Formaldehyde is an atmospheric gas that is sensitive to different vegetation emissions, fires, methane, and climate. We use a 20-year record of atmospheric formaldehyde measurements at Wollongong, southeast Australia, to identify changes in the local environment and determine how these changes have impacted atmospheric composition. We find the amount of formaldehyde at Wollongong has been decreasing by -1.5 percent per year from 1996-2015. By comparing this to satellite measurements of formaldehyde over the greater region, we find that this is a distinctly local trend superimposed on a regional-scale increase in formaldehyde. At Wollongong, formaldehyde was decreasing in all months except November. In summer, the decrease can be partially explained by changes in local wildfires, but the overall decrease remains unexplained. In November, local temperatures increased. This causes plants to emit more gases that can react to form formaldehyde in the atmosphere, counteracting the formaldehyde decrease, so that no change in formaldehyde was observed during November. This work demonstrates the ability of atmospheric composition to change on a local scale and sparks a number of questions related to what could be causing the changes observed over the past 20 years in the southeast Australian atmosphere.

Final questions:

*What major topic or scientific question is addressed and why is rapid publication required?*

This paper provides the first long-term analysis of the response of atmospheric composition in southeast Australia to ongoing environmental change. Rapid publication will allow the community to propose and test theories for the unexplained observed trend.

*What new scientific knowledge is presented and why is it a major advance?*

This paper demonstrates a decrease in formaldehyde at Wollongong superimposed on a regional-scale increase. The trend cannot be fully explained by temperature, biogenic emissions, fires, anthropogenic emissions, or transport -- sparking further questions.

*What are the broad implications of the results, which scientific communities will be impacted by the paper and why?*

The results suggest our understanding of the southern hemisphere atmosphere remains incomplete. It also finds a warming-driven increase in biogenic emissions, with implications for atmospheric chemistry, climate and biosphere-atmosphere interactions.