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**Determination of the atmospheric chemical equator from
GEOS-Chem model simulation**

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The Western Pacific Region (WP) has some of the highest sea surface temperatures in the world, described as the Tropical Warm Pool (TWP). It plays a major role in the troposphere-stratosphere exchange and, the chemical composition in the WP will greatly affect the Tropical Tropopause Layer (TTL) and therefore stratosphere. The atmospheric circulation varies with season, following the course of the sun throughout the year, leading the WP with relatively clean air from the Southern Hemisphere (SH) and relatively polluted air from the Northern Hemisphere (NH) at different seasons. Therefore, it is of great significance to determine the chemical boundary of the NH and SH and its seasonal variation for studying the origin of air masses in the TTL and stratosphere.

Using the GEOS-Chem model, a tropospheric chemical equator is found and calculated in the tropical region, separating the polluted NH from the relatively cleaner SH. An artificially defined passive tracer with constant and uniform emission in the mid and high latitudes (30 to 90 degrees) is introduced in the GEOS-Chem model and, used to establish an atmospheric pattern of a polluted and clean hemisphere. The model simulation result provides evidence of chemical equator with sharply longitudinal gradients of the tracer in the tropics, which is not coincident with the Intertropical Convergence Zone (ITCZ), classically defined by meteorological parameters such as tropical rain belts and cloud cover. There are also regional and seasonal differences in this deviation between chemical equator and ITCZ. Given the importance of the WP region for the composition of the TTL and therefore the stratosphere, the vertical structure of the chemical equator in this region is also investigated.