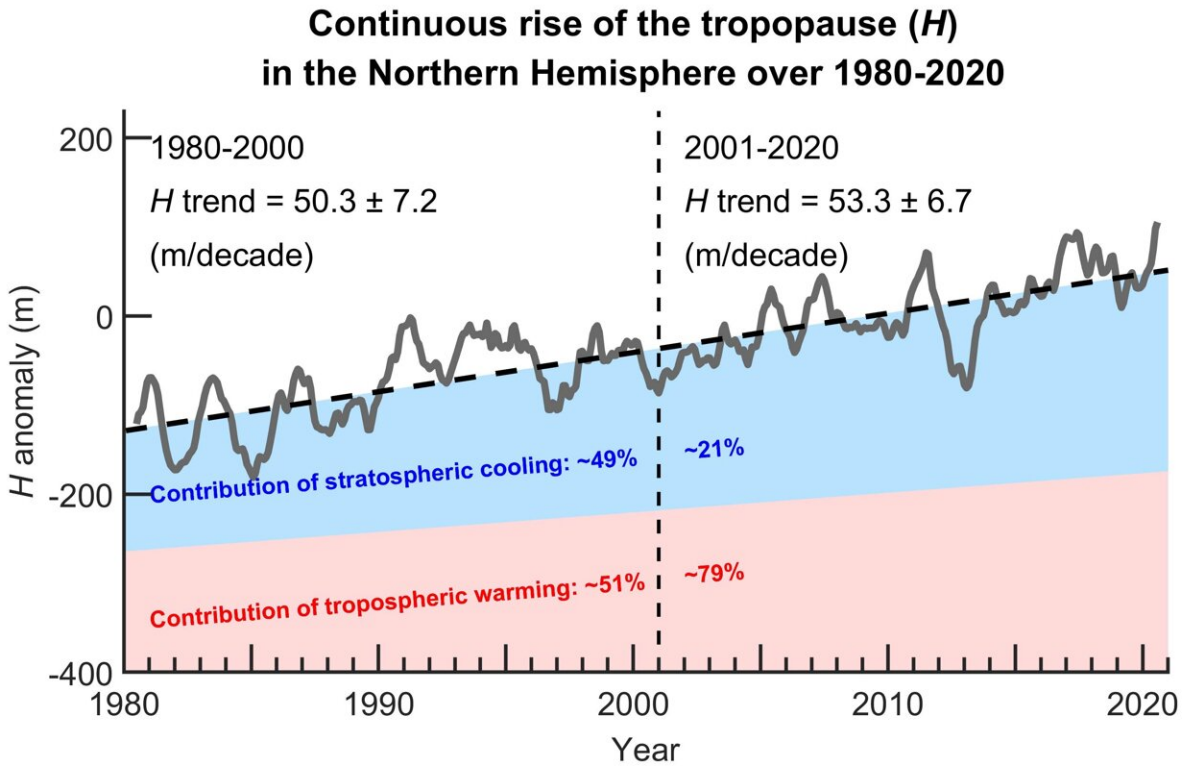
Weather balloon data shows troposphere getting thicker, pushing tropopause higher over past 40 years

November 8 2021, by Bob Yirka



Tropopause height in the Northern Hemisphere has continuously risen since 1980. Tropospheric warming due to the anthropogenic greenhouse effect is the main contributing factor for the rise after 2000. Credit: Meng et al., Sci. Adv. 2021; 7 : eabi8065

An international team of researchers has found evidence that the troposphere has been getting thicker, pushing the tropopause higher at a continuous rate over the past 40 years. In their paper published in the journal *Science Advances*, the group describes their analysis of data obtained from weather balloons and GPS observations.

The bottom layer of the atmosphere, the troposphere, covers the planet, allowing us to breathe—it is also where weather occurs. It is bounded on its upper end by the tropopause, which separates the troposphere and the stratosphere. Back in the early 2000s, several studies used weather balloon data to show that the thickness of the troposphere was growing (over the period 1980 to 2000), which was pushing the tropopause higher—the teams conducting the research blamed global warming. At the time, several teams also tried to predict (using models) whether the troposphere would continue to grow thicker or hold steady. They reached no consensus, however, because of inconsistencies between the models. In this new effort, the scientists conducted similar research, this time also using GPS data to find out what has been going on with the tropopause over the past 20 years.

To learn more about possible changes to the boundaries of the troposphere and the tropopause, the researchers obtained and analyzed data from several ongoing projects that collect atmospheric data using weather balloons and GPS databases. They measured the thickness of the troposphere, which gave them the height of the tropopause, and were able to see that the height of the tropopause (over the northern hemisphere) has risen by approximately 50 to 60 meters for each of the decades under study—an amount that is similar to that found by the researchers studying the height of the tropopause back in 2000. Together, the findings show that as the planet has warmed over the past 40 years due to greenhouse gas emissions, the troposphere has been continually growing thicker. Notably, the team looked for other natural occurrences that might account for the changes such as volcanic

eruptions or El Niño events, but were unable to find any other possible sources.

More information: Lingyun Meng et al, Continuous rise of the tropopause in the Northern Hemisphere over 1980–2020, *Science Advances* (2021). DOI: 10.1126/sciadv.abi8065

Press release