g CO / kg DM 1425.14 ± 63.78 g CO_2 / kg DM Smoldering: 0.0088 ± 0.0003 g OCS / kg DM 133.30 ± 54.16 g CO / kg DM 1324.67 ± 88.28 g CO_2 / kg DM	Flaming: 5.92×10^{-5} mol OCS / mol CO 3.14×10^{-6} mol OCS / mol CO_2 Smoldering: 3.08×10^{-5} mol OCS / mol CO 4.87×10^{-6} mol OCS / mol CO_2 Andreae 2019 uses 60/40 flaming/smoldering average 0.00718 g OCS / kg DM 4.784×10^{-5} mol OCS / mol CO 3.832×10^{-6} mol OCS / mol CO
Bingemer 1992 **ONLY USED FOR CO_2**	Tropical Forest Northern Congo Field Experiment (DECAFE 88)	6.1 to 41 × 10^{-6} mol OCS / mol CO_2 6.1 from 150m vs free trop (3660m) 41 from 1370m vs free trop (3660m)	6.1 - 41 × 10^{-6} mol OCS / mol CO_2 Avg 2.355×10^{-5} mol OCS / mol CO_2

Blake 2008 Page 3 / Par 17	Boreal Forest Flight 9 (Newfoundland) Plume from Alaska (INTEX-NA) Field Experiment	12-20 × 10^{-6} mol OCS / mol CO_2 0.09 (0.07-0.11) × 10^{-3} mol OCS / mol CO (Correcting exponent in paper per correspondence with authors)	9 × 10^{-5} mol OCS / mol CO (7-11) 12-20 × 10^{-6} mol OCS / mol CO_2
Crutzen 1979 Table 2 Using Wild Basin Fire data only.	Extratropical forest Wild Basin, CO Forest Fire Field Experiment	15.8 × 10^{-6} mol OCS / mol CO_2 (range 5.4 - 28.6) 19.9 mol CO / 100 mol CO_2 (range 15.8 - 25.1)	7.94 × 10^{-5} mol OCS / mol CO Based on Wild Basin Fire 1.13 × 10^{-4} mol OCS / mol CO Using average CO value 15.8 × 10^{-6} mol OCS / mol CO_2 (range 5.4 - 28.6)
Crutzen 1985 Using arithmetic means	Tropical Forest / Grass Amazon / Brazil Field Experiment [Canned samples]	Geometric Mean: 4.7 × 10^{-6} mol OCS / mol CO_2 Range: 1.5 - 15 × 10^{-6} Arithmetic Mean: 8.2 × 10^{-6} Arithmetic SD: 7.5 × 10^{-6} Thornton lists the OCS/CO_2 range as well as the reported arithmetic mean. Geometric Mean: 0.121 mol CO / mol CO_2 Range: 0.06 - 0.24 Arithmetic Mean: 0.154 Arithmetic SD: 0.1 Text later averages arithmetic and geometric means for N_2O	Dividing arithmetic means: 5.32 × 10^{-5} mol OCS / mol CO 8.2 × 10^{-6} (1.5 - 15) mol OCS / mol CO_2
Friedli 2001 Using temperate composite for this category	Temperate Forest "Temperate Composite" 2 CO, 2 MT fires Field Experiment	Table 1: 0.123 × 10^{-3} mol OCS / mol CO for "temperate composite" Table 12: Reports 125 × 10^{-6} mol OCS/mol CO for temperate, as well as global total emission of 36.25 × 10^{9} g OCS / yr based on CO total in Koppmann 1997 Table 5; (extratropical forest CO emission of 58 Tg C / yr).	1.23 × 10^{-4} mol OCS / mol CO for "temperate composite"
Friedli 2001 Using CA sage scrub for this category	Grassland 1 CA fire Riversidean Sage Scrub Field Experiment	Table 1: 0.090 × 10^{-3} mol OCS / mol CO for CA fire	9.0 × 10^{-5} mol OCS / mol CO for CA fire

Lacaux 1993 [in *Fire and the Environment*] Same values in Lacaux 1995 (which was cited in Delmas 1995)	Tropical Savanna Ivory Coast / Africa Field Experiment (FOS-DECAFE 91)	1.7×10^{-6} mol OCS / mol CO_2 $0.02\text{-}0.04 \times 10^{6}$ tons OCS in Africa $0.04\text{-}0.06 \times 10^{6}$ tons OCS global 61×10^{-3} mol CO / mol CO_2 $29\text{-}56 \times 10^{6}$ tons CO in Africa $56\text{-}83 \times 10^{6}$ tons CO global	2.79×10^{-5} mol OCS / mol CO 1.7×10^{-6} mol OCS / mol CO_2
Liu 2017 Only using Rim Fire data	Extratropical Forest Rim Fire, CA Field Experiment	$5.9 \pm 0.9 \times 10^{-3}$ g OCS / kg DM 78.7 (4.0) g CO / kg DM [Rim Fire only] 1478 (11) g CO_2 / kg DM [Rim Fire only]	3.50×10^{-5} mol OCS / mol CO 2.93×10^{-6} mol OCS / mol CO_2
Meinardi 2003 Paragraph 10 ONLY USING FOR CO	Australian brush fire Ground samples Field experiment (BIBLE-B)	5.4×10^{-5} mol OCS / mol CO OCS observed only during smoldering	5.4×10^{-5} mol OCS / mol CO "No significant correlation with CO_2"
Nguyen 1994 Table 3 Using avg of wet and dry season values	Agriculture / Tropical Forest Vietnam Field Experiment	Dry season rice straw $37.4 \pm 41.1 \times 10^{-6}$ OCS/CO_2 0.13 ± 0.10 CO/CO_2 Wet Season Rice Straw $78.2 \pm 31.4 \times 10^{-6}$ OCS/CO_2 0.28 ± 0.11 CO/CO_2 [Exponents are shifted in the table header. Compare to text.]	Dry season 2.87×10^{-4} mol OCS / mol CO $37.4 \pm 41.1 \times 10^{-6}$ OCS/CO_2 Wet season 2.79×10^{-4} mol OCS / mol CO $78.2 \pm 31.4 \times 10^{-6}$ OCS/CO_2
Nguyen 1995	Savanna Ivory Coast Field Experiment	Table 2: Mean: $11.4 \pm 15.1 \times 10^{-6}$ mol OCS / CO_2 Range: $3 - 61 \times 10^{-6}$ mol OCS / CO_2 Also provides estimates for Vietnam rice (mean 3.2, range 1.2 to 4.9) and two lab experiments of savanna plants (14.3 and 2.0) Figure 2: 8.5×10^{-5} mol OCS / mol CO	8.5×10^{-5} mol OCS / mol CO 11.4×10^{-6} mol OCS / mol CO_2
Simpson 2011	Boreal Forest Canada FIeld Experiment (ARCTAS 2008)	$(0.12 \pm 0.02) \times 10^{-3}$ mol OCS / mol CO 0.029 ± 0.007 g OCS / kg DM 0.11 ± 0.07 mol CO / mol CO_2	$(1.2 \pm 0.2) \times 10^{-4}$ mol OCS / mol CO 1.32×10^{-5} mol OCS / mol CO_2

		113 ± 72 g CO / kg DM 1616 ± 180 g CO_2 / kg DM Total boreal 41 ± 26 Tg CO / yr Total boreal 10.5 ± 2.5 Gg OCS / yr	
Stockwell 2016a	Ag Residue (Table S9) (also includes garbage and cooking) (NAMaSTE)	OCS: 4.93×10^{-2} (3.47×10^{-2}) g OCS / kg DM CO: 72.3 (23.9) g CO / kg DM CO_2: 1401 (68) g CO_2 / kg DM	3.18×10^{-4} mol OCS / mol CO 2.58×10^{-5} mol OCS / mol CO_2
Stockwell 2016b	Tropical Peat Indonesia El Niño year 35 plumes	0.110 (0.036) g OCS / kg DM 291 (49) g CO / kg DM 1564 (77) g CO_2 / kg DM	1.76×10^{-4} mol OCS / mol CO 5.16×10^{-5} mol OCS / mol CO_2
Tereszchuk 2011	Tropical Forest Amazon Plume Table 1	3.3×10^{-4} mol OCS / mol CO	3.3×10^{-4} mol OCS / mol CO
Tereszchuk 2011	Tropical Forest Congo Plume Table 1	8×10^{-5} mol OCS / mol CO	8×10^{-5} mol OCS / mol CO
Tereszchuk 2011	Savanna Northern Australia Plume Table 1	2×10^{-4} mol OCS / mol CO	2×10^{-4} mol OCS / mol CO
Tereszchuk 2011	Boreal Forest Canada Plume Table 1	2.1×10^{-4} mol OCS / mol CO	2.1×10^{-4} mol OCS / mol CO
Thornton 1996 Table 3 / Page 1878 Text / Page 1875 **ONLY USING FOR CO_2**	Tropical Forest 2 plumes sampled over Pacific Field Experiments (PEM West-A)	13×10^{-6} mol OCS / mol CO_2	13×10^{-6} mol OCS / mol CO_2
Yokelson 1997 Table 1 Only using	Boreal Peat MN and AK Lab Experiments	Minnesota: 493.7 g C / kg dm 0.127 mol OCS / 100 mol C 15.2 mol CO / 100 mol C	MN: 8.36×10^{-3} mol OCS / mol CO 1.62×10^{-3} mol OCS / mol CO_2

Alaska peat value in average.		78.5 mol CO_2 / 100 mol C Alaska: [no estimate of C/DM] 0.005 mol OCS / 100 mol C 21.1 mol CO / 100 mol C 75.6 mol CO_2 / 100 mol C MN C x MN OCS 3.13 g OCS / kg DM MN C x AK OCS 0.12 g OCS / kg DM Average (1.62) and range (3.01) used in “boreal peat” component of Akagi 2011’s factors.	AK: 2.37×10^{-4} mol OCS / mol CO 6.61×10^{-5} mol OCS / mol CO_2
Yokelson 2007 [cited in Yokelson 2008] . Only using same-flight CO and CO_2 data.	Tropical Forest One planned fire / Brazil Field Experiment (TROFFEE 2004)	0.0247 g OCS / kg DM 59.91 g CO / kg DM (same fire/flight) 101.41 ± 23.78 g CO / kg DM (average) 1679 g CO_2 / kg DM (same fire/flight) 1615 ± 40 g CO_2 / kg DM (average) Yokelson 2008 also scales this up to an Amazon total of 0.0119 Tg (240 Tg DM), global total of 0.0329 Tg (1330 Tg DM)	1.92×10^{-4} mol OCS / mol CO (using same-flight CO) 1.08×10^{-5} mol OCS / mol CO_2 (using same-flight CO_2) 1.14×10^{-4} mol OCS / mol CO (using average CO) 1.12×10^{-5} mol OCS / mol CO_2 (using average CO_2)
Primary data excluded from analysis			
Blake 2004	Asian Anthropogenic and Biomass burning Field experiment (TRACE-P 2001) Note: these seem to include biofuel and other sources	Table 2 22 (7 - 46) $\times 10^{-6}$ mol OCS / CO_2 0.75 (0.35 - 0.96) $\times 10^{-3}$ mol OCS / CO Also provides global BMB OCS totals from Watts 2000 (70Gg), Khalil 1984 (200 Gg) and Chin 1993 (140 Gg)	Excluded from analysis because signal includes biofuels.
Blake / Simpson FLAME4 Data	Canadian / Indonesian Peat Flight / field	Canadian Peat OCS / CO = 1.36×10^{-4} OCS / CO_2 = 3.32×10^{-5} CO / CO_2 = 0.245	Excluded from analysis because only one or two samples are available.

Personal communication with Isobel Simpson	measurement	Indonesian peat: OCS / CO = 9.68×10^{-6} OCS / CO_2 = 2.79×10^{-6} CO / CO_2 = 0.288	
Nguyen 1990 Cited in Chin 1993 and Akeredolu 1991	Savanna / forest Ivory Coast / Nigeria Field Experiment	3 - 20 × 10^{-6} mol OCS / mol CO_2 Reported in Chin 1993 10.08×10^{-6} mol OCS / mol CO_2 5.4×10^{-4} Tg OCS (savanna) 2.5×10^{-4} Tg OCS (forest) Reported in Akeredolu 1991	Excluded from analysis -- Data included in Nguyen 1995
Yokelson 1997 Table 3 [cited in Yokelson 1999 and Goode 2000]	Average Lab Experiments	0.04 mol OCS / 100 mol CO	4×10^{-4} mol OCS / mol CO
Zhuang 1996 [T 71.3] [In *Biomass Burning and Global Change* v.2]	Crop Residue China Lab Experiment	Maize: 2.75 ± 0.23 g OCS / ton (n=7) Rice: 1.80 ± 0.12 g OCS / ton (n=9) Wheat: 2.05 ± 0.19 g OCS / ton (n=7)	Excluded from analysis -- no CO or CO_2 relationship available.
Summary papers, some with OCS vs. CO comparison			
Akagi 2011	SUMMARY	g OCS / kg DM Tropical: 0.025 Savanna: - Crop: - Pasture: - Boreal: 0.46 (0.47) Temperate: - Extratropical: 0.46 (0.47) Peatland: 1.20 (2.21) g CO / kg DM Tropical: 93 (27) Savanna: 63 (17) Crop: 102 (33) Pasture: 135 (38) Boreal: 127 (45) Temperate: 89 (32) Extratropical: 122 (44) Peatland: 182 (60) g CO_2 / kg DM	mol OCS / mol CO Tropical: 1.25×10^{-4} Boreal: 1.69×10^{-3} Extratropical: 1.76×10^{-3} Peatland: 3.08×10^{-3} mol OCS / mol CO_2 Tropical: 1.12×10^{-5} Boreal: 2.27×10^{-4} Extratropical: 2.24×10^{-4} Peatland: 5.6×10^{-4}

		Tropical: 1643 (58) Savanna: 1686 (38) Crop: 1585 (100) Pasture: 1548 (142) Boreal: 1489 (121) Temperate: 1637 (71) Extratropical: 1509 (98) Peatland: 1563 (65)	
Akeredolu 1991 Citing Nguyen 1990 [in *Global Biomass Burning*]	SUMMARY Tropical Savanna / Forest Nigeria	0.1 mol CO / mol CO_2 based on Greenberg 1984 and Crutzen 1989 2.4 Tg CO (savanna) 1.1 Tg CO (forest)	1.08×10^{-4} mol OCS / mol CO Using OCS value from Nguyen 1990 and CO value from Greenberg and/or Crutzen
Andreae 1991 [in *Global Biomass Burning*]	SUMMARY	OCS 0.01×10^{-3} mol OCS / mol CO_2 0.02 g OCS / kg DM 0.04 Tg (africa savanna) 0.07 Tg (global savanna) 0.21 Tg biomass burning 0.38 Tg all anthro (based on Chin and Davis 1993) CO 62×10^{-3} mol CO / mol CO_2 65 g CO / kg DM 130 Tg af savanna 240 Tg global savanna 680 Tg biomass burning 1600 Tg all anthro based on Houghton 1995 Table 1.4 gives OCS (field) 0.005-0.016 $\times 10^{-3}$ mol OCS / mol CO_2 CO (field) 65-140 mol CO / 1000 mol CO_2 CO (lab) 59-105 mol CO / 1000 mol CO_2 CO best guess 100 mol CO / 1000 mol CO_2	1.6×10^{-4} mol OCS / mol CO
Andreae 2001	SUMMARY	g OCS / kg DM Savanna: 0.015 ± 0.009 Tropical: 0.04 Extratropical: 0.030-0.036 [using 0.033] Biofuel: 0.04 Charcoal Making: 0.04 Charcoal Burning: 0.04 Ag Waste: 0.065 ± 0.077	mol OCS / mol CO Savanna: 1.08×10^{-4} Tropical: 1.79×10^{-4} Extratropical: 1.44×10^{-4} Biofuel: 2.39×10^{-4} Charcoal Making: 2.67×10^{-4} Charcoal Burning: 9.33×10^{-5} Ag Waste: 3.30×10^{-4}

		g CO / kg DM Savanna: 65 ± 20 Tropical: 104 ± 20 Extratropical: 107 ± 37 Biofuel: 78 ± 31 Charcoal Making: 70 Charcoal Burning: 200 ± 38 Ag Waste: 92 ± 84 g CO_2 / kg DM Savanna: 1613 ± 95 Tropical: 1580 ± 90 Extratropical: 1569 ± 131 Biofuel: 1550 ± 95 Charcoal Making: 440 Charcoal Burning: 2611 ± 241 Ag Waste: 1515 ± 177	mol OCS / mol CO_2 Savanna: 6.82×10^{-6} Tropical: 1.86×10^{-5} Extratropical: 1.54×10^{-5} Biofuel: 1.89×10^{-5} Charcoal Making: 6.67×10^{-5} Charcoal Burning: 1.12×10^{-5} Ag Waste: 3.15×10^{-5}
Chin 1993	SUMMARY	0.14 (0.04-0.26) Tg (OCS) / yr Based on Crutzen 1979, Crutzen 1985, Bingemer 1990, Nguyen 1990 for OCS Based on Andreae 1991, Crutzen 1990 for C emissions.	
Crutzen 1990 Cited in Crutzen 1993	SUMMARY Global biomass burning	0.01 ± 0.005 mol OCS / 100 mol CO_2 0.04-0.2 Tg S OCS from BMB 0.6-1.5 Tg S OCS from “all sources” 10 ± 5 mol CO / 100 mol CO_2 120-510 Tg CO from BMB 600-1300 Tg CO from “all sources”	1×10^{-5} mol OCS / mol CO
Khalil 1984	SUMMARY	200 Gg OCS based on Crutzen 1979’s 15.8×10^{-6} OCS/CO_2	
Taylor and Zimmerman 1991 [in *Global Biomass Burning*]	SUMMARY	Total Methane 63.4×10^{12} g CH_4 Based on Crutzen 1979 and Greenberg 1984 9.88×10^{-4} mol OCS / mol CH_4 Total 0.13×10^{12} g S From Crutzen 8.75 mol CO / mol CH_4 => 971 $\times 10^{12}$ g CO from Crutzen 12.9 mol CO / mol CH_4 => 1431 $\times 10^{12}$ g CO from Greenberg	1.1×10^{-4} mol OCS / mol CO Differs from published estimate because Taylor uses the average CO and CH_4 values, rather than just the Wild Basin Fire ones.

Watts 2000	SUMMARY	Text page 765 gives 0.11 Tg/yr OCS based on Kelly and Smith 1990 0.14 ± 0.12 Tg/yr OCS based on Chin and Davis 1993 0.07 ± 0.05 Tg/yr OCS based on Nguyen 1995 Table 4 gives 0.07 ± 0.05 Tg/yr OCS based on Nguyen 1995	