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Ozone-enhanced layers in the troposphere over the equatorial Pacific Ocean and the influence of transport of midlatitude UT/LS air

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Abstract. Occurrence of ozone (O_3)-enhanced layers in the troposphere over the equatorial Pacific Ocean and their seasonal variation were investigated based on ozonesonde data obtained at three Southern Hemisphere ADditional OZonesondes (SHADOZ) sites, Watukosek, American Samoa and San Cristobal, for 6 years between 1998 and 2003. O_3-enhanced layers were found in about 50% of observed O_3 profiles at the three sites. The formation processes of O_3-enhanced layers were investigated by meteorological analyses including backward trajectories. On numerous occasions, O_3-enhanced layers resulted from the transport of air masses affected by biomass burning. The contribution of this process was about 30% at San Cristobal during the periods from February to March and from August to September, while it was relatively low, about 10%, at Watukosek and Samoa. A significant number of the O_3-enhanced layers were attributed to the transport of midlatitude upper-troposphere and lower-stratosphere (UT/LS) air. Meteorological analyses indicated that these layers originated from equatorward and downward transport of the midlatitude UT/LS air masses through a narrow region between high- and low-pressure systems around the subtropical jet stream. This process accounted for 50–80% at Watukosek between May and December, about 80% at Samoa on yearly average, and 40–70% at San Cristobal between November and March, indicating that it was important for O_3 budget over the equatorial Pacific Ocean.

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