

Water vapor and ozone soundings in the tropical western Pacific in January 2007 and in January 2008

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For the investigation of the processes controlling water vapor and ozone in the tropical upper troposphere and lower stratosphere, intensive observation campaigns were conducted in January 2007 and in January 2008 under the Soundings of Ozone and Water in the Equatorial Region (SOWER) project. A total of 22 sets of the cryogenic frost-point hygrometer of University of Colorado (CU-CFH) together with the electrochemical concentration cell (ECC) ozonesonde were flown at Tarawa, Kiribati (1.35N, 172.92E), Biak, Indonesia (1.17S, 136.06E), Kototabang, Indonesia (0.20S, 100.32E), and Hanoi, Vietnam (21.01N 105.80E) in January 2007, and a total of 17 sets at Biak, Kototabang, and Hanoi in January 2008. Data from three soundings at Alajuela, Costa Rica (9.98N, 84.21W) in January 2008 are also analyzed for comparison.

Average temperature and water vapor mixing ratio at the tropopause at the two equatorial stations, Biak and Kototabang, are substantially lower in the 2008 campaign than in 2007. Variations of the dynamical field are responsible for this difference. The tropopause water vapor at the off-equatorial station, Hanoi, is found to be controlled by transport pathway. It becomes low when the equatorial airmass is transported, and high when the midlatitude airmass is transported.

In the upper troposphere and in the tropical tropopause layer, high supersaturation is often observed at the equatorial stations. In the lower stratosphere, a very clear tape-recorder signal is captured by the CU-CFH sensors. The minimum produced a year before is located around 22.5 km, and the maximum produced about four months before is located around 19.5 km in January 2007 and around 20 km in January 2008.