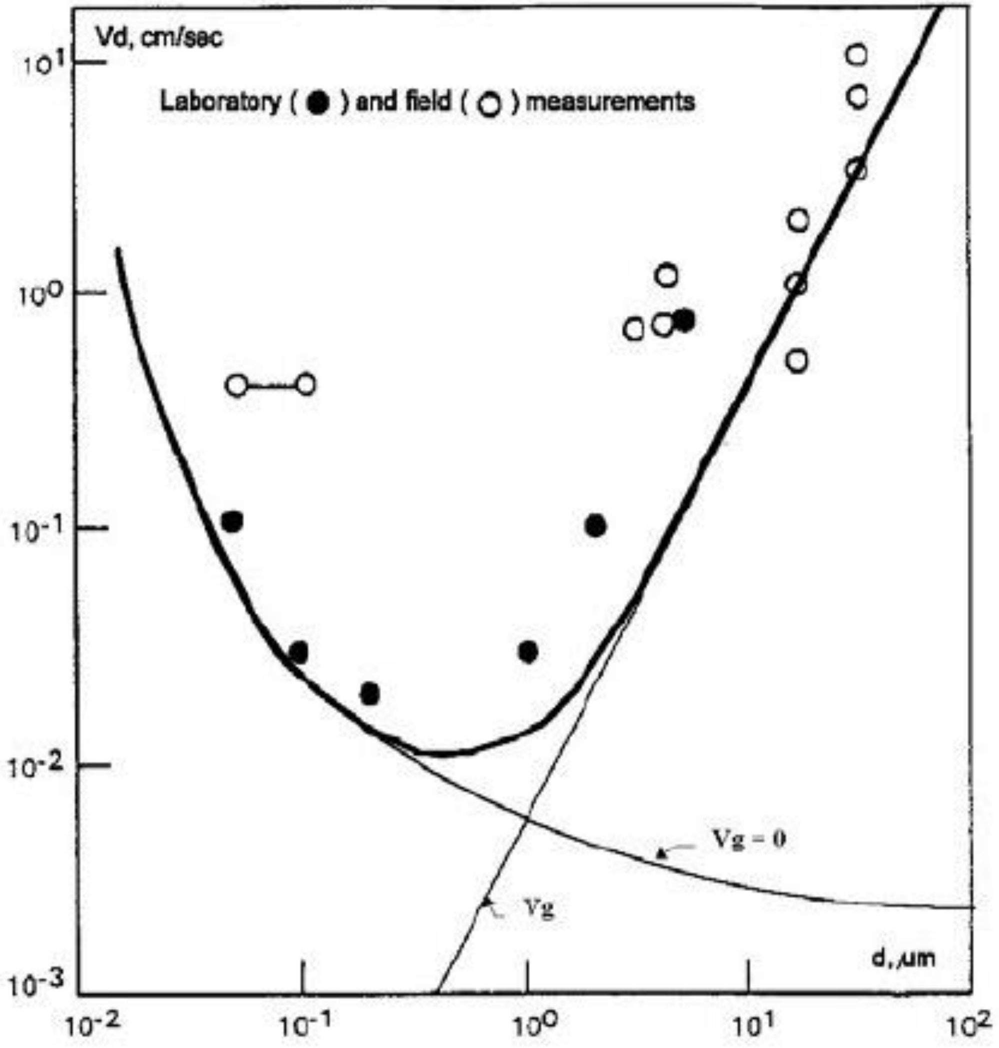
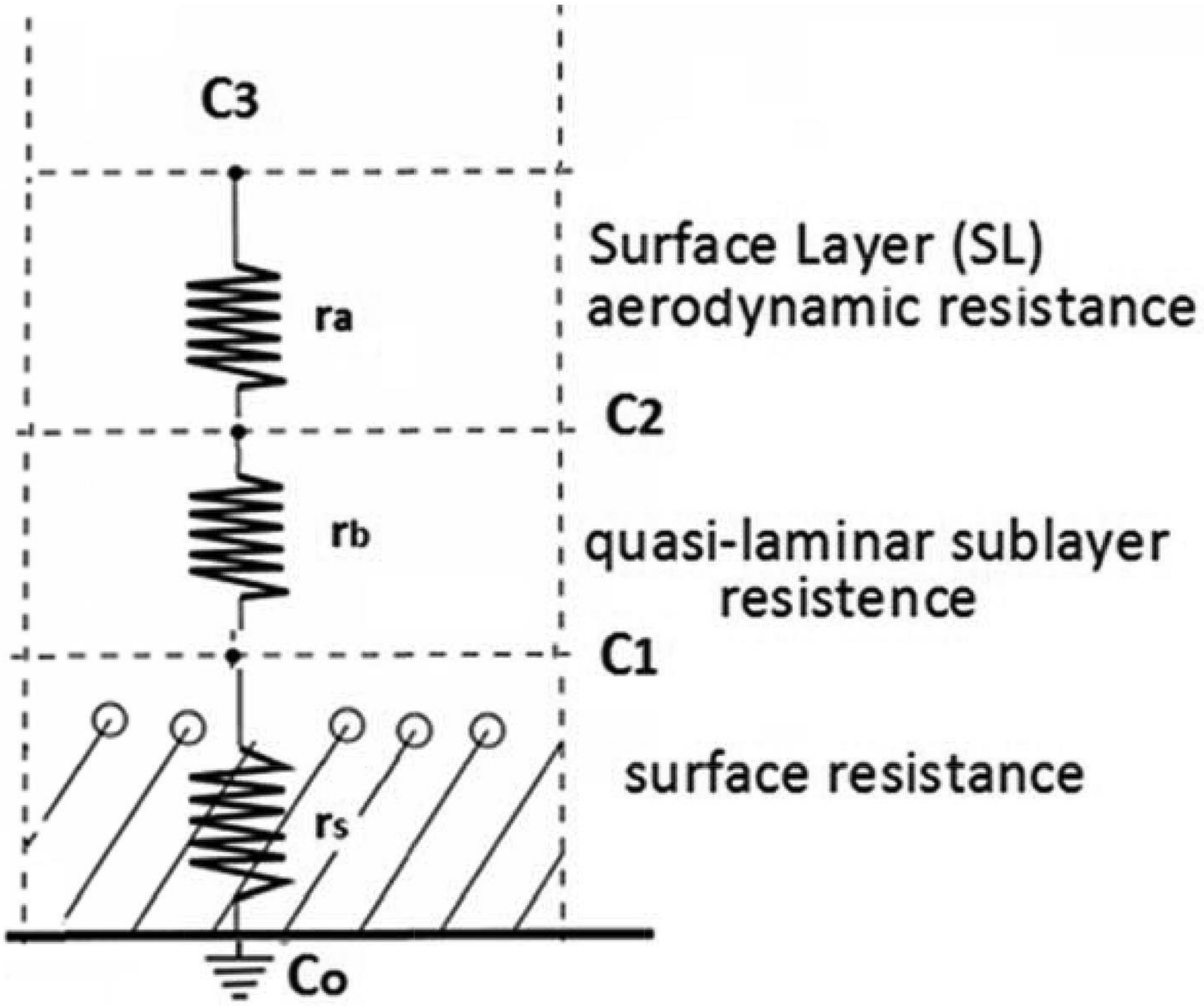


Vd, cm/sec
Laboratory (●) and field (○) measurements
10^1
10^0
10^{-1}
10^{-2}
10^{-3}
Vg = 0
Vg
d, um
10^{-2}
10^{-1}
10^0
10^1
10^2


C3
ra
Surface Layer (SL)
aerodynamic resistance
C2
rb
quasi-laminar sublayer
resistence
C1
rs
surface resistance
Co

Consider a first order chemical reaction in which Chemical 1 is converted to Chemical 2

$$C_1 \rightarrow C_2$$

$$\text{Rate} = k\,C_1$$

$$\frac{dC_1}{dt} = -kC_1$$

$$C_1(t) = C_1(0)e^{-kt}$$

$$C_2(t) = C_1(0) - C_1(t)$$

$$C_2(t) = C_1(0)\,(1-e^{-kt})$$

$$M_2(t) = M_1(0)\,(1-e^{-kt})$$

For values of chemical rxn time constant $\beta = kt < 0.01$, $M_2 \approx M_1(0)kt$

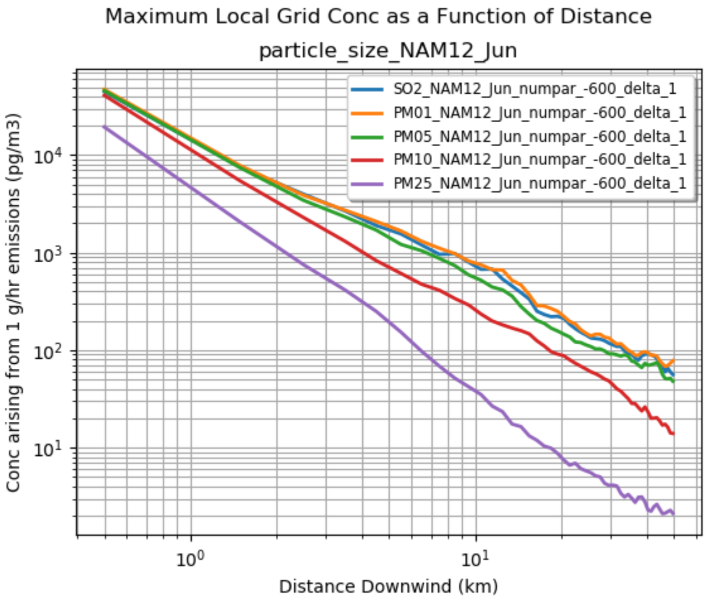
If the molecular weight (W_2) of C_2 is different from the molecular weight (W_1) of C_1, then the mass of C_2 is increased by the ratio of molecular weights, i.e.,

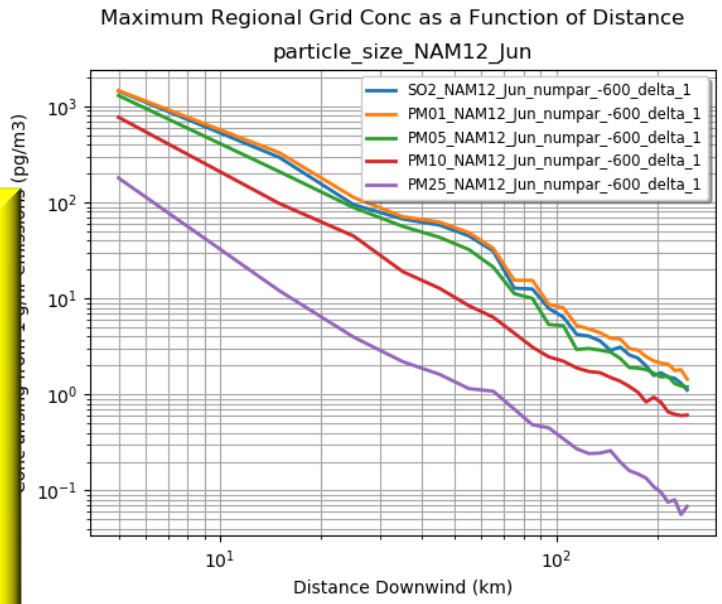
$$M_2(t) = M_1(0)\,(1-e^{-kt})\,(W_2/W_1)$$

For example: $SO_2 \rightarrow SO_4^{-2}$

Molecular weight of SO_2 = 64
Molecular weight of SO_4^{-2} = 96
Ratio = 1.5

For every amount of mass that SO_2 is depleted by the reaction, the mass of SO_4^{-2} increases by 1.5 x that amount of mass (the conversion adds two extra oxygen atoms to the molecule)

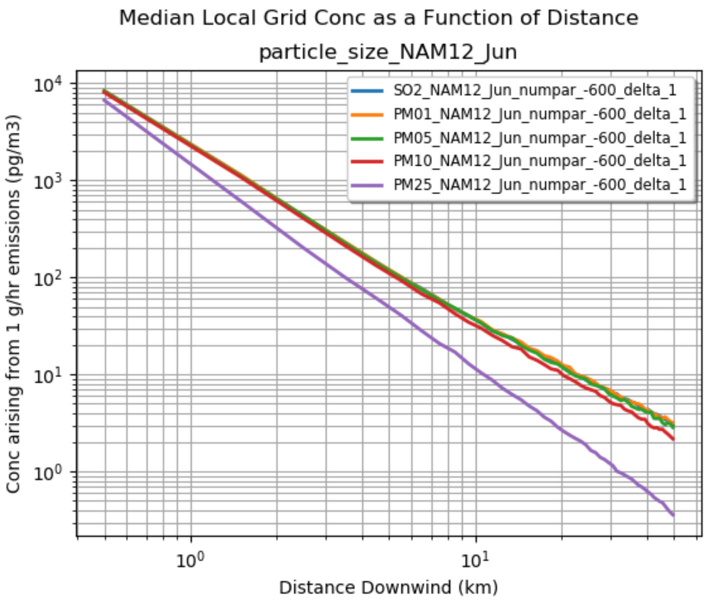


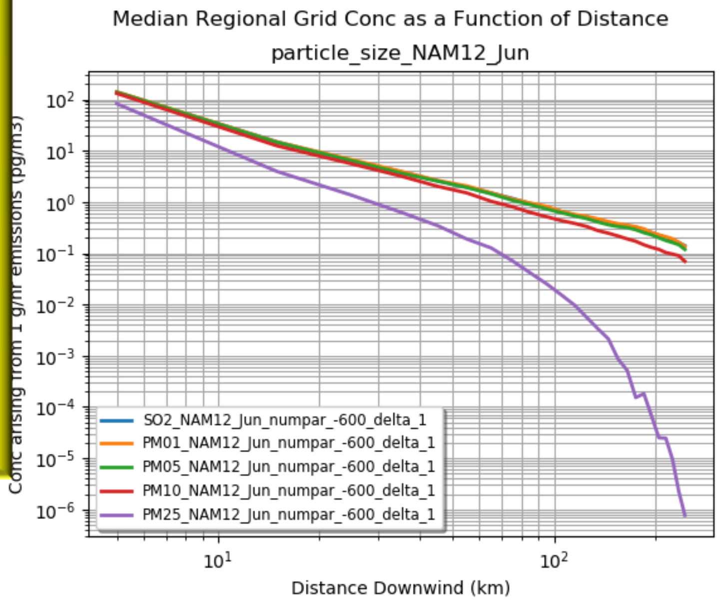


Not a very dramatic difference between gas-phase SO_2, and 1 and 5 µm particles

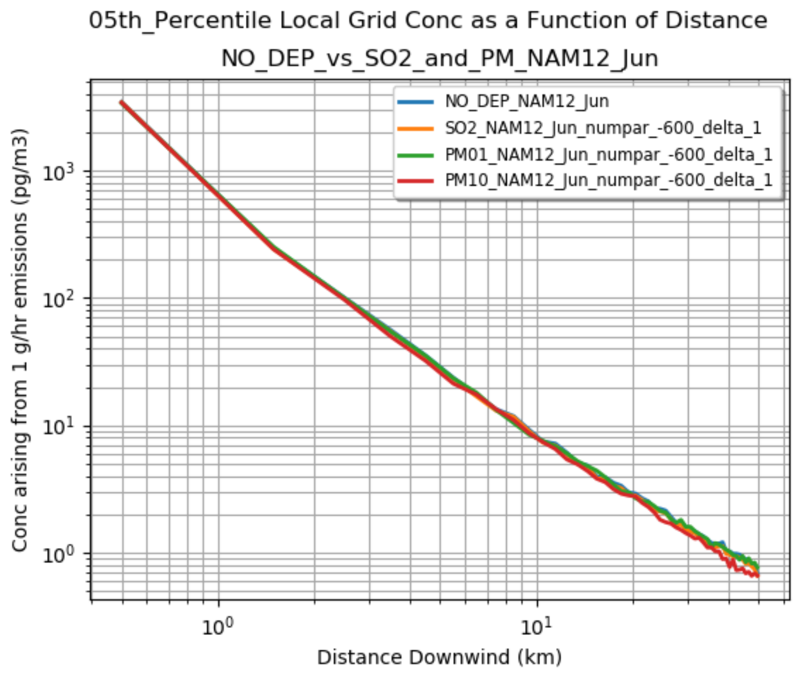
If pollutant partitions to atmospheric particles, most would be associated with particles less than 5 µm

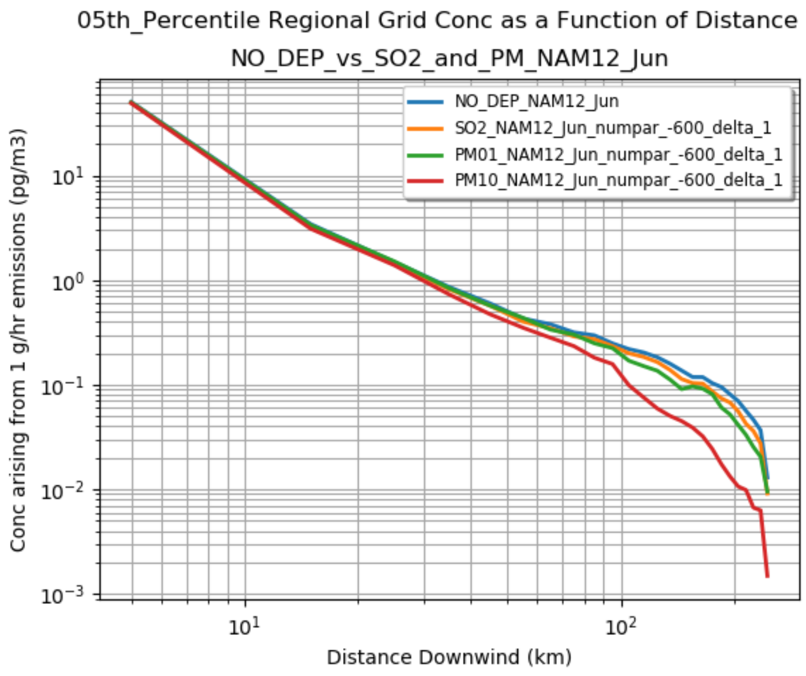
Bigger differences seen with 10 and 25 µm particles





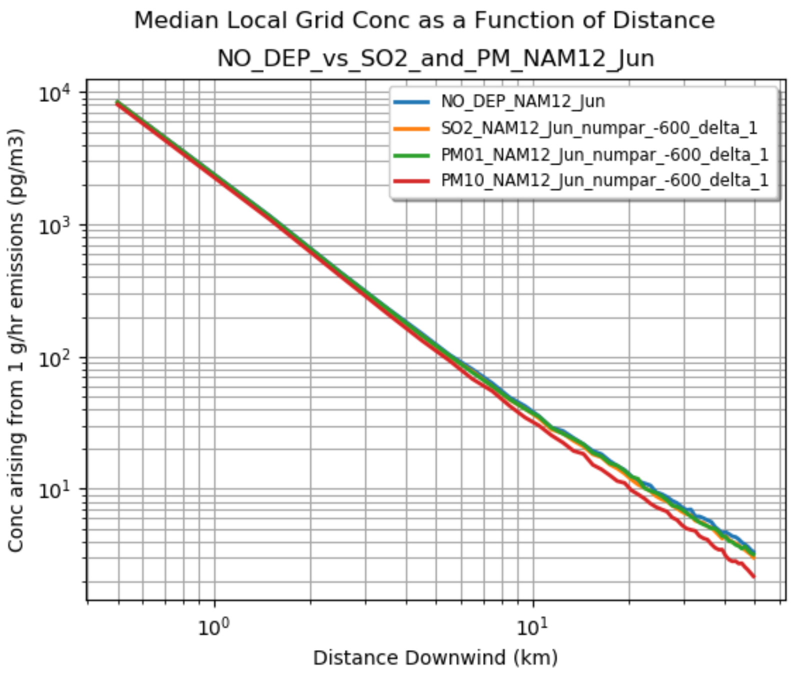
Compare simulation with no deposition with simulation of SO2, PM01 and PM10 with default deposition parameters

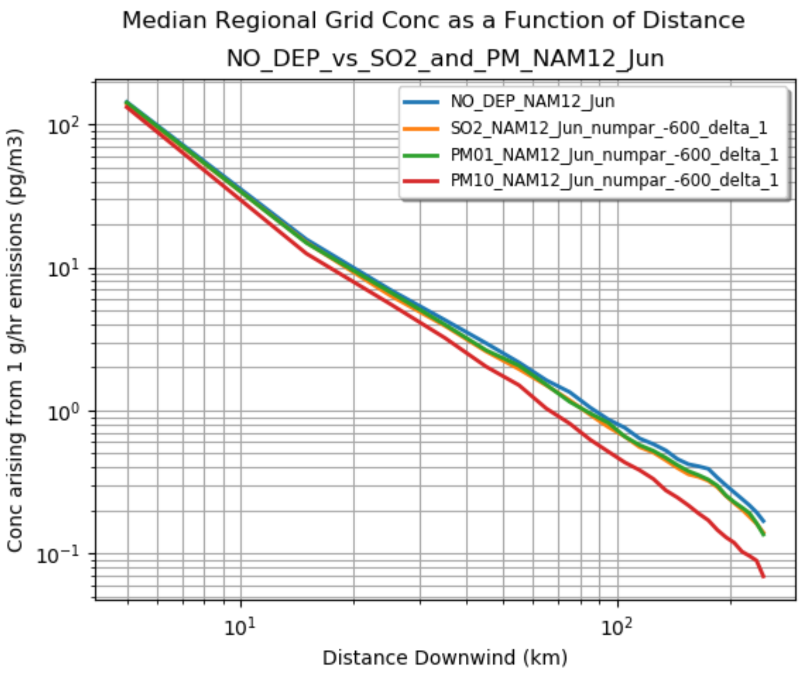




For 5th percentile, where one might expect to see the consequences of deposition (e.g., when it is raining), little difference except for large distances with large particles (10 µm)

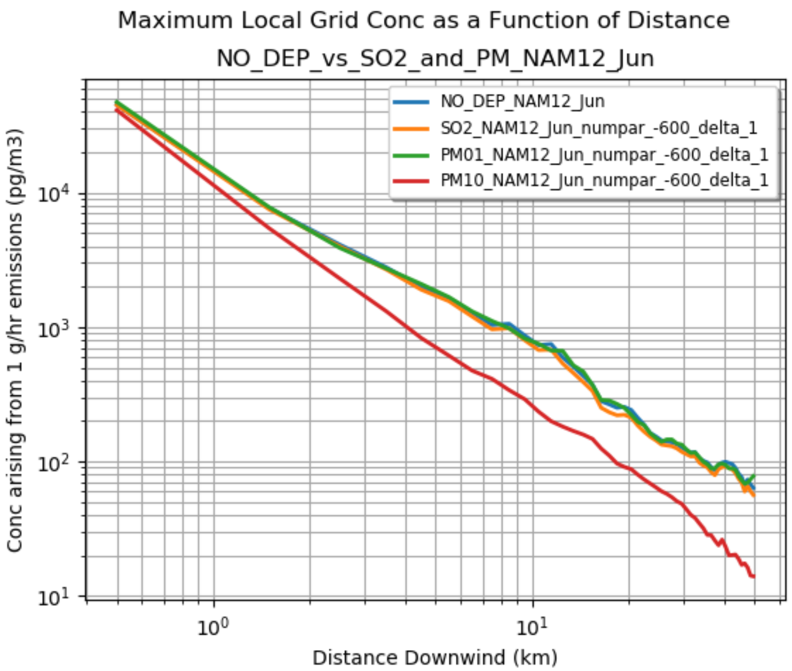
Compare simulation with no deposition with simulation of SO2, PM01 and PM10 with default deposition parameters

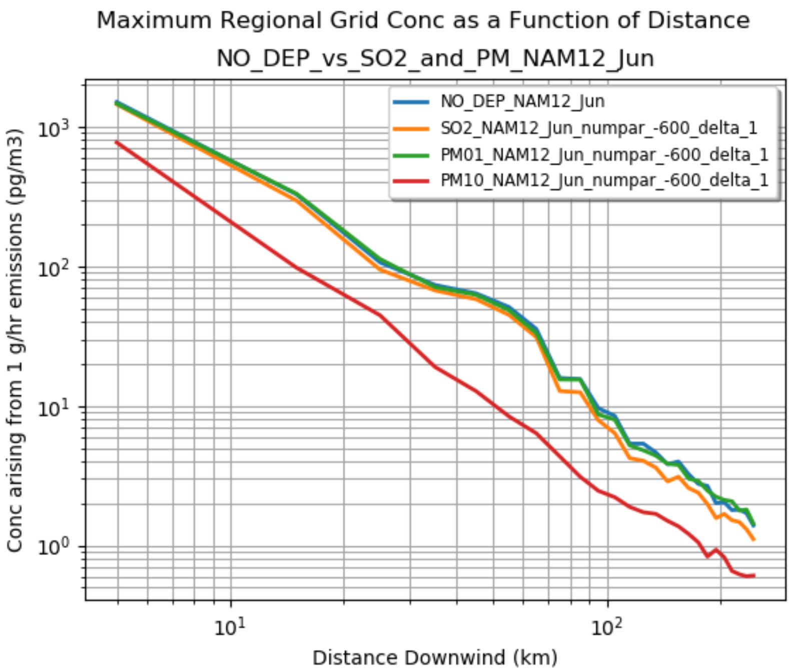




For median concentrations, little difference except for large particles (10 µm)

Compare simulation with no deposition with simulation of SO2, PM01 and PM10 with default deposition parameters





For maximum concentrations, little difference except for large particles (10 µm)

Example of overall impact of wet/dry deposition (for SO_2)