



Emissions with ASCC using various flue gases and water wash configurations at Technology Centre Mongstad (TCM)

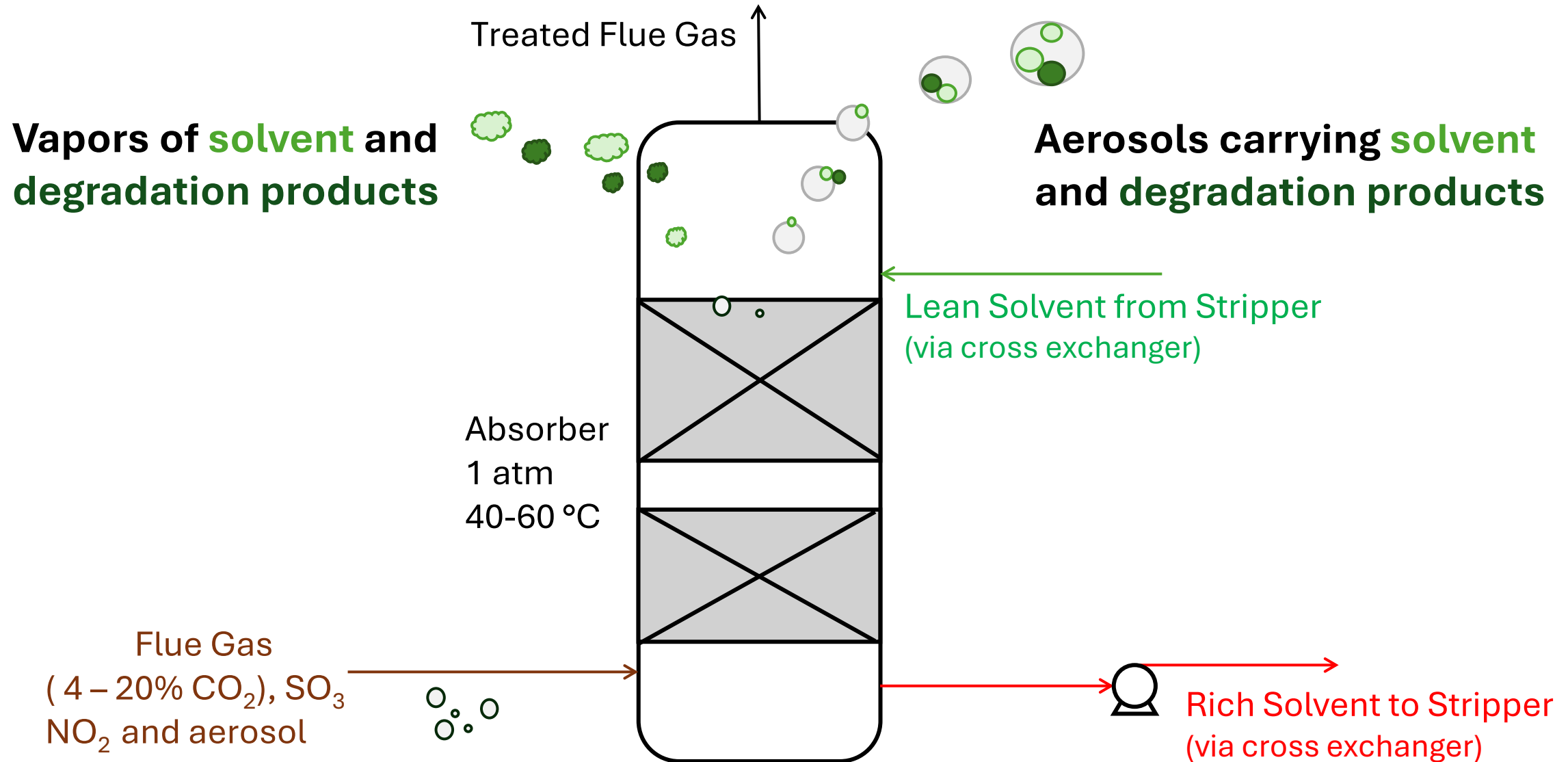
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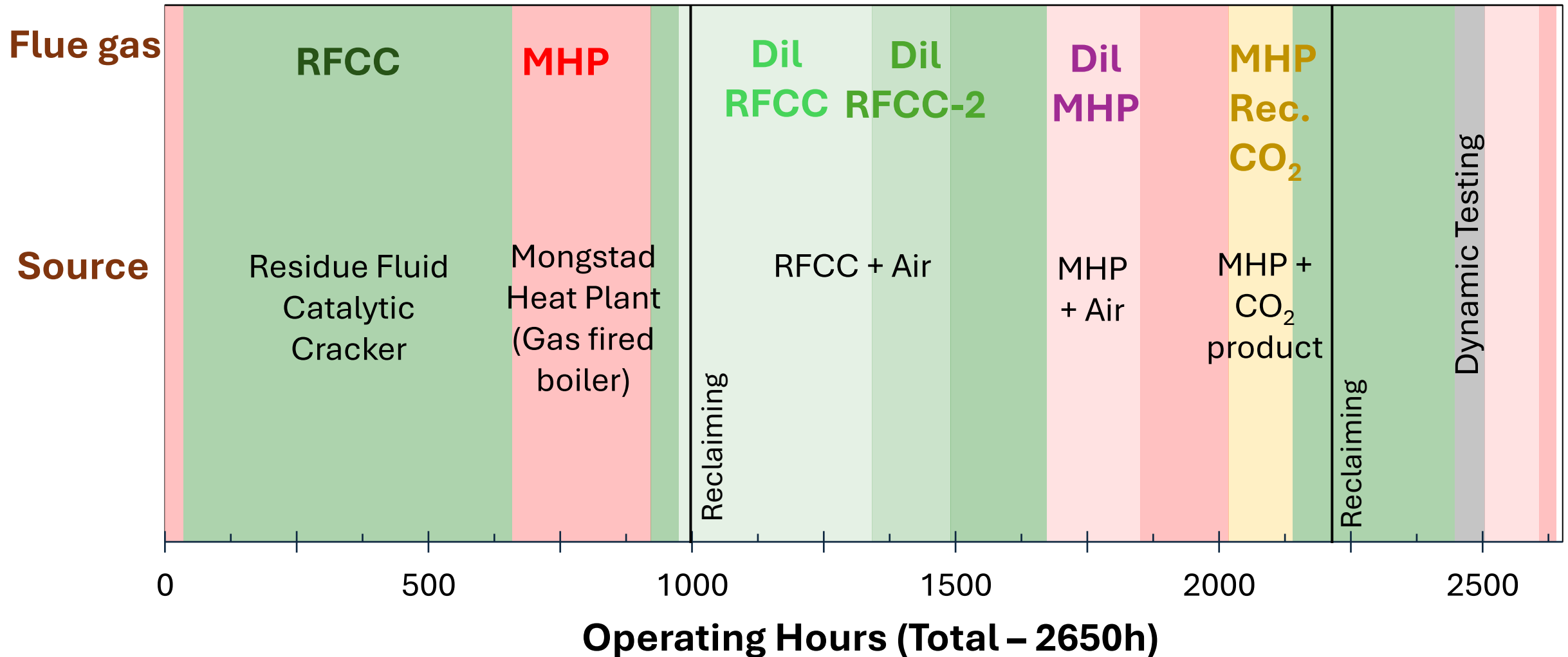
September 17th , 2025



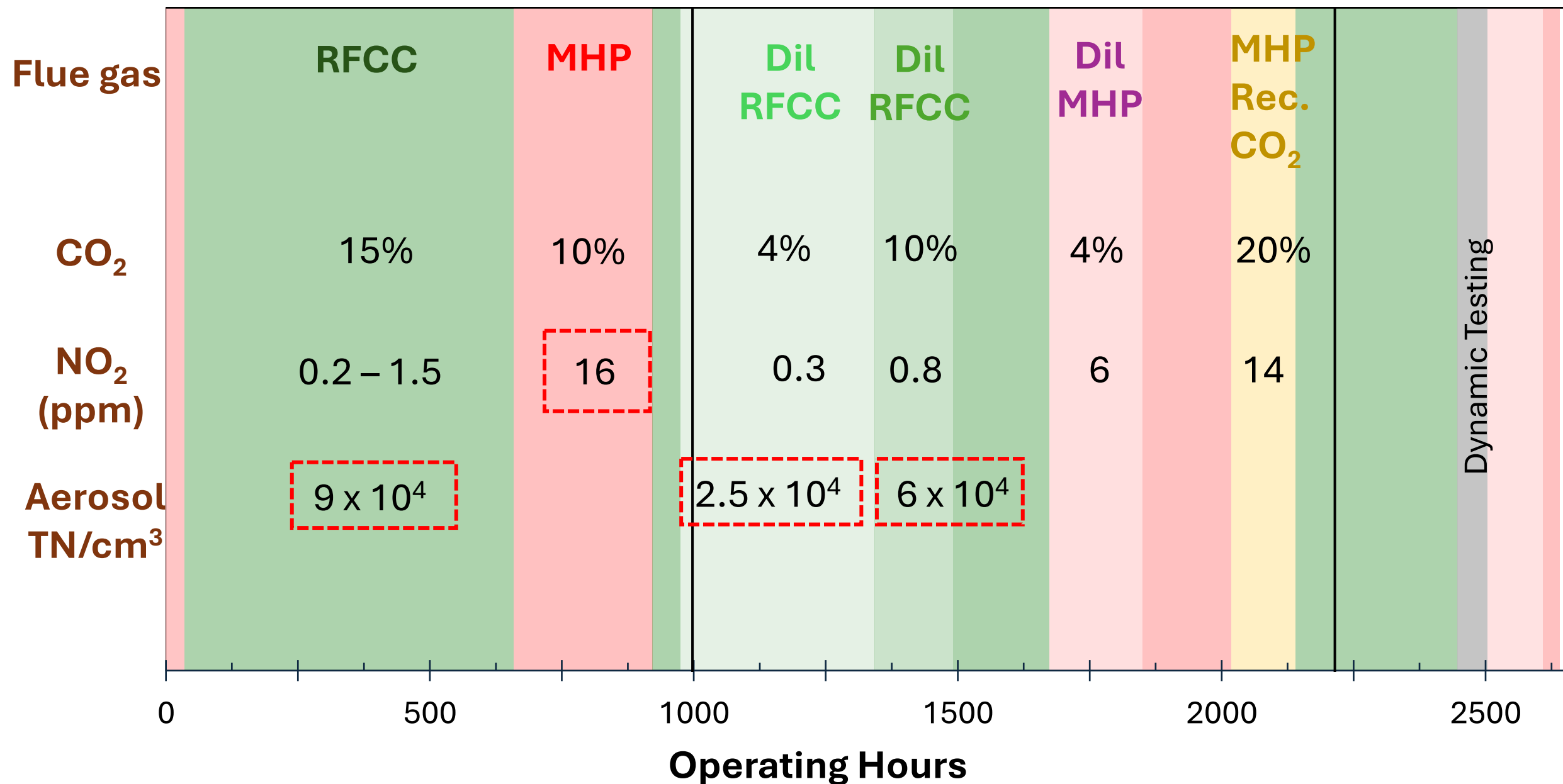
Emissions arise from solvent and degradation product vaporization and aerosol formation



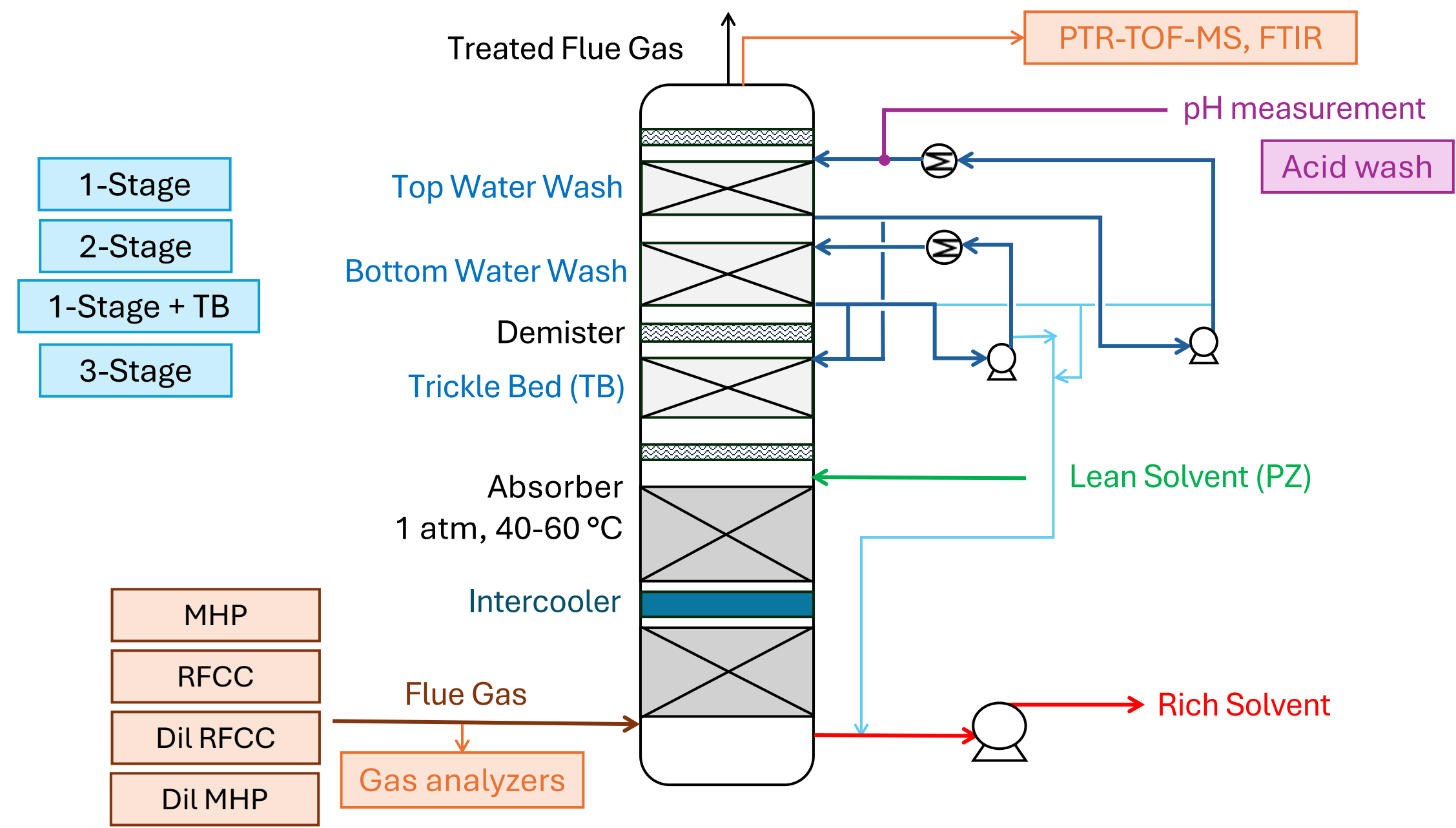
Flue gas configurations tested to characterize emissions at Technology Centre Mongstad (TCM), Norway



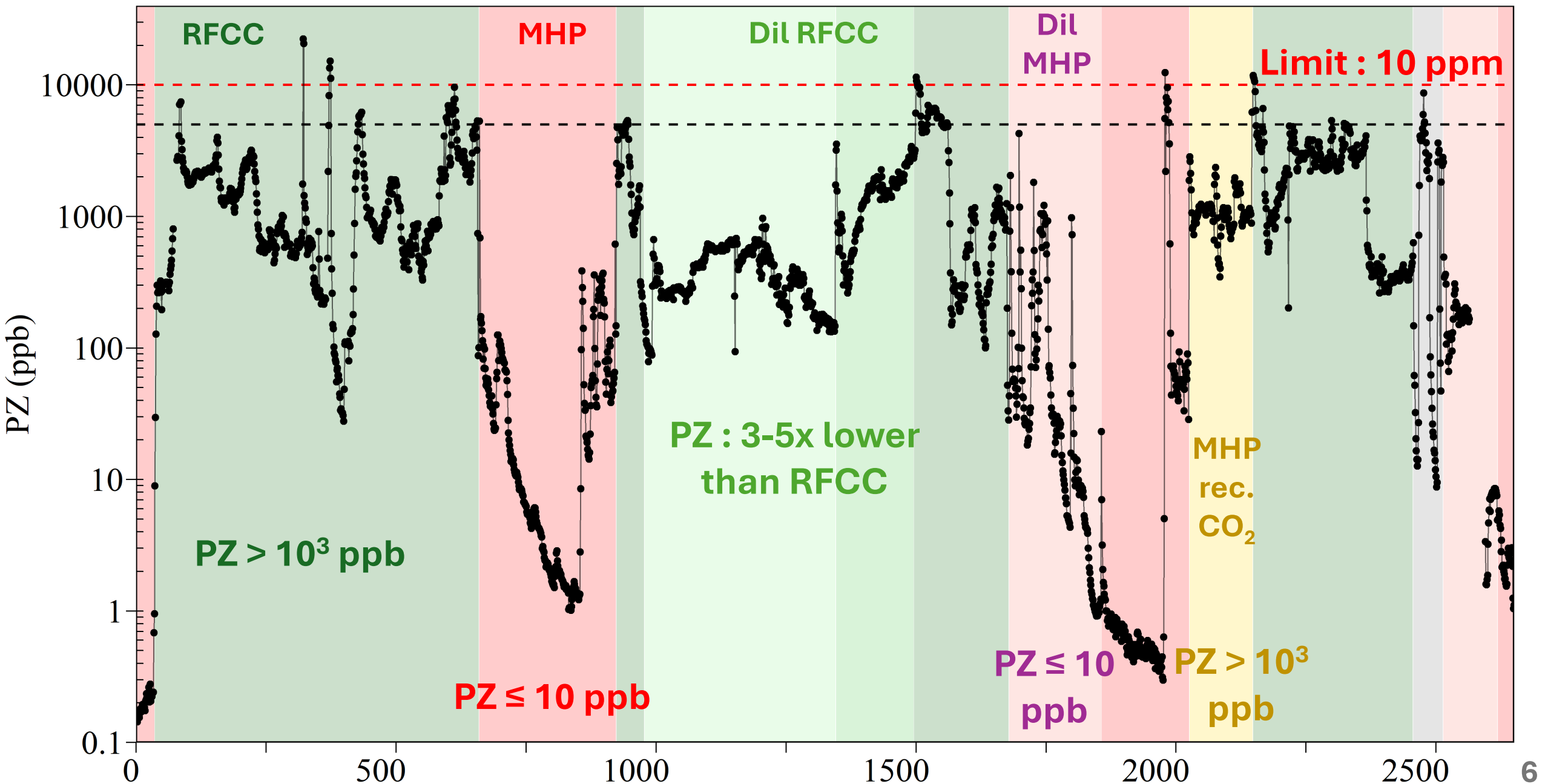
Flue gas configurations tested at TCM



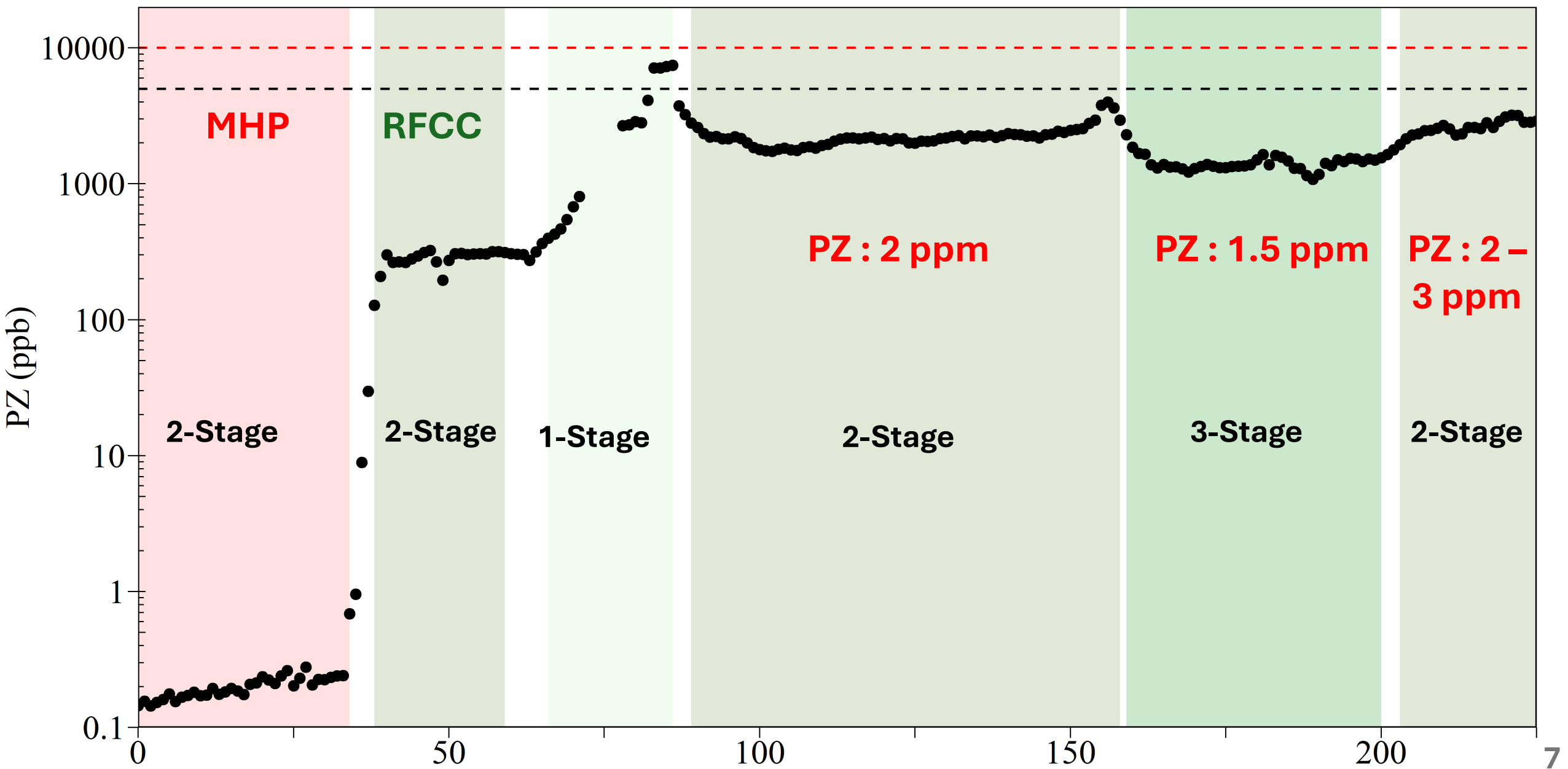
Water wash configurations tested to reduce emissions at TCM



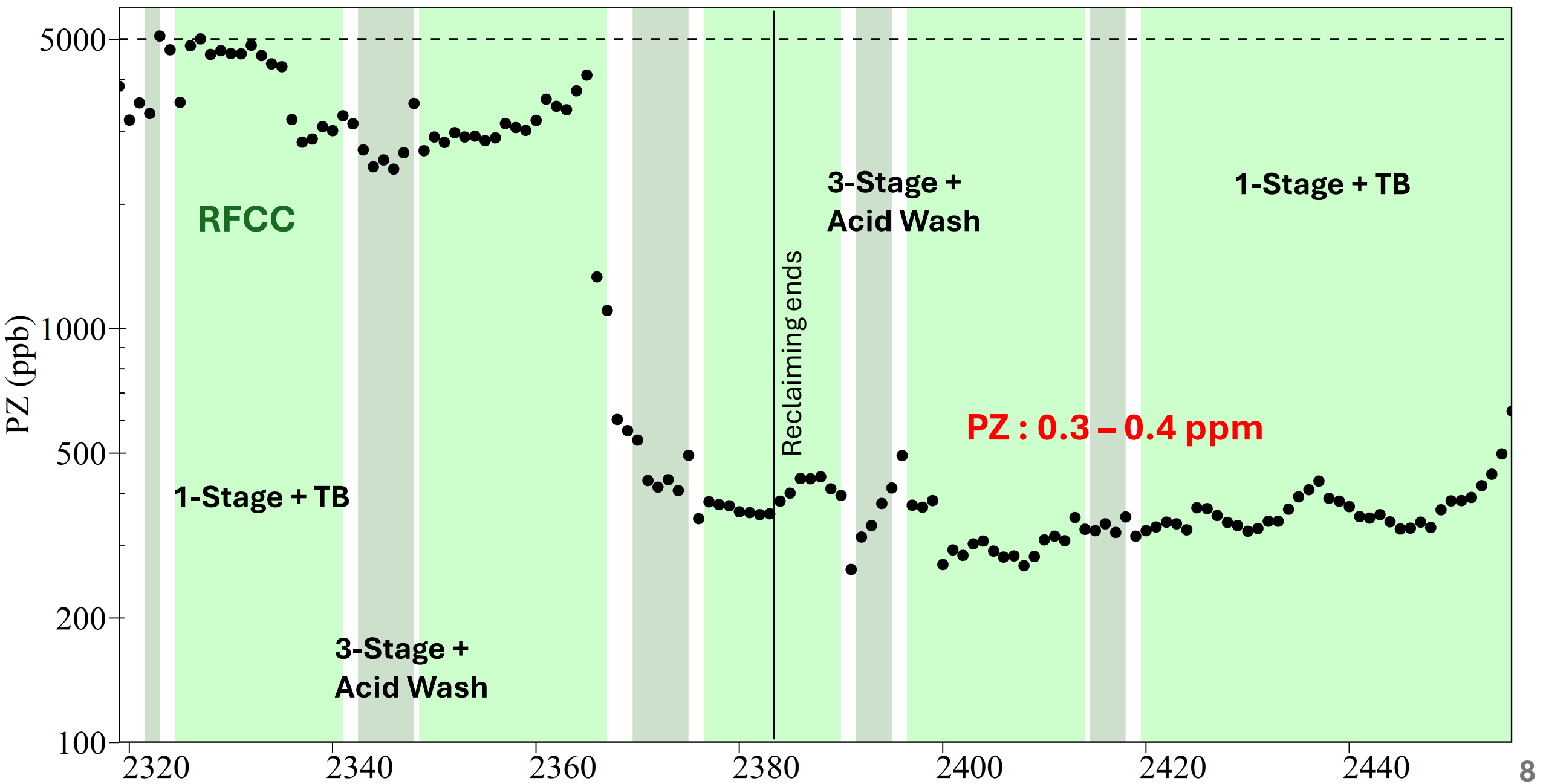
Flue gas type is the main driver of PZ emissions



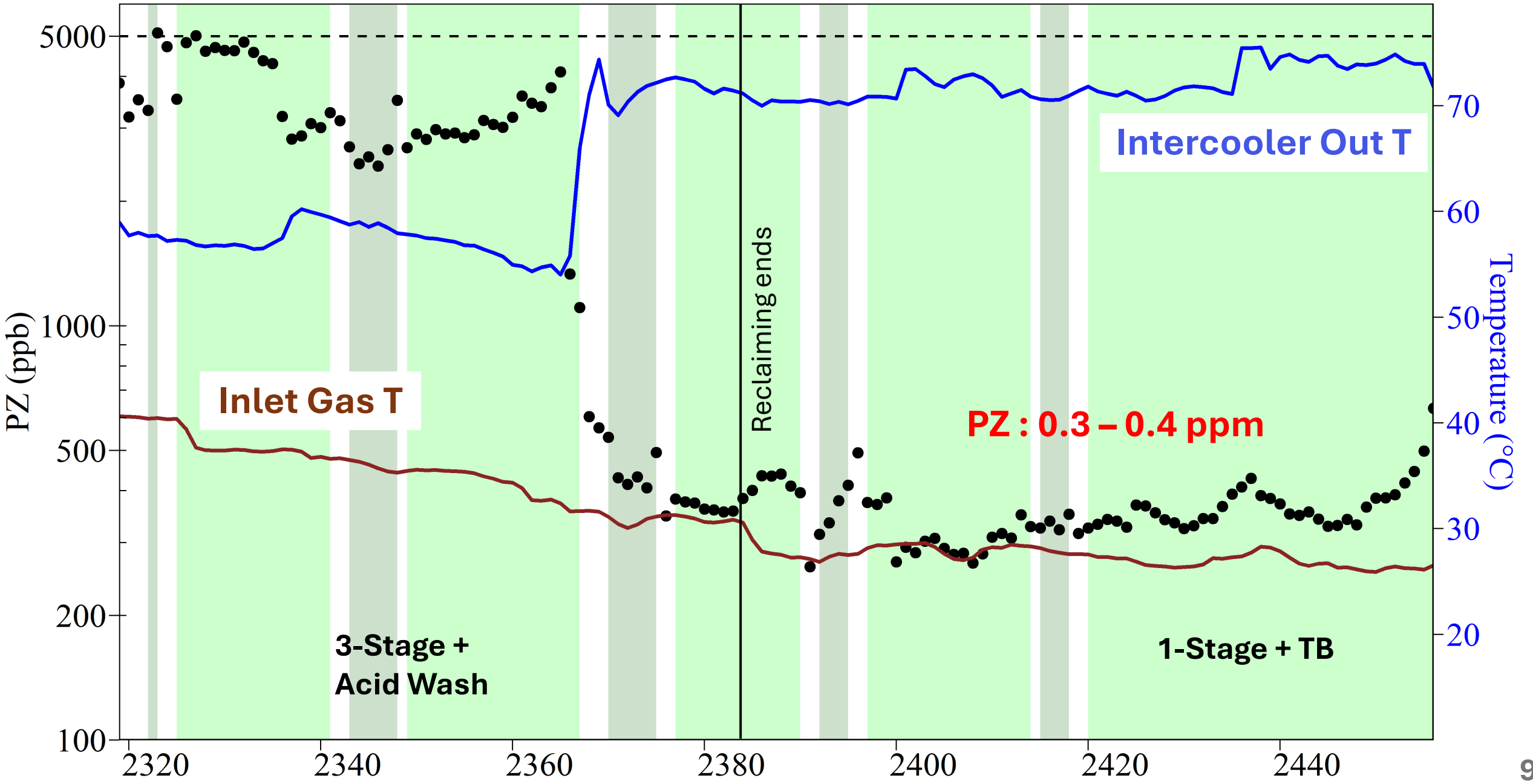
Multiple water wash stages keep PZ emissions < 5 ppm



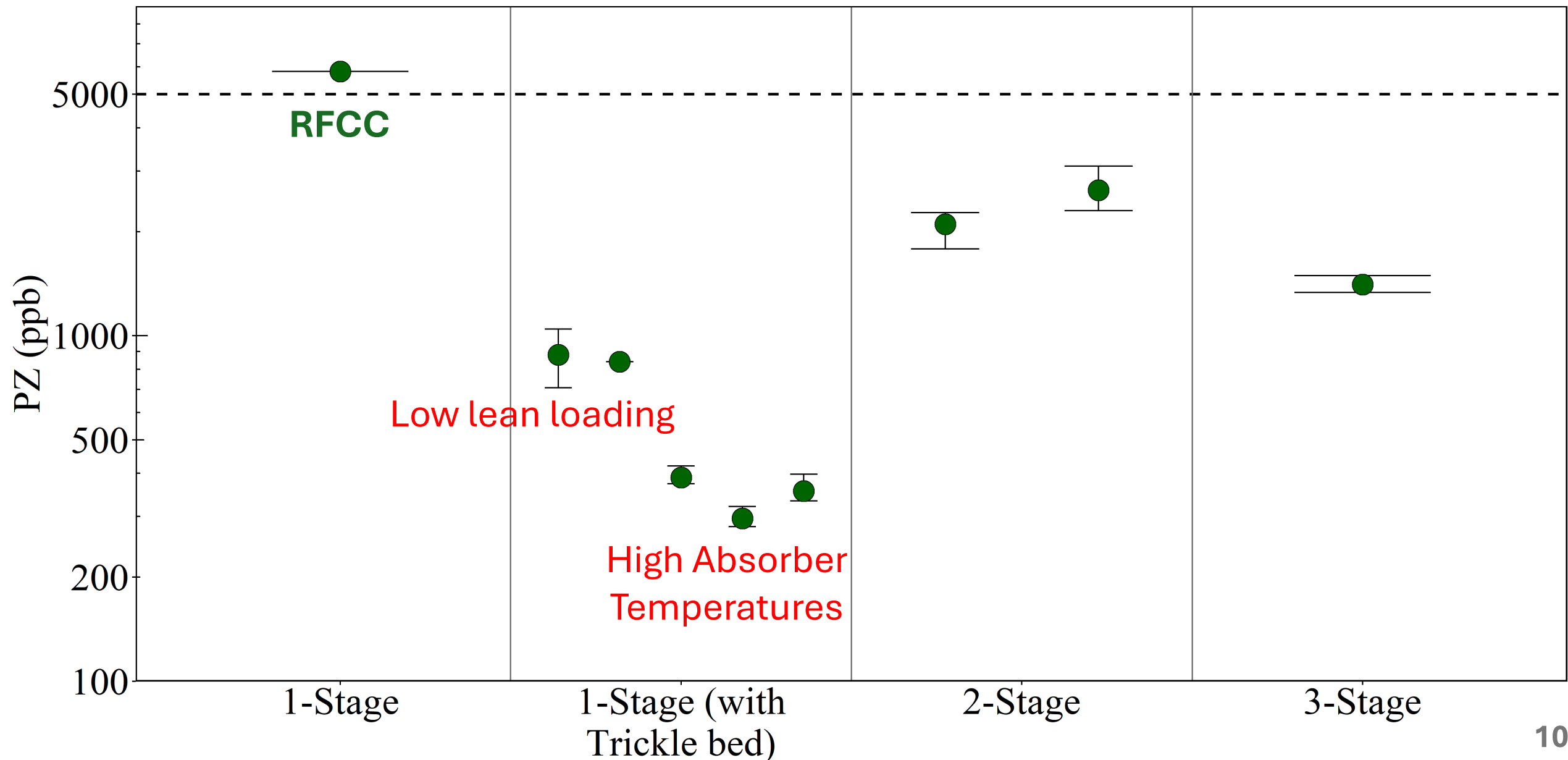
PZ emissions are ~5x lower after solvent reclaiming



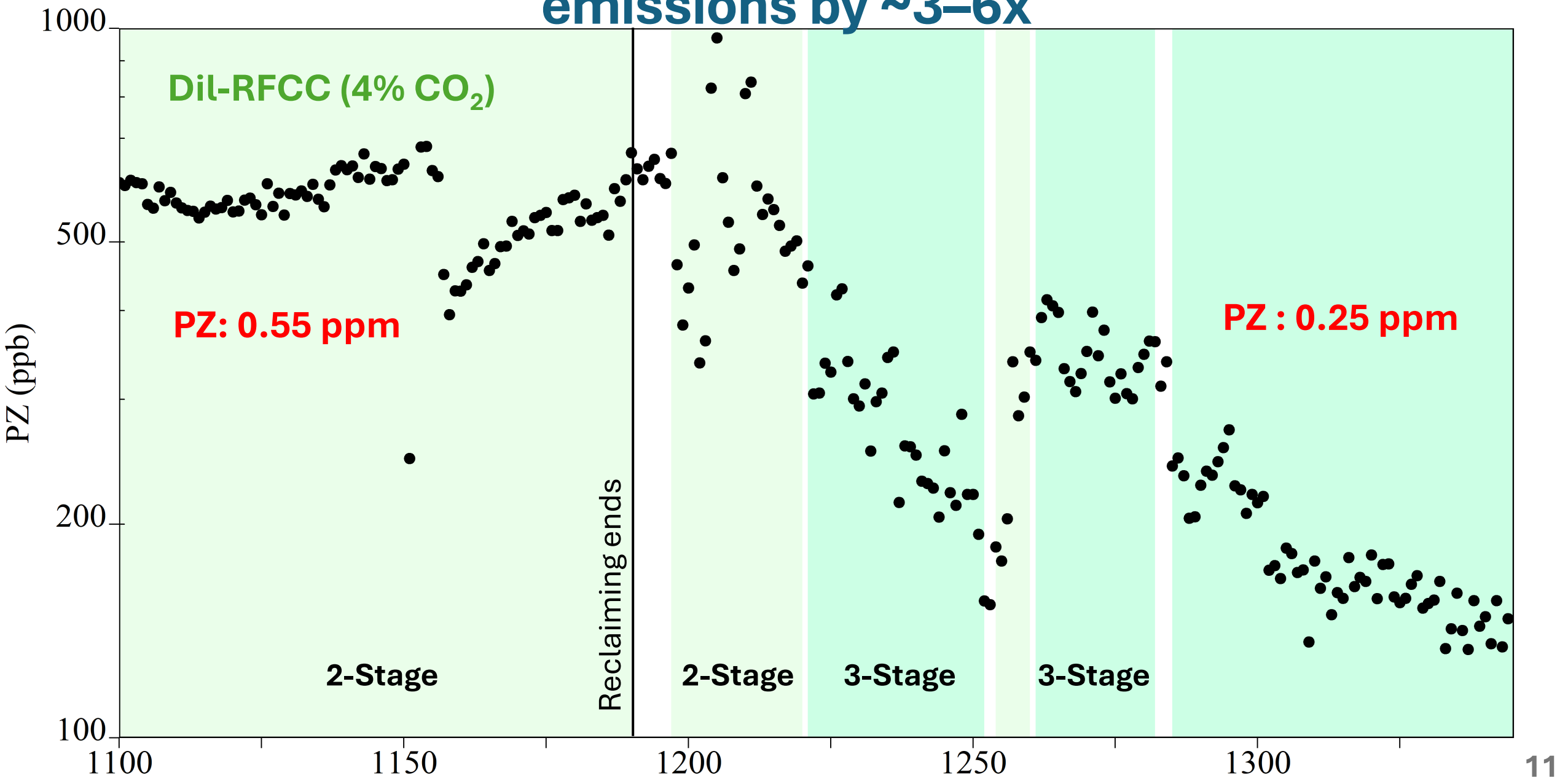
High absorber Ts promote aerosol growth, lower PZ emissions



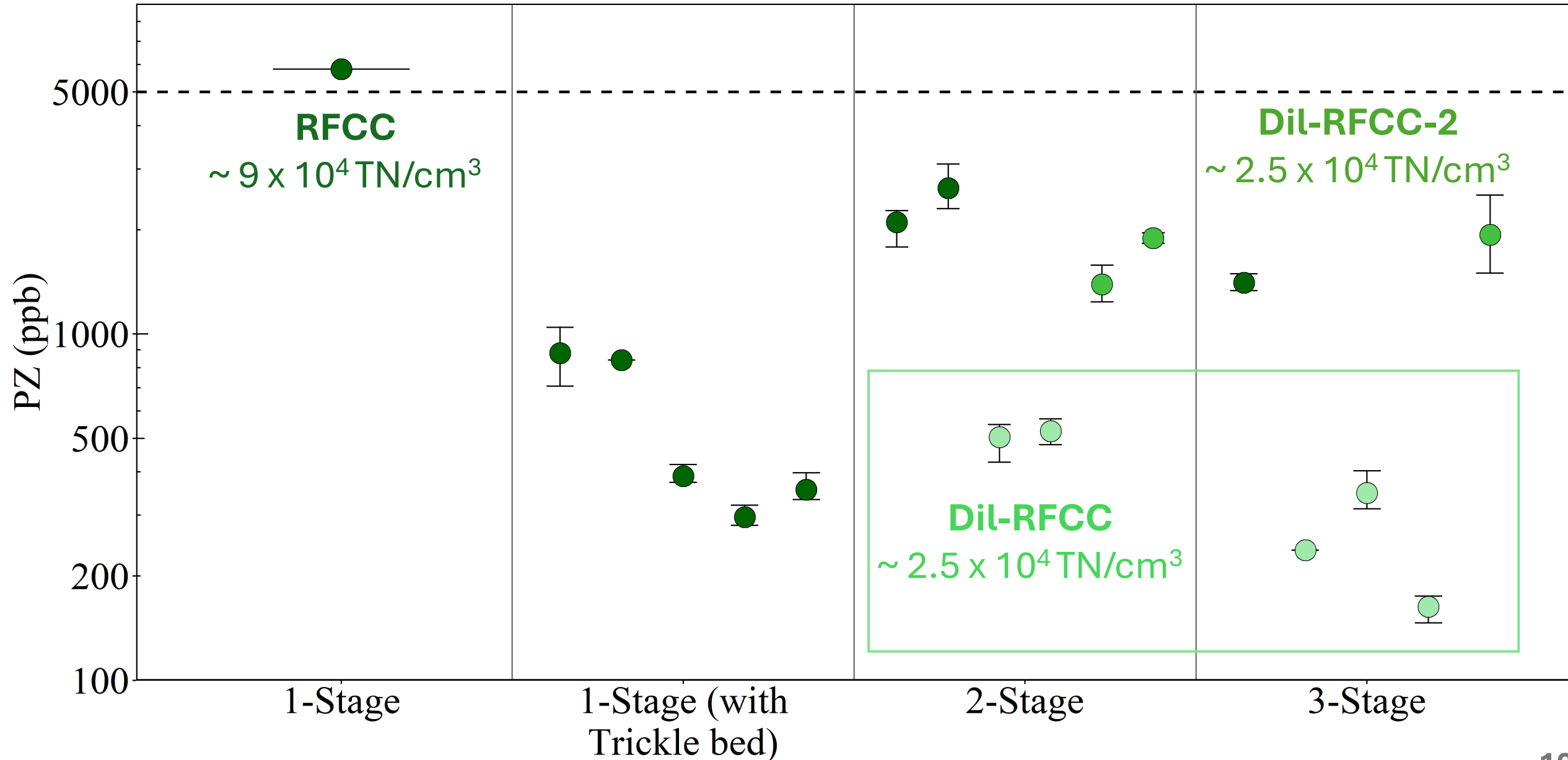
RFCC : PZ emissions are controlled via water wash, absorber T and lean loading



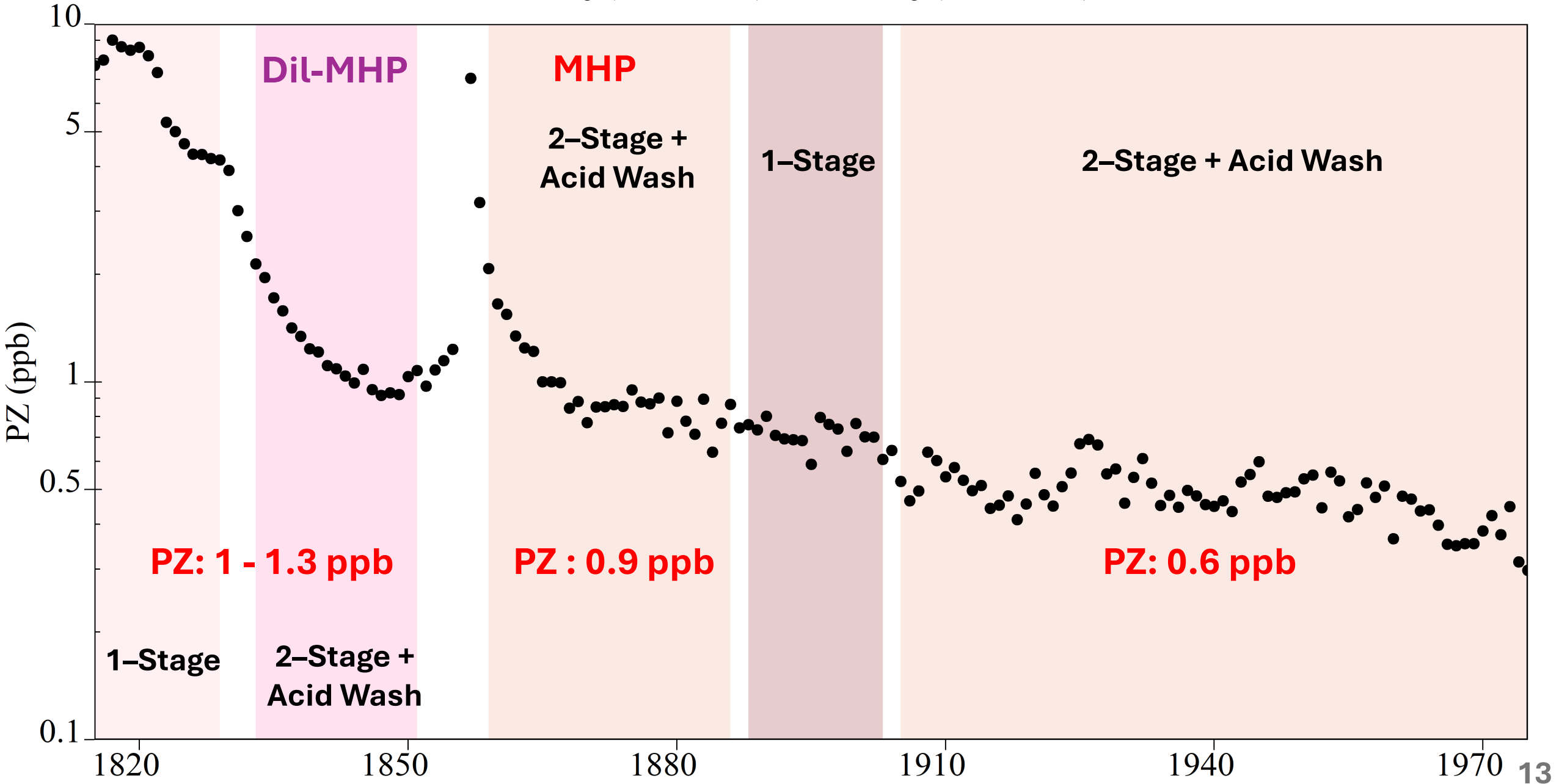
Dilution of RFCC reduces aerosol nuclei, lowering PZ emissions by ~3–6x



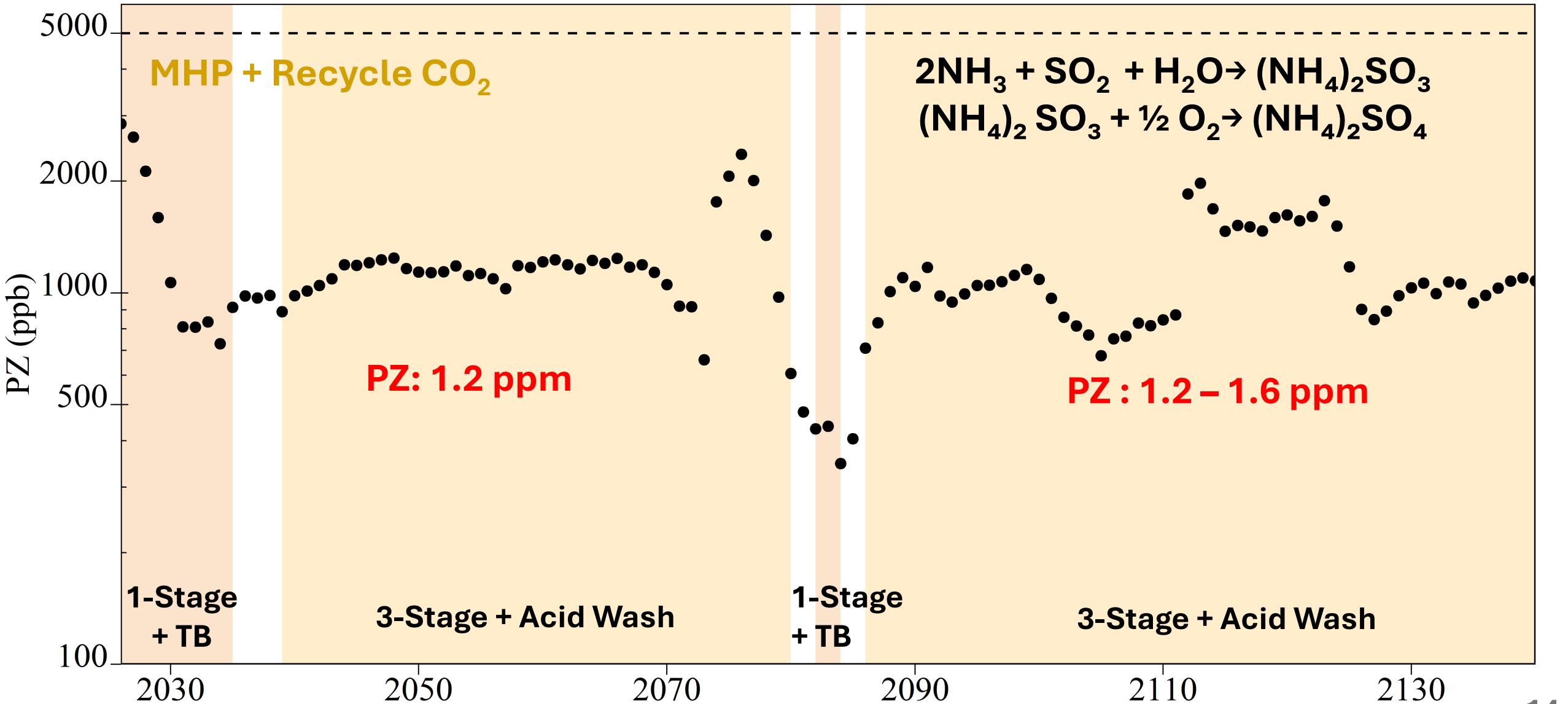
RFCC : PZ emissions decrease with dilution



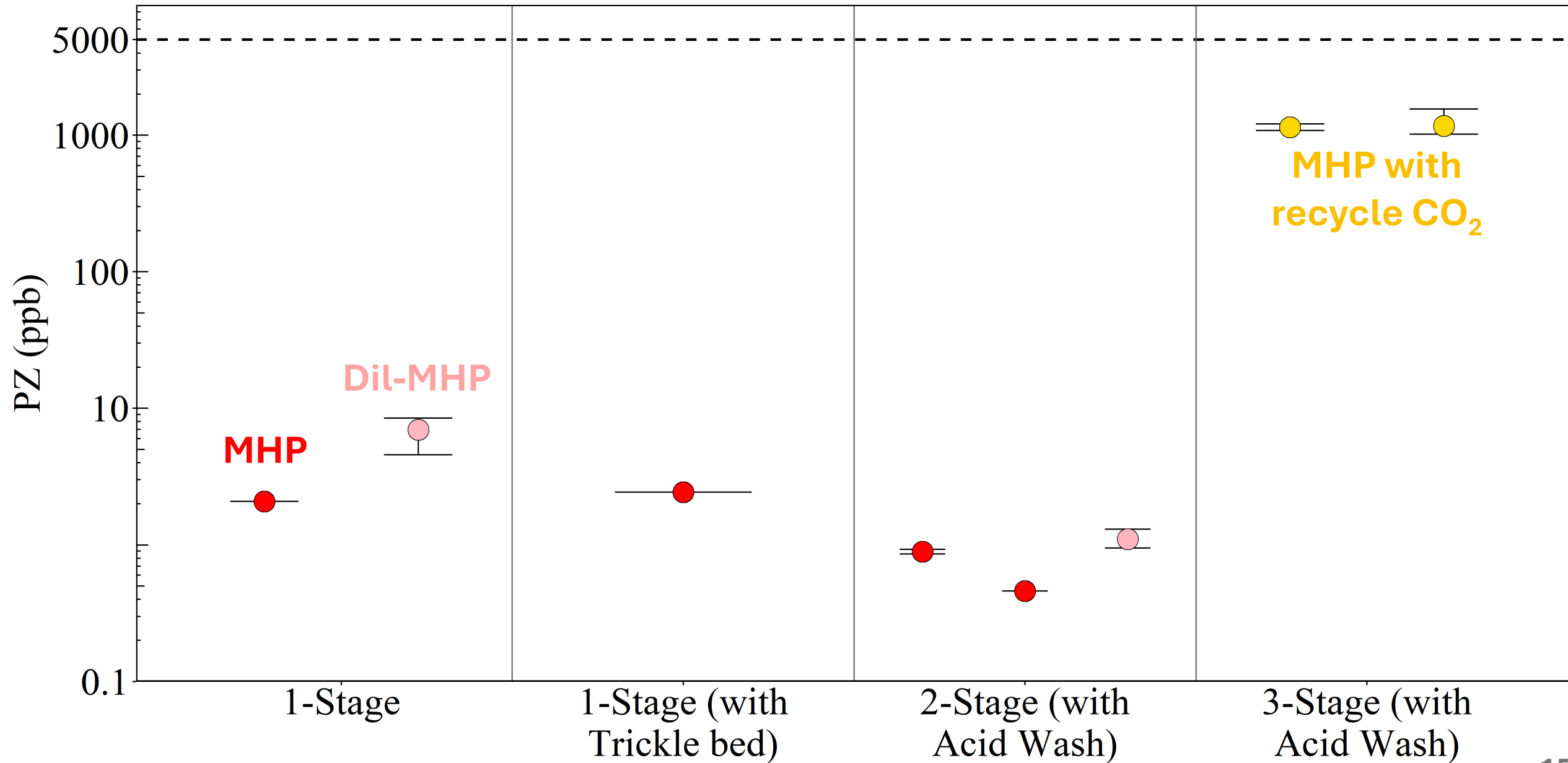
MHP and DiI-MHP : PZ emissions are less than 10 ppb



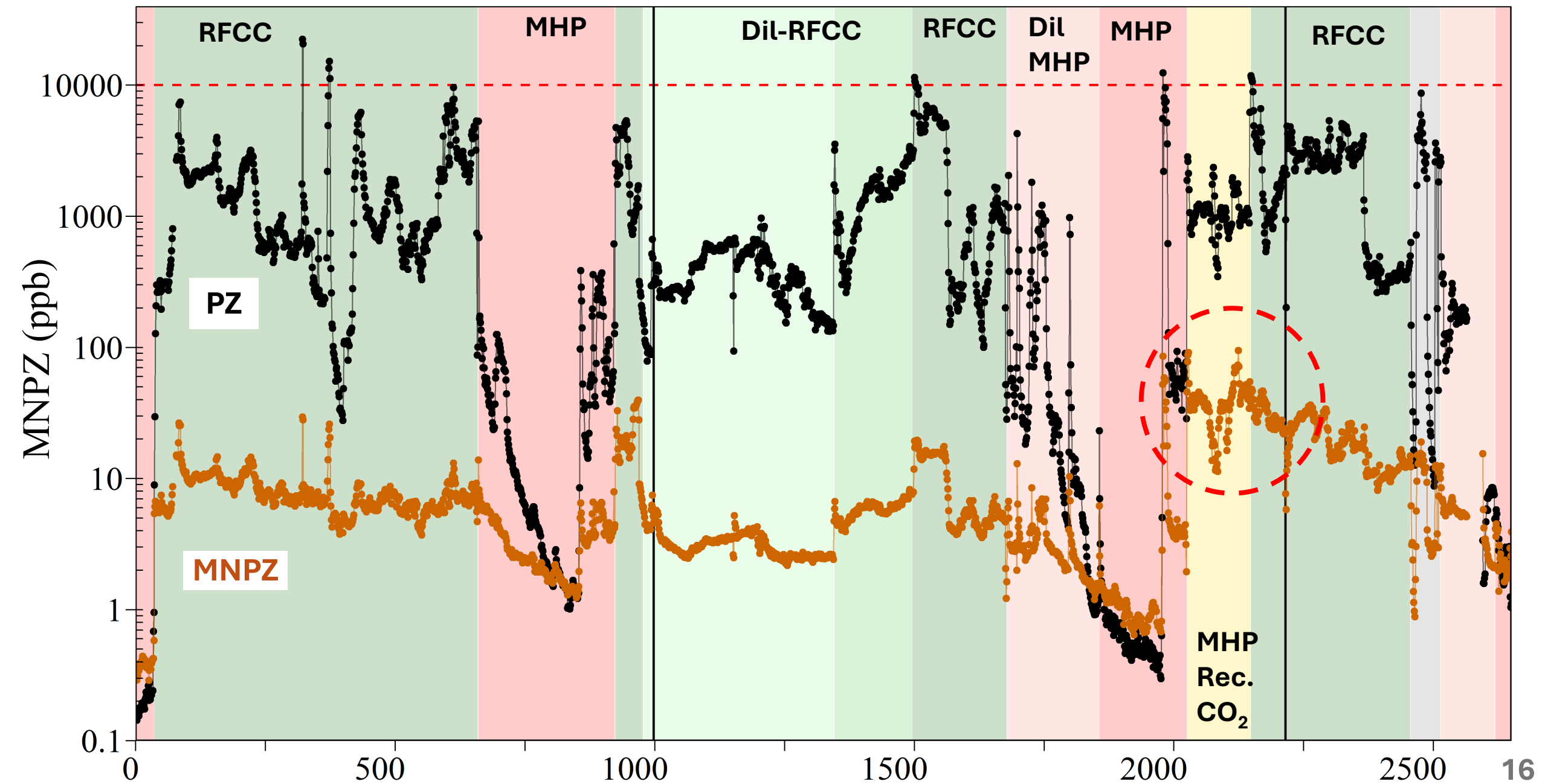
MHP + recycle CO₂ : NH₃ in CO₂ product can react with SO₂ before the caustic scrubber to form aerosols



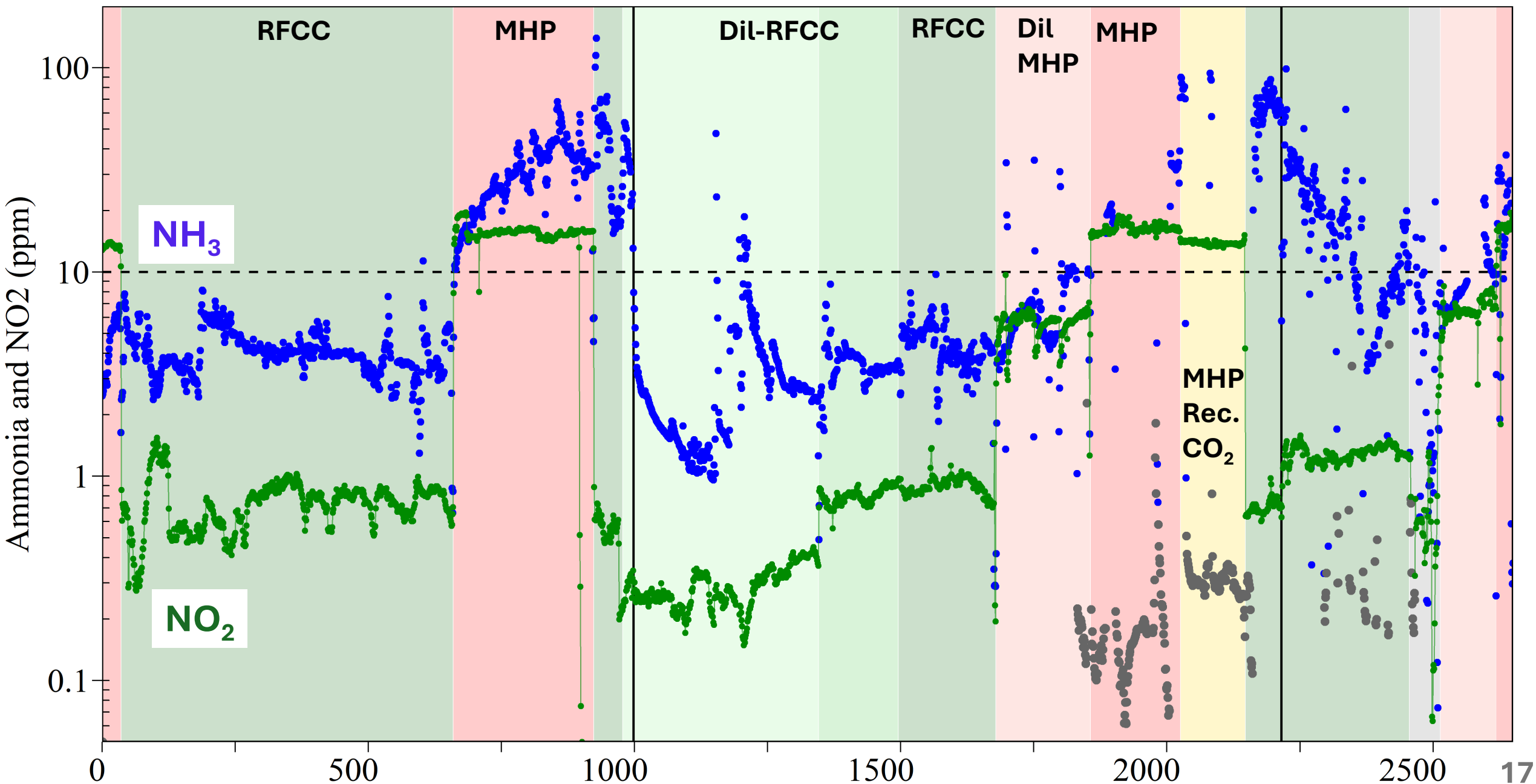
MHP + recycle CO₂ : PZ emissions > 1 ppm, like RFCC



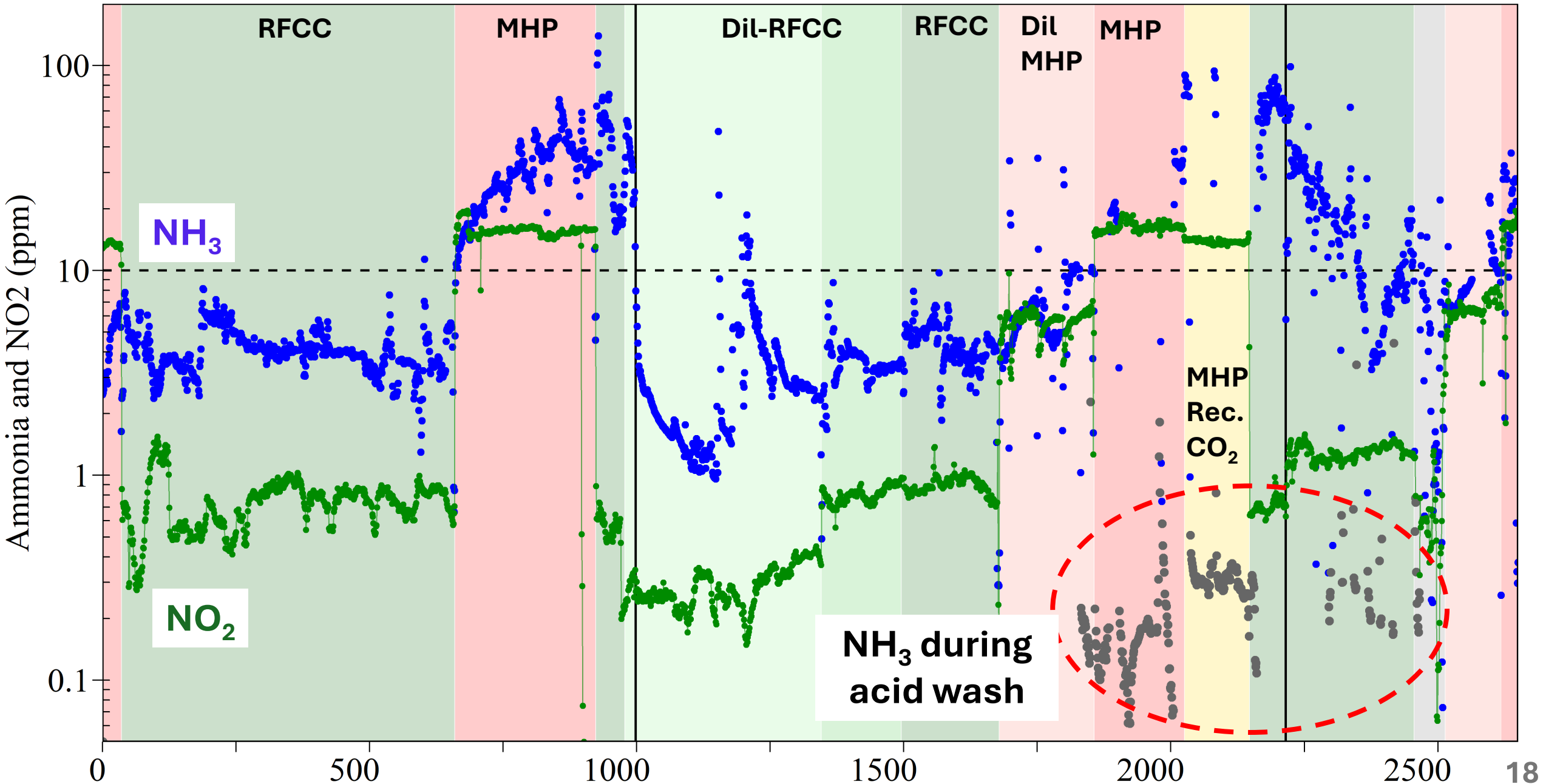
Highest MNPZ is seen during MHP + CO₂ recycle flue gas



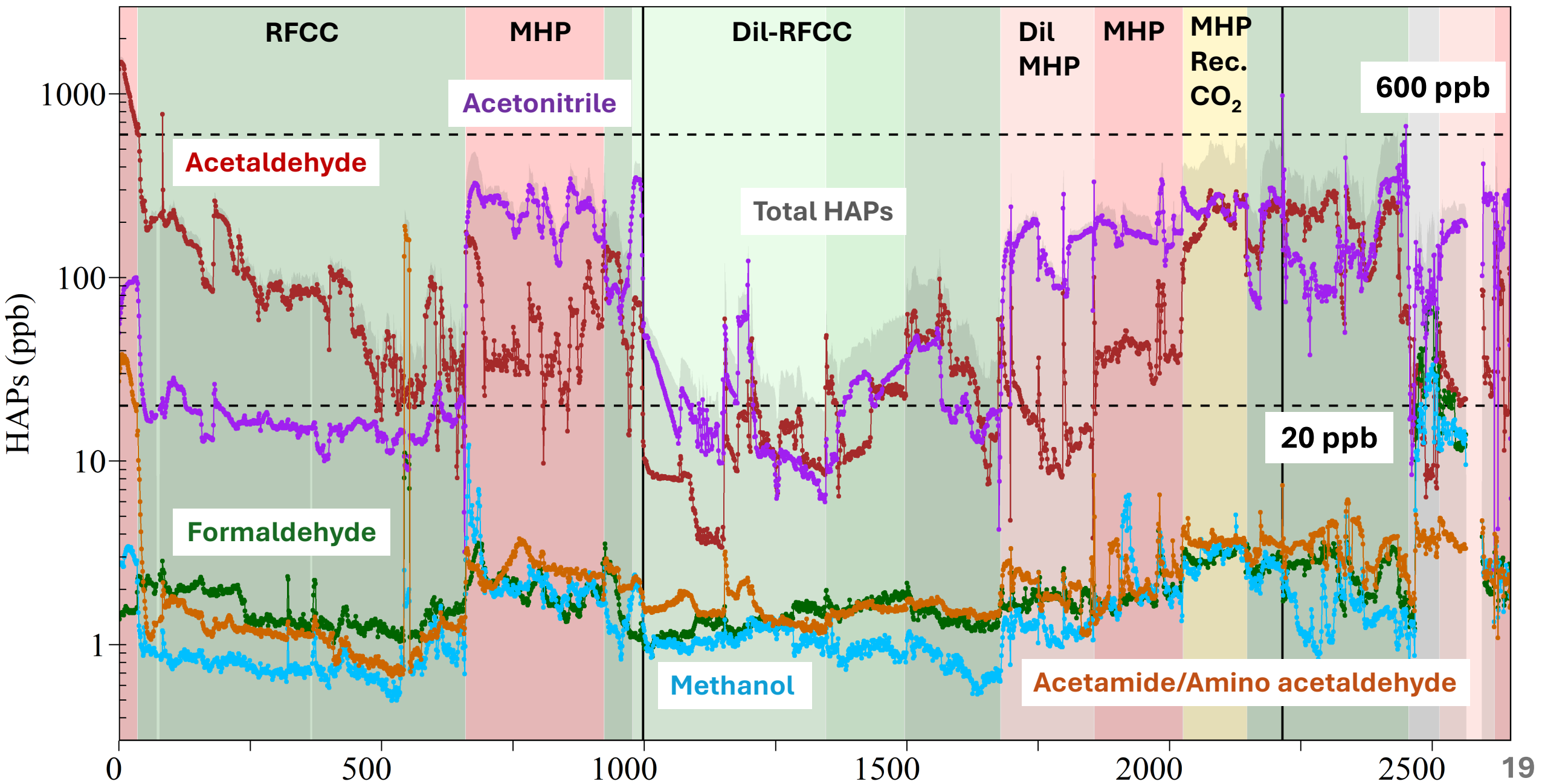
Higher NH_3 is observed during MHP flue gas periods



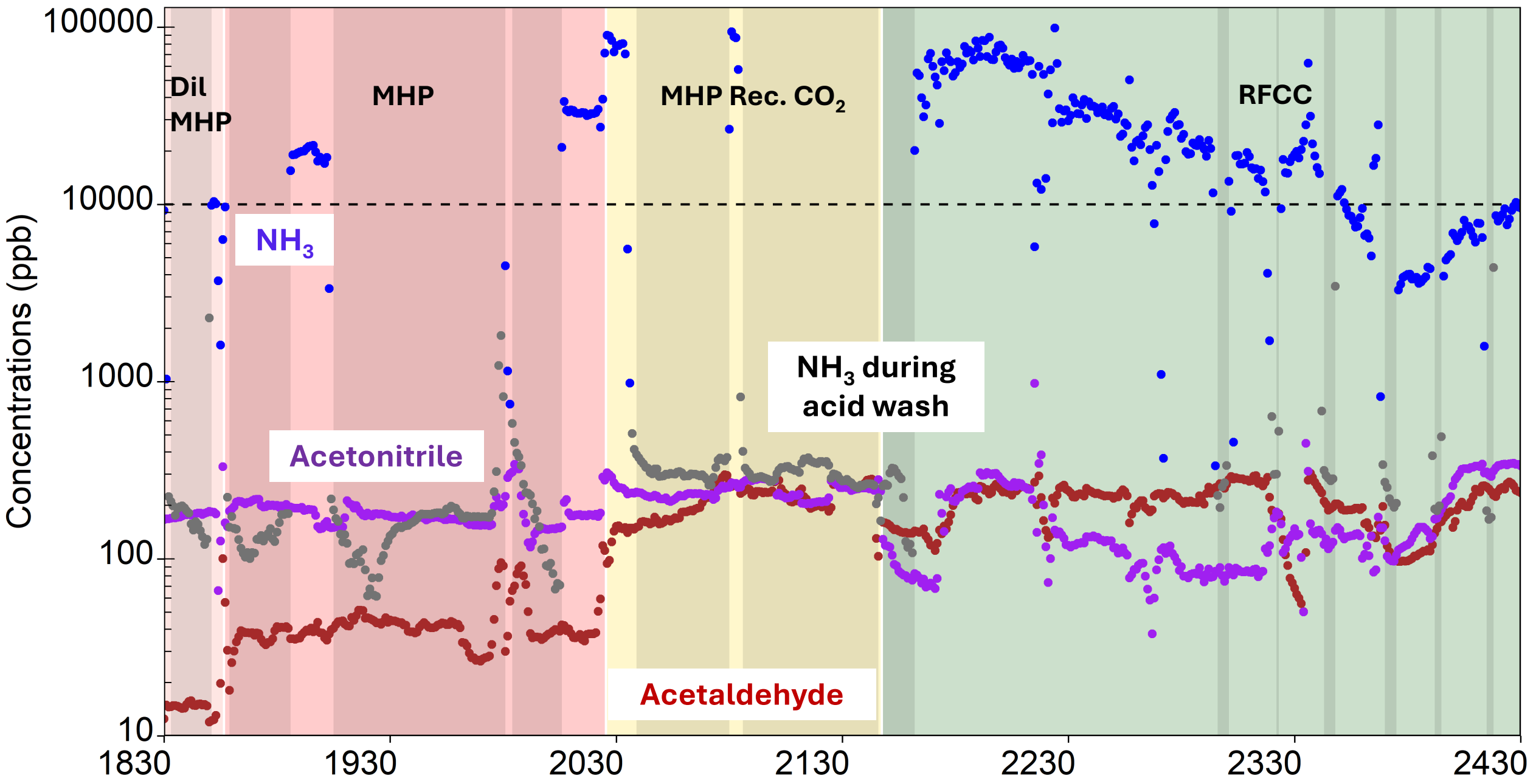
Acid wash reduces NH_3 by 99% or more



Acetaldehyde and Acetonitrile dominate among HAPs



Major HAPs are not removed by acid wash



Conclusions

- Flue gas type, dilution, and absorber conditions are the key drivers of at TCM
 - **MHP and Dil-MHP : PZ < 10 ppb**, for all water wash configurations.
 - **MHP with recycled CO₂ : PZ : 1-2ppm**, likely due to aerosol formation
 - **RFCC : PZ emission up to 5 ppm**, increasing water wash stages decreased PZ emissions
 - Diluting RFCC flue gas reduced PZ emissions by 3-6x
- MNPZ dominates among nitrosamines, with emissions up to 40 ppb
- High NH₃ is generated during MHP flue gas periods(high NO₂), acid wash reduced NH₃ by 99%
- Acetaldehyde and acetonitrile dominate among HAPs – not removed by acid wash

Acknowledgements

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Disclaimer

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One author of this paper consults for a process supplier on the development of amine scrubbing technology. The terms of this arrangement have been reviewed and approved by the University of Texas at Austin in accordance with its policy on objectivity in research. One author also has financial interests in intellectual property owned by the University of Texas that includes ideas reported in this paper.

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Patents assigned to BASF, MHI and SLB Capturi address water wash systems similar to those tested at TCM.



Questions?

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Supplementary Slides

Among nitroso amines MNPZ dominates

