A sudden change in the tropical circulation occurred in the troposphere in mid-January 2009, following the amplification of the planetary waves in the stratosphere which generated a major stratospheric sudden warming event.

Before the onset of sudden warming, the tropical convection was active over the maritime continent. After the onset, the convection becomes active over Indian Ocean and the Africa and South America continents particularly at the southern tropics. The convections excited over the Indian Ocean then moved eastward as Madden-Julian Oscillation. Large-scale tropospheric circulation also changed drastically from a east-west to a north-south type or from Walker- to Hadley circulation type.

Stratospheric tropical temperature decreased in response to a strengthening of the stratospheric meridional circulation associated with the record breaking stratospheric sudden warming event in mid-January 2009. In the Tropical Tropopause Layer (TTL), the cirrus clouds, water vapor and carbon monoxide (CO) also changed dramatically: the cirrus occurred frequently at the south side of the equator where the temperature became low. The distributions of water vapor and CO became small spatial scale due to the change in distribution of convection. It is suggested that the stratosphere and troposphere exchange process occurred on the convective scales after the onset.