

Seasonal distribution and vertical structure of different types of aerosols in southwest China observed from CALIPSO

*Tingting Liao¹, Zhengwu Ouyang¹, Bihan Wang¹, Ke Gui²

1. Chengdu University of Information Technology, 2. Key Laboratory of Atmospheric Chemistry (LAC), Chinese Academy of Meteorological Sciences

Aerosols significantly influence global and regional atmospheric systems. Different types of aerosols play different roles in atmosphere according to their radiation characteristics and existing height. Southwest China is recognized as a region with very complex terrain, consisted of three absolutely different geomorphic units (Sichuan Basin (SCB), Yungui Plateau (YGP) and Tibetan Plateau (TP)) with distinct characteristic in air quality and climate. However, a comprehensive understanding of the regions and three-dimensional (3D) characteristics of aerosol distribution and evolutions over Southwest China is yet to be achieved. Here, the seasonal distribution and vertical structure four types of aerosols including dust, polluted continental/smoke, polluted dust and elevated smoke was studied by using CALIPSO Level 2 nighttime aerosol profile product from 2007 to 2016. It is observed that the extinction coefficient of total aerosols over SCB is highest, among which, the type of polluted continental/smoke and polluted dust, related to anthropogenic sources, made the most contributions. Whereas we can also find these two types of aerosols declined since 2013, which might due to the strict supervision measures on industry emissions and biomass burning in agriculture in recent years. The elevated smoke aerosols over YGP in the altitude of 3km in spring were significantly higher than other seasons which might related to the biomass burning transported from South Asia, while the polluted continental/smoke aerosols in the altitude of 1-2 km were higher in autumn and winter, which is considered to be contributed by local biomass burning. The aerosol extinction coefficient over TP is nearly one magnitude lower than other two regions. However, either the dust and polluted continental/smoke from the Qaidam Basin, or smoke elevated from the Indo-Gangetic Basin, could be transported to the layer as high as 6km over TP, which might make profound impact on the climate system in Southwest China, event in Asia. The vertical structure and evolution of aerosols of different radiation properties over the complex terrain is supposed to provide reliable research foundation to the further study on the aerosols transport and the bifunctional feedback between aerosols, especial the absorptive aerosols, and the climate change.

Keywords: CALIOPSO, Southwest China, Vertical structure, Smoke

