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Role of the stratosphere in the global mercury cycle

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Mercury (Hg) is a global pollutant with substantial risks to human and ecosystem health. By upward transport in tropical regions, mercury enters into the stratosphere, but the contribution of the stratosphere to global mercury dispersion and deposition remains unknown. Here, we find that between 5% and 50% (passing through the 400K adiabatic layer and tropopause, respectively) of the mercury mass deposited on Earth's surface is chemically processed in the lower stratosphere. Our results show the stratosphere as a unique chemical environment where elemental mercury is efficiently converted to long-lived oxidised species. Subsequent downward transport contributes substantially to the oxidised mercury burden in the troposphere. The results show that the stratosphere facilitates the global dispersion of large amounts of mercury from polluted source regions to Earth's remote environments. We find that stratospheric transport is as important as tropospheric transport in interhemispheric mercury dispersion. Future projections suggest that expected changes in atmospheric circulation will increase the transport of mercury into the stratosphere.

Et. al: Wuhu Feng, Juan Z. Dávalos, Daniel Roca-Sanjuán, Douglas E. Kinnison, Javier Carmona-García, Rafael P. Fernandez, Qinyi Li, Peng Zhang, Yanxu Zhang, Christopher S. Blaszcak-Boxe.