

- The Amazon Rainforest is the world's largest contiguous ecosystem and plays a large role in the Earth's hydrological, energy and carbon cycles- its chemistry is very important
- Vegetation releases VOC's which can mix with NOx emitted from microbes in the soil
- After entering the atmosphere, NOx and VOC's are oxidized, primarily by the OH radical.
  - Depending on the mixing ratios, ozone can be produced which is harmful to humans and plants in high enough concentrations.
- Amazonian OH radical reactivity is directly correlated to isoprene- a smaller molecule emitted by trees
  - This is due to isoprene's strong light and temperature dependent emissions and its high reaction rate with OH
  - However, the OH reactivity not explained by isoprene alone. It is attributed to unmeasured sources
    - Some possibly due to unmeasured photochemical products of isoprene
- Luckily, ozone is not being produced in damaging quantities in the Amazon yet
  - However, production strongly depends on NOx quantities
- Researchers at Harvard have quantified the relationship between NOx pollution from human sources and OH radicals in the Amazon.
  - Manaus, Brazil is situated in the Amazon and is one of the fastest growing cities in the world at 2 million people
    - It's polluting significantly due to petroleum refining, chemical manufacturing, and much more
  - The pollution is blown downwind where it mixes with the rainforest's comparatively pristine atmosphere
- Researchers measured isoprene and major OH oxidation products
  - As levels of isoprene increase, the ratio of oxidation products will rise as well. This ratio can tell scientists the concentration of OH radicals with the help of computers
- The increase of daytime NOx from urban pollution caused OH concentrations to jump 250%
  - This means that continued anthropogenic pollution will affect the rainforest's chemistry, cloud formation, and rainfall- changing a very delicate ecosystem
- The rainforest has two "tipping points":
  - Temperature increase of >4 degrees Celsius (At 1 degree now)
  - Deforestation exceeding 40% of total area (At 20% now)

- If transgressed, much of the rainforest could irreversibly turn into a savannah
- Obviously, this would have large scale implications for biodiversity in the world's most biodiverse region, as well as local industries, tourism, as well as the world's economy and the health of our atmosphere in general
- Luckily, there have been recent significant reductions in deforestation (80% in the last 10 years) so there is hope!

Sources:

<http://www.pnas.org/content/113/39/10759.full>

<https://www.sciencedaily.com/releases/2018/04/180411174145.htm>

<https://www.sciencedirect.com/science/article/pii/S1352231015305161>

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(Last two are peer-reviewed)