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- Recent Final Revised Papers
- Volumes and Issues
- Special Issues
- Library Search
- Title and Author Search

Online Library ACPD
Alerts & RSS Feeds
General Information
Submission
Review
Production
Subscription
Comment on a Paper

Volumes and Issues | Contents of Issue 2

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Tropospheric ozone over Equatorial Africa: regional aspects from the MOZAIC data

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Abstract. We analyze ozone observations recorded over Equatorial Africa between April 1997 and March 2003 by the MOZAIC programme, providing the first ozone climatology deriving from continental in-situ data over this region. Three-dimensional streamlines strongly suggests connections between the characteristics of the ozone monthly mean vertical profiles, the most persistent circulation patterns in the troposphere over Equatorial Africa (on a monthly basis) such as the Harmattan, the African Easterly Jet, the Trades and the regions of ozone precursors emissions by biomass burning. During the biomass burning season in each hemisphere, the lower troposphere exhibits layers of enhanced ozone (i.e. 70 ppbv over the coast of Gulf of Guinea in December-February and 85 ppbv over Congo in June-August). The characteristics of the ozone monthly mean vertical profiles are clearly connected to the regional flow regime determined by seasonal dynamic forcing. The mean ozone profile over the coast of Gulf of Guinea in the burning season is characterized by systematically high ozone below 650hPa ; these are due to the transport by the Harmattan and the AEJ of the pollutants originating from upwind fires. The confinement of high ozone to the lower troposphere is due to the high stability of the Harmattan and the blocking Saharan anticyclone which prevents efficient vertical mixing. In contrast, ozone enhancements observed over Central Africa during the local dry season (June-August) are not only found in the lower troposphere but throughout the troposphere. Moreover, this study highlights a connection between the regions of the coast of Gulf of Guinea and regions of Congo to the south that appears on a semi annual basis. Vertical profiles in wet-season regions exhibit ozone enhancements in the lower troposphere due to biomass burning products transport from fires situated in the opposite dry-season hemisphere.

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