Dry season termite mound methane flux

My data (point estimates, not whole mound estimates):

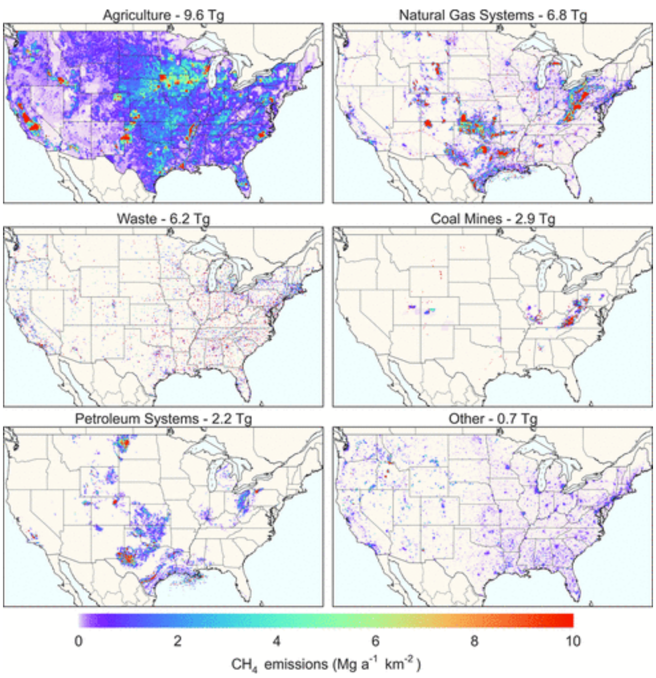
- Amitermes average: 50,685 ug CH4/m2*d
- Coptotermes average: 28,107 ug CH4/m2*d
- Nasutitermes average: 77,744 ug CH4/m2*d

Jamali 2011 (whole mound estimates, not point estimates):

- Amitermes average: 22,944 ug CH4/m2*d

Comparison with other sources

Figure 1. From the 'Gridded National Inventory of U.S. Methane Emissions' (Maasakkers et al 2016), take a range of values of say 3-10 Mg CH4/km2*yr that appear across sectors



$$\frac{3\cancel{Mg}\ CH4}{\cancel{km^2} * \cancel{yr}} * \frac{1\ \cancel{yr}}{365\ d} * \frac{1\cancel{km^2}}{1000000m^2} * \frac{10^{12}ug}{1M\cancel{g}} = \frac{3 * 10^{12}ug\ CH4}{365 * 10^6 d * m^2} = \frac{8219\ ug\ CH4}{d * m^2}$$

3 Mg CH4/km2*yr = $\frac{8219\ ug\ CH4}{d*m^2}$

10 Mg CH4/km2*yr = $\frac{27397\ ug\ CH4}{d*m^2}$

Compare with **termite values** ranging $\frac{28{,}107\ \ ug\ CH4}{d*m^2}$ to $\frac{77{,}744\ \ ug\ CH4}{d*m^2}$

Scaling is the next important thing. Termite mounds are not as widespread on the landscape as say agriculture is (point area coverage for termite mounds in comparison to total area coverage for cows wandering around).

From Clement et al 2021, mound density at the dry savanna sites was 359 mounds per hectare. So assuming mound SA of 1 square meter (rough assumption, but this is something I can fine tune with the 3D mound scans for more accurate SA) with this recorded mound density, using the Amitermes values (since they are most apparent at 68% encounter rate at the sites where the mounds/ha estimate comes from):

$$\frac{1\cancel{m^2}}{1\,\cancel{mound}}\frac{50{,}685\ \ ug\,CH4}{d*\cancel{m^2}}*\frac{359\,\cancel{mounds}}{Ha}=\frac{18{,}195{,}915\ \ \cancel{ug}\,CH4}{\cancel{d*Ha}}*\frac{1\,Mg}{10^{12}\cancel{ug}}*\frac{365\,\cancel{d}}{1\,yr}*\frac{1\cancel{Ha}}{0.01\,km^2}=\frac{0.66\,Mg}{yr*km^2}$$

So this is on the low end of the scale proposed in Figure 1 (think purples). But it would still make the map. Also not surprising that it isn't say, red, because termites have an estimated contribution of **1-5% to the global methane budget**.

All in all, termite mounds can be local hotspots, not creating sweeping methane-emitting landscapes. Yet even as hotspots, if you go out to the Australian savannas, termite mounds can be everywhere. Also I'm told this is even more true for areas outside of Aus, especially Aftrica

Note that these measurements for termites characterize dry season fluxes, Jamali 2011 estimated the seasonal variation is big: 'Fluxes in the wet season were 5–26-fold greater than those in the dry season', but this is highly dependent on species. This points the study in future directions to capture wet season fluxes at my field sites.

Lastly these preliminary fluxes from my dataset do not correct for time of day, of which Jamali 2011 proves to be of important consideration. Termite methane emissions are positively correlated with temperature, and therefore time of day. I plan to address this using Q10s (some reported in literature, also we have a small pilot study for termite mound Q10s that could be useful).